M.Sc. CHEMISTRY LOCF SYLLABUS - 2021

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF CHEMISTRY SCHOOL OF PHYSICAL SCIENCES ST.JOSEPH'S COLLEGE (AUTONOMOUS)

Special Heritage Status Awarded by UGC Accredited at A⁺⁺ Grade (IV Cycle) by NAAC College with Potential for Excellence by UGC DBT-STAR & DST-FIST Sponsored College **Tiruchirappalli - 620 002, Tamil Nadu, India**

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS) POSTGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to maintain and uphold the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014 - 15, to meet and excel the challenges of the 21^{st} century.

Each School integrates related disciplines under one roof. The school system enhances the optimal utilization of both human and infrastructural resources. It also enhances academic mobility and enriches employability. The School system preserves the identity, autonomy and uniqueness of every department and reinforces Student centric curriculum designing and skill imparting. These five schools adhere to achieve and accomplish the following objectives.

Optimal utilization of resources both human and material for the academic flexibility leading to excellence.

Students experience or enjoy their choice of courses and credits for their horizontal mobility.

The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.

Human excellence in specialized areas

Thrust in internship and / or projects as a lead towards research and

The multi-discipline nature of the School System caters to the needs of stake-holders, especially the employers.

Credit system:

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The credits and hours of each course of a programme is given in the table of Programme Pattern. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of 110 credits as mentioned in the programme pattern table. The total number of minimum courses offered by the Department is given in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

OBE is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no single specified style of teaching or assessment in OBE; instead, classes, opportunities and assessments should all help the students achieve the specific outcomes

Outcome Based Education, as the name suggests depends on Outcomes and not Inputs. The outcomes in OBE are expected to be measurable. In fact each Educational Institute can state its own outcomes. The ultimate goal is to ensure that there is a correlation between education and employability

Outcome –Based Education (OBE): is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve, stated objectives and outcomes. It focuses on measuring student performance i.e. outcomes at different levels.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs):

PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Programme Educational Objectives (PEOs): The PEOs of a programme are the statements that describe the expected achievement of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the first few years after Graduation.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC)

A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE)

Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

DSE: Four courses are offered, one course in each semester.

Note: To offer one DSE, a minimum of two courses of equal importance / weightage is a must.

One DSE Course in semester two is offered as interdisciplinary/common course among the departments in a School (Common Core Course) at the PG level.

Generic Elective Courses

An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Two GE Courses are offered, one each in semesters II and III. The GE course offered in semester II is within the school level and the GE in semester III is Between Schools level

The Ability Enhancement Courses (AEC)

One Main discipline related Ability Enhancement Course for 3 credits is offered for a PG programme by the Department.

Skill Enhancement Courses (SECs)

These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme.

One SEC is offered in semester II as a compulsory course on Soft Skills, offered by the Department of Human Excellence, common to all the students of PG programme.

Self-paced Learning: It is a course for two credits. It is offered to promote the habit of independent/self learning of Students. Since it is a two credit course, syllabus is framed to complete within 45 hours. It is not taught in the regular working hours.

Comprehensive Examinations: A detailed syllabus consisting of five units to be chosen from the courses offered over the five semesters which are of immense importance and those portions which could not be accommodated in the regular syllabus.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL and etc.

Course Coding:

The following code system (10 alphanumeric characters) is adopted for Post Graduate courses:

21	PXX	Ν	XX	NN/NNX
Year of	PG Department	Semester	Part Category	running number/with choice
Revision	Code	number.		

N:- Numerals X :- Alphabet Part Category CC - Core Theory **CP-** Core Practical **IS-Internship SP- Self Paced Learning CE-** Comprehensive Examination PW- Project Work & viva-voce **Electives Courses** ES – Department Specific Electives **EG-** Generic Electives EC - Additional core Courses for Extra Credits (If any)* **Ability Enhancement Courses** AE – Ability Enhancement Course SE – Skill Enhancement Course – Soft skills CW - SHEPHERD & Gender Studies (Outreach)

CIA AND SEMESTER EXAMINATION

Continuous Internal Assessment (CIA):

Distribution of CIA Marks					
Passing Minimum: 50 Marks					
Library Referencing	5				
3 Components	35				
Mid-Semester Test	30				
End-Semester Test	30				
CIA	100				

MID-SEM & END-SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective and Descriptive elements; with the existing question pattern PART-A; PART-B; PART-C and PART D.

2. One of the CIA Component II/III for UG & PG will be of 15 marks and compulsorily a online objective multiple choice question type.

3. The online CIA Component must be conducted by the Department / faculty concerned at a suitable computer centre.

4. The one marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS.

5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.

Duration of Examination must be rational; proportional to teaching hours 90 minuteexamination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

S. No.			Description
		It is the ability to remember the previously learned	
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level)	Lower Order Thinking			Higher (Total		
K- LEVELS	K1	K2	K3	K4	K5	K6	%
SEMESTER EXAMINATIONS	15	20	35	30		100	
MID / END Semester TESTS	12	20	35	33		100	

QUESTION PATTERN FOR SEMESTER E	XAMINATION	
SECTION		MARKS
SECTION-A		15
(No choice ,One Mark) THREE questions from each unit	(15x1 = 15)	13
SECTION-B		20
(No choice ,2-Marks) TWO questions from each unit	(10x2 = 20)	20
SECTION-C		35
(Either/or type) (7- Marks) ONE question from each unit	(5x7 =35)	
SECTION-D		20
(3 out of 5) (10 Marks) ONE question from each unit	(3x10 = 30)	30
	Total	100

BLUE PRINT OF QUESTION PAPER FOR SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.					Max	Mar	k : 100
K- LEVELS	K1	K2	K3	K4	K5	K6	Total
SECTIONS							Marks
SECTION-A (One Mark, No choice) $(15x1 = 15)$	15						15
SECTION-B (2-Marks, No choice) (10x2=20)		10					20
SECTION-C (7- Marks) (Either/or type) (5x7=35)			5				35
SECTION-D (10 Marks) (3 out of 5) (3x10=30)				3			
Courses having only K4 levels							
Courses having K4 and K5 levels				2	1		30
One K5 level question is compulsory				Z	1		30
(Courses having all the 6 cognitive levels							
One K5 and K6 level questions can be				1	1	1	
compulsory							
Total	15	20	35		30		100

QUESTION PATTERN FOR MID/END TEST	
SECTION	MARKS
SECTION-A (No choice, One Mark) $(7x1 = 7)$	7
SECTION-B (No choice, 2-Marks) $(6x2 = 12)$	12
SECTION-C (Either/or type) $(7 - Marks)$ $(3x7 = 21)$	21
SECTION-D (2 out of 3) (10 Marks) (2x10=20)	20
Tot	al 60

BLUE PRINT OF QUESTION PAPER FOR MID/END TEST							
DURATION: 2. 00 Hours.					Μ	ax Ma	ark: 60.
K- LEVELS	K1	K2	K3	K4	K5	K6	Total
SECTIONS							Marks
SECTION – A (One Mark, No choice) $(7 \times 1 = 7)$	7						07
SECTION-B (2-Marks, No choice) $(6 \times 2 = 12)$		6					12
SECTION-C (Either/or type) (7-Marks) (3 x 7 =21)			3				21
SECTION-D (2 out of 3) (10 Marks) (2x10=20)				2			
Courses having only K4 levels							
Courses having K4 and K5 levels				1	1		20
One K5 level question is compulsory							
Courses having all the 6 cognitive levels					1	1	
One K6 level question is compulsory							
Total Marks	07	12	21		20		60
Weightage for 100 %	12	20	35		33		100

Assessment pattern for two credit courses.

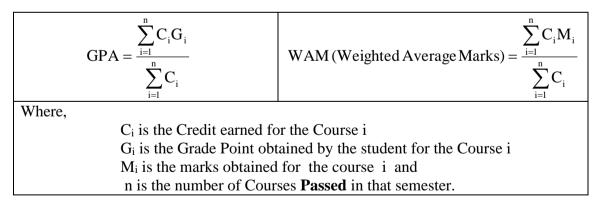
S. No.	Course Title	CIA	Semester Examination	Total Marks	
1	Self Paced Learning Course	25 + 25 = 50	50 Marks MCQ (COE)	100	
2	Comprehensive Examinations	25 + 25 = 50	50 Marks (MCQ) (COE)	100	
3	Internship	100		100	
4	Field Visit	100		100	
5	Ability Enhancement Course (AEC) for PG (3 credits)	50 (Three Components)	Specific Question Pattern		
Assess	ment Pattern for Courses in Par	t - IV			
6	Value Education Courses and Environmental Studies	50	50 Marks (For 2.00 hours) (COE)	100	
7	Skill Enhancement Courses(SECs)	50 marks (by 0 50 Marks (by the Department	100		
8	SEC: SOFT SKILLS (For UG and PG)	100	(Fully Internal)	100	

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) respectively. These two are calculated by the following formulae:



CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

- i) The classification of final results shall be based on the CGPA, as indicated in Table-2.
- ii) For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99 and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.
- iii) A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.
- iv) Absence from an examination shall not be taken an attempt.

Marks Range	Grade Point	Corresponding Grade
90 and above	10	0
80 and above and below 90	9	A+
70 and above and below 80	8	Α
60 and above and below 70	7	B +
50 and above and below 60	6	В
Below 50	0	RA

Table-1: Grading of the Courses

Table-2: Final Result						
CGPA	Corresponding Grade	Classification of Final Result				
9.00 and above	0	Outstanding				
8.00 to 8.99	A+	Excellent				
7.00 to 7.99	Α	Very Good				
6.00 to 6.99	B +	Good				
5.0 0 to 5.99	В	Above Average				
Below 5.00	RA	Re-appearance				

Credit based weighted Mark System is adopted for the individual semesters and cumulative semesters in the column 'Marks secured' (for 100)

Declaration of Result

Mr./ MS. ______ has successfully completed the Post Graduate in programme. The candidate's Cumulative Grade Point Average (CGPA) is ______ and the class secured is ______ by completing the minimum of 110 credits. The candidate has also acquired ______ (if any) extra by attending MOOC courses.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

The Programme Outcomes(POs)/Programme Specific Outcomes(PSOs) are the qualities that must be imbibed in the graduates by the time of completion of their programme. At the end of each programme the PO/PSO assessment in done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

For each Course, there are five Course Outcomes to be achieved at the end of the course. These Course outcomes are framed to achieve the POs/PSOs. All course outcomes shall have linkage to POs/PSOs in such a way that the strongest relation has the weight 3 and the weakest is 1. This relation is defined by using the following table.

Mapping	<40%	\geq 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

Mean Scores of COs = Sum of values Total No.of POs & PSOs		Mean Overall Score = $\frac{\text{Sum of Mean Scores}}{\text{Total No.of COs}}$		
		< 1.2	# Low	
Result	Mean Overall Score	\geq 1.2 and < 2.2	# Medium	
	Score	≥ 2.2	# High	

If the mean overall score is low then the course in charge has to redesign the particular course content so as to achieve high level mean overall score.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

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If the mean overall score is low then the course in charge has to redesign the particular course content so as to achieve high level mean overall score.

Vision

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

Mission

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.
- Nurturing comprehensive learning and best practices through innovative and valuedriven pedagogy.
- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

Programme Educational Objectives (PEOs)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

Programme Outcomes (POs)

- 1. Graduates will be able to apply assimilated knowledge to evolve tangible solution to emerging problems.
- 2. Graduates will be able to analyze and interpret data to create and design new knowledge.
- 3. Graduates will be able to engage in innovative and socially relevant research and effectively communicate the findings.
- 4. Graduates will become ethically committed professional and entrepreneurs upholding human values.
- 5. Graduates imbibed with ethical values and social concern will be able to understand and appreciate cultural diversity, social harmony and ensure sustainable environment.

Programme Specific Objectives (PSOs)

- 1. Graduates will be able to apply assimilated knowledge to evolve chemical alternatives to emerging environmental requisites.
- 2. Graduates will be able to analyze, interpret and create data for emerging scientific needs.
- 3. Graduates will be able to engage in innovative and socially relevant research with ethical concern.
- 4. Graduates will be able to lead, appreciate and exhibit compatibility with humane values for social harmony.
- 5. Graduates will be able to effectively communicate and apply modern tool knowledge to evolve financial rewarding projects.

	M. Sc. C	CHEMISTRY									
	PROGRAMME STRUCTURE										
Sem	Specification	Credits	Total Credits								
I-IV	Core Courses : Theory	10	54	51	51						
I-IV	Core Courses : Practicals	6	24	18	18						
II	Self-paced learning	1	-	2	2						
IV	Comprehensive Examination	1	-	2	2						
IV	Project work & Viva Voce	1	6	5	5						
I- IV	Discipline Specific Elective	4	20	16	16						
Ι	Ability Enhancement Course	1	4	3	3						
II	Skill Enhancement Course (Soft Skills)	1	4	3	3						
III	Generic Elective IDC (WS)	1	4	3	3						
IV	Generic Elective IDC (BS)	1	4	3	3						
II-IV	Online courses (MOOC)	3	-	(6)	(6)						
I-IV	Outreach Programme	1	-	4	4						
I-IV	Total	31	120	110(6)	110(6)						

		M. Sc. CHEMISTRY PROGRAMME PATTERN					
		Course Details			Sche	me of Ex	ams
Sem	Code	Course Title	Hrs	Cr	CIA	SE	Final
	21PCH1CC01	Inorganic Chemistry-I	6	6	100	100	100
	21PCH1CC02	Physical Chemistry-I	7	6	100	100	100
	21PCH1CP01	Inorganic Chemistry Practical-I	4	3	100	100	100
т	21PCH1CP02	Physical Chemistry Practical-I	4	3	100	100	100
Ι	21PCH1ES01A	DSE-1: Organic Chemistry I	5	4	100	100	100
	21PCH1ES01B	DSE-1: Stereochemistry	5	4	100	100	100
	21PCH1AE01	AEC : Analytical Techniques	4	3	50	50	50
		Total	30	25			
	21PCH2CC03	Inorganic Chemistry-II	4	4	100	100	100
	21PCH2CC04	Organic Chemistry-II	5	4	100	100	100
	21PCH2CP03	Inorganic Chemistry Practical-II	4	3	100	100	100
	21PCH2CP04	Physical Chemistry Practical-II	4	3	100	100	100
	21PCH2SP01	Self-Paced Learning : Selected Topics in		2	50	50	50
II	211 C11251 01	Organic Chemistry	-	2	50	50	50
	21SPS2ES02A	DSE-2: Spectroscopy and Group Theory	5	4	100	100	100
	21PSS2SE01	SEC: Soft skills	4	3	100	-	100
21PCH2EG0	21PCH2EG01	GE-1(WS): Industrial Products	4	3	100	100	100
		Extra Credit Courses (MOOC)-1	-	(2)			
		Total	30	26(2)			
	21PCH3CC05	Inorganic Chemistry- III	5	4	100	100	100
	21PCH3CC06	Organic Chemistry-III	6	6	100	100	100
	21PCH3CC07	Physical Chemistry - II	6	6	100	100	100
	21PCH3CP05	Organic Chemistry Practical- I	4	3	100	100	100
III	21PCH3ES03A	DSE-3: Bioorganic Chemistry	~	4	100	100	100
	21PCH3ES03B	DSE-3: Pharmaceutical Chemistry	5	4	100	100	100
	21PCH3EG02	GE-2 (BS): Health Science	4	3	100	100	100
		Extra Credit Courses (MOOC)-2		(2)			
			20	2((2)			
	21PCH4CC08	Total	30	26 (2)	100	100	100
	21PCH4CC08 21PCH4CC09	Inorganic Chemistry-IV Organic Chemistry-IV	<u>6</u> 5	6 5	100	100	100
	21PCH4CC09	Physical Chemistry - III	4	4	100	100	100
	21PCH4CC10 21PCH4CP06	Organic Chemistry Practical- II	4	3	100	100	100
	21PCH4ES04A	DSE-4: Selected Topics In Inorganic and	4	5	100	100	100
IV	211 CH4L504A	Physical Chemistry- I	5	4	100	100	100
1 V	21PCH4ES04B	DSE- 4: Selected Topics In Chemistry	5	4	100	100	100
		1 7	6	5	100	100	100
	21PCH4PW01	Project work and Viva-Voce	6	5	100	100	100
	21PCH4CE01	Comprehensive Examination	-	2	50	50	50
		Extra Credit Courses (MOOC)-3	-	(2)			1
		Total	30	29 (2)			
I-IV	21PCW4OR01	Outreach Programme (SHEPHERD)	~ ~	4			1
		Total (Four Semesters)	120				

*The courses with a scheme of Exam 50 in CIA and SE will be converted to 100 for grading.

	GENERIC ELECTIVE -1: 2 nd Semester										
V	Within school (WS)- Offered to students belong to other Departments in the School Course Details Scheme of Exams										
	Course Details										
School	Course Code	Course Title	Hrs	Cr	CIA	SE	Final				
	21PBI2EG01	Herbal Technology	4	3	100	100	100				
SBS	21PBT2EG01	Medical Biotechnology	4	3	100	100	100				
	21PBO2EG01	Medicinal Botany	4	3	100	100	100				
	21PCA2EG01	Applied Statistics using R	4	3	100	100	100				
SCS	21PMA2EG01	Mathematical Foundations	4	3	100	100	100				
	21PCS2EG01	Mobile Adhoc Networks (MANET)	4	3	100	100	100				
	21PEN2EG01A	Indian Literature in Translation									
SLAC	21PEN2EG01B	English Literature For Competitive Examinations	4	3	100	100	100				
	21PCO2EG01	Supply Chain Management	4	3	100	100	100				
~ ~	21PEC2EG01	Labour Economics	4	3	100	100	100				
SMS	21PHR2EG01	Organizational Behaviour	4	3	100	100	100				
	21PCC2EG01	Stress Management	4	3	100	100	100				
	21PCH2EG01	Industrial Products	4	3	100	100	100				
SPS	21PPH2EG01A	Solar Energy and Utilization	4	3	100	100	100				
	21PPH2EG01B	Renewable Energy Resources	4	3	100	100	100				

GENERIC ELECTIVE -2: 3rd Semester Between schools (BS)- Offered to students in the Departments belong to other Schools

	(Except the school offering the course)									
	Schei	Scheme of Exams								
School	Course Code	Course Title	Hrs	CIA	SE	Final				
	21PBI3EG02	First Aid Management	4	3	100	100	100			
SBS	21PBT3EG02	Food Technology	4	3	100	100	100			
	21PBO3EG02	Horticulture and Landscaping	4	3	100	100	100			
	21PCA3EG02	Web Design	4	3	100	100	100			
SCS	21PMA3EG02	Operations Research	4	3	100	100	100			
565	21PCS3EG02	Advances in Computer Science	4	3	100	100	100			
	21PDS3EG02	Deep Learning	4	3	100	100	100			
SLAC	21PEN3EG02	English for Effective Communication	4	3	100	100	100			
	21PCO3EG02	Basics of Taxation	4	3	100	100	100			
	21PEC3EG02	Managerial Economics	4	3	100	100	100			
SMS	21PHR3EG02	Counselling and Guidance	4	3	100	100	100			
	21PCC3EG02	Dynamics of Human Behaviour in	4	3	100	100	100			
		Business	4	3	100	100	100			
	21PCH3EG02	Health Science	4	3	100	100	100			
SPS	21PPH3EG02A	Physics for Competitive Exam	4	3	100	100	100			
	21PPH3EG02B	Nano Science	4	3	100	100	100			

Semester	Course code	Title of the Course	Hours	Credits
Ι	21PCH1CC01	CORE-1: INORGANIC CHEMISTRY - I	6	6

CO.	CO-Statements	Cognitive
No.	On successful completion of this course, students will be able to	Levels (K-Level)
CO-1	identify the catalytic and magnetic properties of transition elements.	K1
CO-2	understand the structures of selected complexes.	K2
CO-3	apply the fundamental aspects of nuclear chemistry.	K3
CO-4	compare and contrast the properties of lanthanides and actinides.	K4
CO-5	interpret and elaborate various structure-property relations of transition metal complexes.	K5 & K6

Unit-I Transition Elements

Transition elements - general characteristics - atomic, ionic radii - variation along the period and group - variable valency, colour, magnetic properties, non-stoichiometry, catalytic property, formation of alloys, complexing tendency - stabilization of unusual oxidation states.

Unit-II Inner Transition Elements

Inner transition elements - position in the periodic table - electronic configuration, oxidation states, solubility, colour and spectra, magnetic properties - separation of lanthanides - lanthanide contraction: causes and consequences - gadolinium break, shift reagents - extraction of thorium and uranium- comparison of actinides and lanthanides.

Unit-III Selected Compounds of *d*-block and basics of Nuclear Chemistry (18 Hours) Selected compounds of *d*-block elements: (Structure only): chromium (II) acetate, manganese (III) acetate, manganese (III) oxalate, $[\text{Re}_2\text{Cl}_8]^{2-}$, $[\text{Nb}_6\text{Cl}_{12}]^{2+}$, $[\text{Mo}_6\text{Br}_8]^{4+}$, Prussian blue, Turnbull's blue, $[\text{Ni}(\text{DMG})_2]$, [Zn(EDTA)].

Fundamentals of Nuclear Chemistry: Subatomic particles and their properties - nuclear binding energy - nuclear structure - liquid drop model and nuclear shell model - n/p ratio - nuclear forces - modes of radioactive decay - alpha, beta and gamma decay - orbital electron capture - nuclear isomerism - internal conversion.

Unit -IV Instrumental Techniques in Nuclear Chemistry

Q-value of nuclear reaction, coloumbic barrier, nuclear cross section, threshold energy and excitation function - different types of nuclear reactions: fragmentation, nuclear fission, nuclear fusion and spallation - proportional counter, Geiger-Muller counter, scintillation counter and Cherankov counter-linear accelerators - cyclotron, synchrotron.

Unit - V Applications of Fission, Fusion and Trace Elements

Characteristics of fission reactions - product distribution, theories of fission - fissile and fertile isotopes - nuclear fusion and stellar energy- nuclear wastes - nuclear reprocessing - radiation hazards and prevention - applications of isotopes - neutron activation analysis -

6

(18 Hours)

(18 Hours)

(18 Hours)

(18 Hours)

isotopic dilution analysis - uses of tracers in structural and mechanistic studies, agriculture, medicine and industry - radio carbon dating - hot atom chemistry - atomic power projects in India.

Books for Study

- Huheey J E, Keiter E A and Keiter R L, *Inorganic Chemistry Principles of Structure* and Reactivity, 4th Edition, Harper Collins College Publishers, New York, 1993.
 Unit I and II Chapter 14
- Lee J D, Concise Inorganic Chemistry, 5th Edition, ELBS, London, 1998.
 Unit I Chapter 18 Unit II Chapter 29 and 30
- Glasstone S, Source Book on Atomic Energy, Affiliated East West Press Pvt. Ltd. New Delhi, 1967.
 Unit III Chapter 1 and 5 Unit IV Chapter 6 Unit V Chapter 13-18

Books for Reference

- 1. Cotton F A and Wilkinson G, *Inorganic Chemistry A Comprehensive Text*, 3rd Edition, Inter Science Publishers, New York, 1972.
- 2. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York, 2014.
- 3. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education Limited, Essex, 2012.
- 4. Friedlander G, Macias E S, Kennedy J W and Miller J M, *Nuclear and Radiochemistry*, 3rd Edition, John Wiley and Sons Inc., London, 1981.
- 5. Arniker H J, *Essentials of Nuclear Chemistry*, New Age International Publishers, New Delhi, 2005.

Web Resources











Radioactivity

Nuclear Fission Nuclear Reactions

Reactions Reactor System

Periodic Table Properties

Semester	Co	Course code			Title of the Course			Но	urs	Credits		
I	21P	21PCH1CC01			ORGA	CORE NIC CE	E-1: IEMIST	rry - I		5	6	
LOUISE Programme Outcomes (PDS)						comes (POs) Programme Specific Outcomes (PSOs)			omes	Mean Score		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs	
CO-1	3	2	2	2	2	3	2	2	2	2	2.2	
CO-2	3	2	2	2	2	3	2	2	2	2	2.2	
CO-3	3	3	2	2	2	2	3	2	2	2	2.3	
CO-4	3	2	2	2	2	2	3	2	2	2	2.2	
CO-5	3	2	2	2	2	3	3	2	2	2	2.3	
	Mean overall Score									2.24 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21PCH1CC02	CORE-2: PHYSICAL CHEMISTRY-I	7	6

CO. No.	CO-Statements	Cognitive
	On successful completion of this course, students will be able to	Levels (K level)
CO-1	describe the concepts of classical mechanics.	K1
CO-2	understand the fundamentals of statistical thermodynamics.	K2
CO-3	apply mathematical relations in quantum chemistry.	K3
CO-4	correlate the Schrodinger equation with simple systems.	K4
CO-5	interpret and validate the concepts of statistical thermodynamics in various thermodynamic functions.	K5 & K6

Unit-I Classical Mechanics

Conservation principles- conservation of linear momentum, angular momentum and energyequations of motion - Newtonian, Lagrangian and Hamiltonian- failure of classical mechanics - black body radiation- photoelectric effect - heat capacity of substances- hydrogen atomic spectrum- wave particle dualism- de-Broglie equation- Compton effect - uncertainty principle and its applications - conversion of classical wave equation into Schrodinger wave equation.

Unit-II Mathematics for Quantum Chemistry

Functions - definition- classification- linearly dependent and independent functions- odd and even functions- inner product- normalization- orthogonality- orthonormal functions-Kronecker delta -proper function - Eigen functions - need for normalization- review of vectors and vector spaces- operators - linear and non-linear operators- commutation relationship- Construction of operators-linear momentum- angular momentum and energy operators- commutation relation among angular momentum operators- Hermitian operators and their properties- anti Hermitian - postulates of quantum mechanics.

Unit-III Basic Quantum Chemistry

Solution of the Schrodinger equation for exactly solvable problems - particle in 1D and 3D boxes - harmonic oscillator and rigid rotor- tunneling - one dimensional potential barrier and wells - solution of Schrodinger equation for hydrogen atom - radial and angular probability distributions - atomic orbital and electron spin - Pauli's exclusion principle.

Unit-IV Fundamentals of Statistical Thermodynamics

Statistical method - microstates- macro states - permutations and combinations - combinatory rule - probability theorems - ensembles - phase space - thermodynamic probability - statistical equilibrium - Maxwell Boltzmann statistics - derivation of M.B. statistics - relationship between entropy and probability - heat capacity of solids - Einstein and Debye models - statistical meaning of third law of thermodynamics.

Unit-V Applications of Statistical Thermodynamics

Partition functions - molar- translational- rotational and vibrational partition functions of diatomic and polyatomic molecules - separation of partition function according to forms of energy-partition function and vibrational energy - total partition function - electronic partition function-derivation of thermodynamic quantities E, S, A, H, G, K and C_p , C_v using partition function-Sackur-Tetrode equation - Bose - Einstein statistics - Fermi - Dirac statistics -

(21 Hours)

(21 Hours)

(21 Hours)

(21 Hours)

(21 Hours)

electronic heat capacity of gases - equipartition of energy - classical and quantum statistical theory of heat capacities - heat capacities for diatomic molecule - rotational heat capacity of hydrogen molecule - nuclear spin statistics - nuclear spin entropy- quantum statistics.

Books for Study

- 1. Prasad R K, *Quantum Chemistry*, 5th Edition, Wiley Eastern Ltd, New Delhi, 1992. **Unit I, II and III** *Chapters 1-7*
- Anderson J M, *Mathematics of Quantum Chemistry*, 1st Edition, W.A. Benjamine Inc., Massachusetts, 2005. Unit II Chapter 1 and 2
- McQuarrie D A, *Quantum Chemistry*, 1st Indian Edition, Viva Books Private Ltd., New Delhi,2007. Unit I, II and III Chapter: 1-6
- 4. Kuriakose J C and Rajaram J C, *Thermodynamics*, Shoban Lal Co., Jalandar, 1996.
 Unit IV and V Chapter 7 and 8

Books for Reference

1. Levine I N, *Quantum Chemistry*, 6th Edition, Prentice Hall of India, Pvt. Ltd., 2009.

2. Atkins P and Ronald Friedman, *Molecular Quantum Mechanics*, 5th Edition, Oxford University Press, New York, 2011.

3. Gupta M C, *Statistical Thermodynamics*, 2nd Edition, New Age International Publishers, Chennai, 1998.

4. McQuarrie D A, *Statistical Thermodynamics*, Indian Edition, Viva Books Private Ltd., New Delhi, 2003.

Web Resources











Wave Duality

Postulates-Part-I

Particle in a Box

Statistical Thermodynamics

Microstates

Semester	Co	urse co	ode		Title of the Course				Но	urs	Credits
I	21P	CH1C	C02	P	HYSIC	CORE CAL CH		'RY-I		7	6
Course Outcomes	$\langle PSOs \rangle$						c Outco	omes	Mean Score		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	3	2	2	1	3	3	2	2	1	2.2
CO-2	2	2	2	3	1	2	2	2	3	1	2.0
CO-3	3	2	2	2	2	3	2	2	2	2	2.2
CO-4	2	3	2	2	2	2	3	2	2	2	2.2
CO-5	3	3	3	2	2	3	3	3	2	2	2.6
Mean overall Score									2.24 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21PCH1CP01	Core Practical-1: INORGANIC CHEMISTRY PRACTICAL-I	4	3

CO No.	CO-Statement On completion of the course, the postgraduates will be able to	Cognitive Level (K-Level)
CO-1	understand the basics of semimicro inorganic analysis.	K1
CO-2	explain the classification of metal cations into different groups.	K2
СО-3	examine a given inorganic mixture and find out the different groups of cations in it.	К3
CO-4	investigate the presence of trace metal ions using colorimetry.	K4
CO-5	assess and improve the water quality by eliminating the environmental pollutants.	K5 & K6

Unit-I Introduction to Inorganic Semimicro Analysis

Introduction to the semi-micro method - apparatus and procedures - reaction vessels - reagent bottles - the dropper pipette - stirrers - spatula - generators for hydrogen sulphide - heating devices- centrifuge - evaporation - testing for gaseous products

Unit-II Classification of Cations into Groups

Classification of cations into groups - analysis of group I - separation of copper and tin groups - analysis of groups IIA and IIB - analysis of group III - analysis of group IV - analysis of group VI

Unit-III Systematic Semi-micro Analysis of Inorganic Mixtures Containing TwoCommon and Two Less Common (rare) Cations(30 Hours)

Systematic semi-micro analysis of any five inorganic mixtures.

Unit-IV Introduction to Colorimetric Analysis

Basic principles of colorimetry - Lambert's law - Beer's law -Beer-Lambert law - applications of Beer's law - deviations from Beer's law - classification of methods of color measurement - the standard series method - photoelectric photometric method - spectrophotometric method.

Unit-V Experimental Colorimetric Determinations

Some general remarks on colorimetric determinations - general procedure for colorimetric determinations - colorimetric estimation of iron as its thiocyanate complex - colorimetric estimation of copper by its reaction with ferrocyanide - colorimetric estimation of nickel as its dimethyl glyoxime complex.

(5 Hours)

(5 Hours)

(5 Hours)

Books for Study

- 1. *Inorganic Laboratory Manual*, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli-2. **Unit III** and **Unit-V**
- Ramanujam V V, Inorganic Semi Micro Qualitative Analysis, 3rd Edition, National Publishing Company, Chennai, 1990.
 Unit-I Chapter 1 and 2
 Unit-II Chapter 3 and 4
- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5thEdition, Longman Scientific & Technical, Essex, England, 1989. Unit-IV Chapter 17 Unit-V Chapter 17

Books for Reference

- 1. Svehla G, Vogel's Qualtitative Inorganic Analysis, 7th Edition, Longmann, London, 1996.
- 2. Metz C and Castellion M E, *Chemistry: Inorganic Qualitative Analysis in the Laboratory*, Academic Press, New York, 1980.
- 3. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, USA, 2014.

Web Resources





Colorimeter

Gravimetry-Virtual Lab

Semester	Co	Course code Title					Course		Но	urs	Credits
Ι	71PCHICP01						ANIC CHEMISTRY RACTICAL-I			4	3
Course Outcomes	Prog	gramm	e Outc	utcomes (POs) Programme Specific Outcomes (PSOs)							Mean Score of COs
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	2	3	2	2	2	2	3	2	2	2.2
CO-2	1	3	2	2	3	2	3	2	2	3	2.3
CO-3	3	2	3	2	1	3	2	3	2	1	2.4
CO-4	2	1	2	2	2	2	1	2	2	2	2.0
CO-5	2	2	2	2	1	2	2	2	2	1	1.8
Mean overall Score									2.14 (Medium)		

SCHEME OF VALUATION

INTERNAL

	,	
CIA		100 Marks
Cumulative m	nark of regular practical classes	40 Marks
Record		10 Marks
Two CIA test	s	50 Marks
For Each CIA Test	100 marks	
Test	10 Marks	
Results	90 Marks (60 Marks for Analysis & 3	0 Marks for colorimetry)

Scheme of valuation

Inorganic Analysis

15 marks for each radical Only 10 marks for group identification

Colorimetry

<5% Error	30 Marks
10%	20 Marks
>10%	10 Marks

EXTERNAL

Total		100 Marks							
	Viva voce	10 Marks							
	Results	90 Marks (60 Marks	for Analysis & 30 Marks for colorimetry)						
Schen	ne of valuation								
Inorga	anic Analysis								
	15 marks for e	each radical							
	Only 10 marks for group identification								
Colori	imetry								
	-	<5% Error	30 Marks						

<5% Error	30 Marks
10%	20 Marks
>10%	10 Marks

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21PCH1CP02	Core Practical-2: PHYSICAL CHEMISTRY PRACTICAL- I	4	3

CO.	CO-Statement	Cognitive Level
No.	On successful completion of this course, students will be able to	(K-Level)
CO-1	learn concepts of kinetics of chemical reaction and adsorption	K1
0.1	isotherm.	N1
CO-2	understand the effect of ionic strength on the rate constant.	K2
CO-3	analyze the phase transformations.	K3
CO-4	experiment the concepts of surface catalysis and adsorption.	K4
CO-5	justify the concepts of phase rule in different component systems.	K5

Unit – I Principle Behind Experiments

Kinetics of reaction between iodide and persulphate- iodination of acetone- hydrolysis of ester- phase diagram (simple and compound forming systems)- adsorption isotherm- heat of solution-polarimetry.

Unit -II Preparation of Solutions

Preparation and standardization of HCl, NaOH, iodine, potassium persulphate, oxalic acid, sucrose.

Unit -III Cycle I

Neutral salt effect - kinetics of reaction between iodide and persulphate - effect of ionic strength on rate constant.

- 1. Kinetics of iodination of acetone.
- 2. Kinetics of hydrolysis of ester comparison of acid strengths.

Unit – IV Cycle II

- 1. Phase diagram of naphthalene *m*-dinitrobenzene system. (Simple eutectic system).
- 2. Freundlich's adsorption isotherm adsorption of acetic acid by charcoal.
- 3. Phase diagram of two-component system forming a compound.

Unit -V Cycle II

- 1. Determination of Arrhenius parameters Hydrolysis of methyl acetate by acid
- 2. Heat of solution of oxalic acid by solubility.
- 3. Polarimetry Inversion of Cane sugar.

Books for Study

- 1. Lab Manual, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli.
- 2. Venkateswaran V, Veeraswamy R and Kulandaivelu A R, Basic Principles of Practical Chemistry, 2nd Edition, Sultan Chand & sons, New Delhi, 1997.
- 3. Daniels, Mathews F, Howard J and John Warren W, Experimental Physical Chemistry, 7th Edition, Mc Graw Hill, New York, 1970.
- 4. Findlay A, Practical Physical Chemistry, 7th Edition, Longman, London, 1959.

(4 Hours)

(8 Hours)

(16 Hours)

(16 Hours)

(16 Hours)

Web Resources





Phase diagram of naphthalene - *m*-dinitrobenzene system.

Freundlich's adsorption isotherm

Semester	Course code				Tit	Title of the Course			Но	urs	Credits
I	I 21PCH1CP02				PHYSICAL CHEMISTRY PRACTICAL- I					4	3
Course Outcomes	Prog	ramm	e Outc	omes (mes (POs) Programme Specific Outcomes (PSOs)						Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	2	2	2	2	3	2	2	2	2	2.2
CO-2	3	3	2	2	1	3	3	2	2	1	2.2
CO-3	3	3	3	3	2	3	3	3	3	2	2.8
CO-4	3	2	3	2	1	3	3	2	2	2	2.3
CO-5	2	3	3	2	2	2	3	3	2	2	2.4
Mean overall Score									2.38		

SCHEME OF VALUATION INTERNAL

50 Marks 50 Marks

CIA			100 Marks
Cumulative m	50		
Two CIA test	S		50 N
For Each CIA Test	100 marks		
Procedure	10 Marks		
Record	10 Marks		
Viva	10 Marks		
Results			
	Table-10mar	ks	
	Calculation-1	0 marks	
	Graph - 10 m	arks	
	Results-40 m	arks	
	Scheme of vo	luation	
	<2% Error	40 Marks	
	3%	30 Marks	
	4%	20 Marks	
	>4%	10 Marks	

EXTERNAL

Total	100 Marks	
Procedure	10 Marks	
Viva	10 Marks	
Results/Analysis	80 Marks	
•	Table-10ma	rks
	Calculation-	10 marks
	Graph - 10 n	narks
	Results -50 1	
	Scheme of v	aluation
	<2% Error	50 Marks
	3%	40 Marks
	4%	30 Marks
	>4%	20 Marks

Semester	Course Code	Title of the Course	Hours	Credits
т		DSE-1:	5	4
Ι	21PCH1ES01A	ORGANIC CHEMISTRY - I	5	4

CO No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K - level)
CO-1	understand the concepts of stereochemistry and write the configurational nomenclature.	K1
CO-2	examine the mechanisms of nucleophilic substitution reactions and describe nucleophilic substitution on aromatic rings.	K2
CO-3	compose multiple ways for addition-elimination reactions and predict the stereochemistry of elimination mechanisms.	К3
CO-4	assess the concept of aromaticity and classify the reactions on aromatic rings.	K4
CO-5	identify the types of intermediates and their role in identifying organic mechanisms.	К5

Unit -I Stereochemistry

Configuration: Double bonds - cyclic systems - tetrahedral atoms with multiple stereogenic centres - other types of stereogenic centres - axial chirality - biphenyls, allenes, spiranes - assigning R/S - chirality and symmetry concept of atropisomerism - helicity and chirality - Topocity and prostereoisomerism - topocity of ligands and faces - enantiotopic ligands and faces - diastereotopic ligands and faces - configuration at prochiral centers.

Conformation: Mono and disubstituted three-, four-, five- and six- membered ring systems and their optical activity - conformations of decalin - Newmann projection of cyclohexane and decalins - chirality in molecules with non-carbons stereocenters (N, S and P).

Unit-II Nucleophilic Substitutions

Mechanisms of nucleophilic substitution: Ionization mechanism: S_N1 and direct displacement mechanism: S_N2 - borderline mechanism - stereochemistry and mechanism - substitution in aryldiazonmium ions - structural and solvation effects on reactivity - nucleophilicity - solvation -leaving group ability - steric and strain effects - effect of conjugation on reactivity - neighbouring group participation (NGP) - substitution at vinylic and allylic carbons and reactivity - ambient nucleophiles and substrates - hydrolysis of esters - mechanisms - phase transfer catalysis (PTC) - crown ethers.

Nucleophilic substitutions on aromatic rings: S_NAr mechanism - S_N1 (Aromatic) mechanism with evidences - Benzyne mechanism - effect of substrate structure, leaving group, attacking nucleophile and solvent.

Unit - III Aromatic Substitution Reactions

Aromaticity: Huckel's theory of aromaticity: Huckel Molecular Orbital (HMO) energies for conjugated planar ring systems of 3-9 carbon atoms - annulenes - cyclobutadiene - benzene - cyclooctatetraene - [10-18] and larger annulenes - aromaticity in charged rings - cations and anions - homoaroamticity - fused ring systems - polycyclic aromatic compounds - hydrocarbons incorporating exocyclic bonds - heteroaromatic systems.

Electrophilic substitution reactions: Active electrophiles - generalized mechanism - structure -reactivity relationships for substituted benzenes - mechanistic interpretation of the relationship -reactivity of polycyclic and heteroaromatic compounds - nitration - halogenation

(15 Hours)

(15 Hours)

- protonation and hydrogen exchange - alkylation and acylation - substitution by diazonium ions - substitution of groups other than hydrogen.

Unit-IV Addition and Elimination Reactions

Addition reactions: Introduction - addition of HX to alkenes - acid catalyzed hydration and related reactions - addition of halogens - sulfenylation and selenylation - addition reaction involving epoxides - solvomercuration - argentation - hydroboration - reactions of organoboranes - enantioselective hydroboration - addition to alkynes and allenes.

Elimination reactions:E1, E2 and E1CB mechanisms-spectrum of E1, E2 and E1CB mechanisms, regioselectivity - stereochemistry of E2 reactions - dehydration of alcohols - dehalogenation - Chugav reaction - Hofmann exhaustive methylation - elimination and its regioselectivity - Cope elimination - Shappiro reaction - extrusion reactions.

Unit-V Reactive Intermediates

(15 Hours)

Carbocations: Structure and stability - direct observation of carbocations - competing reactions - rearrangement of carbocations - non-classical carbocations.

Carbenes: Reactivity - generation - addition and insertion reactions - generation and reactions of ylides by carbenoid decomposition - rearrangement reactions: ring expansion of cycloalkanones - Wolff - aldehyde to alkyne elongation *via* carbine and carbenoid.

Nitrenes: Generation - rearrangements to electron deficient nitrogen.

Free radicals: Sources of radicals - addition reactions of radicals with substituted alkenes - cyclization - addition to C=N bonds - Tandem radical cyclizations and alkylations - fragmentation and rearrangements - intramolecular functionalization by radical reactions.

Books for Study

- Carey F A, Sundberg R J, Advanced Organic Chemistry, Part A: Structure and mechanisms, 5th Edition, Springer (India) Pvt. Ltd. New Delhi, 2007. Unit I Chapter 2 Unit II Chapter 4
 - Unit IChapter 2Unit IIChapter 4Unit IIIChapter 8 & 9Unit IVChapter 5
- 2. Carey F A, Sundberg R J, Advanced Organic Chemistry, **Part B**: Structure and Mechanisms, 5th Edition, Springer (India) Pvt. Ltd. New Delhi, 2007.

Unit IIIChapter 11Unit IV Chapter 4Unit VChapter 10Books for Reference

- 1. Eliel E L, *Stereochemistry of Carbon Compounds*, Tata-McGraw Hill Publishing Company, New Delhi, 1998.
- 2. Nasipuri D, *Stereochemistry of Carbon Compounds*, 2nd Edition, New-Age International Publishers, New Delhi, 1996.
- 3. Bruckner R, Organic Mechanisms Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin, Heidelberg, 2010.
- 4. Clayden J, Greeves N, and Warren S, *Organic Chemistry*, 2nd Edition, Oxford University Press, New York, 2012.
- 5. Gould E S, *Mechanism and Structure in Organic Chemistry*, Holt-Reinhart and Winston, New York, 1959.
- 6. Smith M B, and March J, *March's Advanced Organic Chemistry*, 6th Edition, John-Wiley and Sons, New York, 2007.







Stereochemistry

Substitution Reaction

Carbocations

Semester	Course Code				Title of the Course					Hours	Credits
Ι	21PCH1ES01A				DSE -I: ORGANIC CHEMISTRY - I				I	5	4
Course	P	rogran		utcon	nes	Pro	gramn	ne Speci		tcomes	Mean
Outcomes			(POs)					(PSO	s)		scores
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	2	2	3	2	3	3	2	2	3	2	2.4
CO-2	3	2	2	3	2	2	2	2	3	2	2.3
CO-3	2	2	2	3	1	3	1	2	2	3	2.1
CO-4	3	2	2	3	2	2	3	2	2	3	2.4
CO-5	3	2	2	2	2	1	2	3	3	2	2.2
		Mean Overall Score									2.28 (High)

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21PCH1ES01B	DSE-1: STEREOCHEMISTRY	5	4

CO No.	CO-Statement On successful completion of this course, students will be able to	Cognitive Level (K - level)
CO-1	find the configuration of organic molecules.	K1
CO-2	infer the conformational analysis of cyclic and acyclic systems.	К2
CO-3	apply chiral auxiliaries in asymmetric synthesis and design diastereoselectivity in selective organic reactions.	К3
CO-4	assess the importance of protecting groups and categorize Chemo-, regio-, and stereoselectivity in selective organic synthesis.	K4 & K5
CO-5	design asymmetric synthesis using chiral auxiliaries	K6

Unit - I Configuration

Configuration: Double bonds - cyclic systems - tetrahedral atoms - with multiple stereogenic centres - other types of stereogenic centres - axial chirality - biphenyls, allenes, spiranes - assigning R/S - chirality and symmetry concept of atropisomerism - helicity and chirality - topocity and prostereoisomerism - topocity of ligands and faces - enantiotopic ligands and faces - diastereotopic ligands and faces - configuration at prochiral centers.

Unit – II Resolution

Absolute configuration - enantiomers - diastereomers - polarimeter - resolution - methods - chiral shift reagents and chiral solvating agents - separation of enantiomers - enzymatic resolution and disymmetrization - the anomeric effect in cyclic compounds.

Unit – III Conformational Analysis

Conformational isomerism in ethane and n-butane - projection formula - Fischer, Newmann and Sawhorse - conformational isomerism in cycloalkanes - Baeyer's strain theory- mono and disubstituted three-, four-, five- and six- membered ring systems and their optical activity - conformations of decalin - chirality in molecules with non-carbons stereocenters (N, S and P).

Unit- IV Stereoselectivity

Chemoselectivity: Chemo-, regio-, and stereoselectivity - reactivity of carbonyl groups towards nucleophiles - selectivity of hydrides in reduction - selectivity in oxidations - Protecting groups - hydroxyl, amino, carbonyl and carboxylic acid protecting groups

Regioselectivity: Regioselectivity in electrophilic and nucleophilic aromatic substitution, regioselectivity in elimination reactions, electrophilic attack on alkenes, regioselectivity in radical reactions, nucleophilic attack on allylic compounds, electrophilic attack on conjugated dienes and conjugate addition.

Unit - V Asymmetric Synthesis

Chiral auxiliaries: Alkylation of chiral enolates - enantiomeric excess - optical purity - chiral reagents and chiral catalysis - asymmetric hydrogenation - asymmetric epoxidation - asymmetric dihydroxylation

Diastereoselectivity: Prochirality, Cram's rule and chelation effect, diastereoselectivity in aldol reaction, diastereoselective epoxidation

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

Books for Study

- Carey F A, Sundberg R J, Advanced Organic Chemistry, Part A: Structure and mechanisms, 5th Edition, Springer (India) Pvt Ltd. New Delhi, 2007. Unit I Chapter 2 Unit II Chapter 2
- Clayden J, Greeves N, and Warren S, Organic Chemistry, 2nd Edition, Oxford University Press, New York, 2012.
 Unit III Chapter 16
 Unit IV Chapter 23
 Unit V Chapter 41
- Carey F A, Sundberg R J, Advanced Organic Chemistry, Part B: Structure and Mechanisms, 5th Edition, Springer (India) Pvt. Ltd, New Delhi, 2007. Unit IV Chapter 3

Books for Reference

- 1. Bruckner R, Organic Mechanisms Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin, Heidelberg, 2010.
- 2. Gould E S, *Mechanism and Structure in Organic Chemistry*, Holt-Reinhart and Winston, New York, 1959.
- 3. Eliel E L, *Stereochemistry of Carbon Compounds*, Tata-McGraw Hill Publishing Company, New Delhi, 1998.
- 4. Nasipuri D, *Stereochemistry of Carbon Compounds*, 2nd Edition, New-Age International Publishers, New Delhi, 1996.

Web Resources



Conformation Analysis



Regioselectivity



Asymmetric Synthesis

Semester	Course code Tit					le of the	Course		Ho	urs	Credits
Ι	21P0	CH1ES	501B	DS	E-1: ST	ΓEREO	CHEM	ISTRY		5	4
Course Outcomes	Prog	ramm	e Outc	omes (omes (POs) Programme Specific Outcome (PSOs)					omes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	2	3	2	2	3	1	2	2	2	2.2
CO-2	2	2	3	3	2	2	3	2	2	2	2.3
CO-3	3	1	2	3	2	1	2	2	3	3	2.2
CO-4	3	3	2	2	2	2	3	2	2	3	2.4
CO-5	3	2	2	3	2	2	1	3	2	2	2.2
	Mean overall Score									2.26 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21PCH1AE01	AEC: ANALYTICAL TECHNIQUES	4	3

CO. No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K-Level)
CO-1	know the different types of errors that could occur experimentally.	K1
CO-2	compare different spectrophotometric methods.	K2
CO-3	apply thermal methods to characterize minerals and polymers and differentiate the principles and applications of chromatography.	К3
CO-4	predict the presence of functional groups and structural information of molecules using UV-Vis spectra	K4
CO-5	apply IR spectra to infer the structural features of organic molecules.	K5

Unit-I Spectrophotometric methods

Spectrophotometric Methods - Colorimetry, Flame Photometry, Fluorimetry, Phosphorimetry, AAS. Colorimetry - fundamental laws - deviations from Beer's law - instrumentation and applications of spectrophotometry. Principle, instrumentation and applications of fluorimetry and phosphorimetry. Flame photometry and atomic absorption spectrophotometry - Theory, instrumentation, interferences and applications.

Unit-II Thermal methods and Chromatography

Thermal Methods General Characteristics of thermo-analytical methods -Thermogravimetric analysis - Principle, instrumentation and applications - Factors affecting thermogram - Differential Thermal Analysis- DTA instrumentation and applications -Differential scanning calorimetry - Principle, instrumentation and applications

Chromatography: Principles of chromatography - retardation factor - plate theory - column efficiency - Classification of chromatographic techniques - Principle, instrumentation and applications of gas chromatography (GC), thin-layer chromatography (TLC) and high-performance liquid chromatography (HPLC)

Unit-III Optical Activity

Absolute configuration - optical activity - specific rotation - polarimeter - enantiomeric excess -resolution - methods - chiral shift reagents and chiral solvating agents - separation of enantiomers - enzymatic resolution and desymmetrization - the anomeric effect in cyclic compounds

Unit-IV UV-Visible Spectroscopy

Nature of electronic transitions - UV band structure - principles of absorption spectroscopy - instrumentation-presentation of spectra - solvents - chromophore -effect of conjugation - Woodward-Fieser rules for dienes, enones, and aromatic compounds - visible spectra - colour in compounds.

ORD and CD: Concept of circularly polarized light-cause of optical activity-atomic and conformational asymmetry-ORD and CD-octant rule, α -haloketone rule and their applications-Cotton effect and ORD curves-applications to determine the absolute configurations of monocyclic ketones and steroids.

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

21

Unit-V IR spectroscopy

(12 Hours)

Absorption process - modes of stretching and bending - bond properties and absorption trends - vibrations -Hooke's law - FT-IR spectrometer - sample preparation - correlation charts and tables - analysis of a spectrum - characteristic absorption bands of: alkanes, alkenes, alkynes - conjugation effects, ring size effects for exo and endo double bonds - aromatic rings - substituted aromatic rings - alcohols and phenols - ethers - carbonyl compounds: factors influencing C=O stretching- conjugation, ring size, substituents, and hydrogen effects - amines - nitriles, isocyanates, and imines-nitro compounds-solving spectral problems.

Books for Study

- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition, Longman Scientific & Technical, Essex, England, 1989. Unit I Chapters 17, 18, 20 and 21
 - Unit II Thermal studies Chapters 11 Chromatography Chapters 8 and 9
- Carey F A, Sundberg R J, Advanced Organic Chemistry, Part A: Structure and mechanisms, 5th Edition, Springer (India) Pvt. Ltd. New Delhi, 2007. Unit III Chapter 2
- Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, *Introduction to Spectroscopy*, 5th Edition, Cengage Learning, Delhi, 2015. Unit IV & V Chapter 2-10

Books for Reference

- 1. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002-3098, USA, 2014.
- 2. Silverstein R M and Bassler G C, *Spectrometric Identification of Organic Compounds*, 4th Edition, John- Wiley and Sons, New York, 1993.
- 3. Kemp W, Organic Spectroscopy, 3rd Edition, ELBS, London, 1987.

Web Resources







Analytical Chemistry

MIT-Online Course

Error Analysis

Semester	Course code Title					le of the	Cours	e	Ho	ours	Credits
I	21PCH1AE01			AN	ALYT	AE(ICAL 1		IQUES		4	3
Course Outcomes	Programme O (POs)			Outcomes Programme Specific O				c Outc	omes	Mean Score of	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	3	2	3	2	2	3	1	2	2	2	2.2
CO-2	3	3	2	2	2	2	3	2	2	3	2.4
CO-3	2	2	3	3	2	2	3	2	2	2	2.3
CO-4	3	2	2	3	2	2	1	3	2	2	2.2
CO-5	3	1	2	3	2	1	2	2	3	3	2.2
Mean overall Score									2.26 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCH2CC03	CORE-3:	4	4
		INORGANIC CHEMISTRY - II		

CO. No.	CO-Statement	Cognitive Level
	On successful completion of this course, students will be able to	(K-Level)
CO-1	understand the concept of ionic bonding.	K1
CO-2	summarize the concepts of acids and bases.	K2
CO-3	discuss the chemistry of halogens and noble gases.	K2
CO-4	apply the VSEPR theory to predict the structures.	K3
CO-5	summarize the nature of inorganic chains, rings, cages and clusters.	К5

Unit-I Ionic Bonding

Effective nuclear charge - shielding - Slater's rule - Born - Lande equation - Born Haber cycle and its applications - radius ratio - polarization- Fajan's rule - results of polarization. electronegativity - determination - methods of estimating charges, electronegativity equalization - types of chemical forces - Van der Waals forces - hydrogen bonding - effects of chemical forces - melting and boiling points, solubility and hardness.

Unit-II Covalent Bonding

Octet rule - valence bond theory - resonance - conditions of resonance - formal charge - hybridization - molecular orbital theory - symmetry and overlap - molecular orbital in homonuclear diatomic molecules: O_2 , B_2 , N_2 and C_2 - MO treatment of hetero nuclear diatomic molecules: CO and HCl - VSEPR theory: methane, ammonia, water, PCl₃F₂ (Bent's rule), SF₄, BrF₃, TeF₅⁻, ICl₂⁻, ICl₄⁻, XeF₂, XeF₄, XeF₆, XeO₃, XeO₄, XeO₂F₂, XeOF₄, phosphorus trihalides, ammonia and NX₃ dipole moments, OF₂ and COF₂ - bond angle - s, p character relationship - energetics of hybridization.

Unit-III Acids and Bases

Electrode potentials and electromotive forces - applications - acid-base concepts: Bronsted-Lowry, Lux-Flood, Usanovich, Lewis, solvent system and generalized acid base concepts - measures of acid-base strength - steric effect and solvation effects F-strain and B-strain - hard and soft acids and bases - acid base strength - hardness and softness - symbiosis - theoretical basis of hardness and softness, electronegativity and hardness and softness - types of solvents, types of reactions - autoionisation, neutralisation, precipitation, solvation, solvolysis and complex formation. Liq. NH₃, liq. SO₂, HF and H₂SO₄ as solvents - alkali metals in liq. NH₃.

Unit-IV Periodicity and the Chemistry of Halogens and Noble Gases (12 Hours) Periodicity: The use of p-orbitals in pi-bonding - $p\pi$ - $p\pi$ bonding in phosphine complexes and π bonding - comparison of $p\pi$ - $d\pi$ non-metals - the use of d orbitals by non-metals experimental evidence of p oxides - experimental evidences for d-orbital contraction and participation Chemistry of halogens and noble gases: Interhalogen compounds - polyhalide ions - oxyacids of heavier halogens -structure and reactivity of noble gas fluorides.

(12 Hours)

(12 Hours)

(12 Hours)

Unit - V Inorganic Chains, Rings, Cages and Clusters

Silicate minerals - ortho, pyro, and meta silicates - pyroxene, amphiboles - two-dimensional silicates - talc, mica and three dimensional aluminosilicates, feldspar, zeolites, ultramarine - silicones-preparation, properties and uses-polymeric sulphur nitride, phosphonitrilic compounds - trimers and tetramers - homocyclic inorganic ring systems - concept of multi-centered bond - structure of B_2H_6 , B_4H_{10} , $[B_{12}H_{12}]^2$, B_6H_{10} , B_8H_{12} , $B_{10}H_{14}^-$ Wade's rules, *closo-*, *nido-*, *arachno-* boranes and carboranes - The "STYX" code.

Books for Study

Huheey J E, Keiter E A and Keiter R L, *Inorganic Chemistry Principles of Structure and Reactivity*, 4th Edition, Pearson Education, India, 2008.
 Unit I Chapter 4 Unit II Chapter 5 Unit III Chapter 8 Unit IV Chapter 10 & 12 Unit V Chapter 11

Books for Reference

- 1. Cotton F A and Wilkinson G, *Inorganic Chemistry A Comprehensive Text*, 3rd Edition, Inter Science Publishers, New York, 1972.
- 2. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York, 2014.
- 3. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education Limited, Essex, 2012.

Web Resources



Ionic Vs Covalent



Acid and Base



Metal Clusters

Semester	Course code			Title of the Course					Hours		Credits
II	21PCH2CC03			CORE-3: INORGANIC CHEMISTRY - II					4		4
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	3	3	2	2	1	3	2	2	2	1	2.1
CO-2	2	2	2	2	1	2	2	2	2	2	2.0
CO-3	2	2	2	2	1	2	2	2	2	2	2.0
CO-4	3	2	2	2	1	3	2	2	2	1	2.0
CO-5	2	3	2	2	2	2	3	2	2	2	2.2
Mean overall Score										2.0 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
Π	21PCH2CC04	CORE-4:	5	4
	21PCH2CC04	ORGANIC CHEMISTRY - II	5	4

CO. No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K -Level)	
CO-1	define the techniques of determining the mechanisms of reactions.	K1	
CO-2	understand the synthetic applications of enolates.	K2	
CO-3	utilize the synthetic applications carbon nucleophiles in synthesis.	К3	
CO-4	categorize the reduction reactions and their mechanism.	K4	
CO-5	determine and design the multiple ways for using oxidation reactions in synthesis.	K5 & K6	

Unit - I Methods of Determining Reaction Mechanism

Non-kinetic methods: Product analysis and its importance- intermediates and transition states - trapping, testing and detection of intermediates - cross-over experiments - isotopic labeling -stereochemical studies.

Kinetic methods: isotope effects-primary, secondary and solvent isotope effect-correlation analysis-linear free energy relationships - Hammett equation-significances of σ and ρ -applications of Hammett equation -Taft equation and its applications.

Catalysis: By acids and bases - Bronsted catalysis law - acidity functions-pH profile rates - Lewis acid catalysis - solvent effects: bulk solvent effects - specific solvent effects - acidity of hydrocarbons: pKa values of weakly acidic hydrocarbons.

Unit - II Oxidations

Oxidation of alcohols to aldehydes, ketones, and carboxylic acids -transition metal oxidants - addition of oxygen to C=C- transition metal oxidants - epoxides from alkenes and peroxide reagents-subsequent transformations of epoxides - allylic oxidations - transition metal oxidants - reactions of alkenes with singlet oxygen - oxidative cleavage of C=C-transition metal oxidants - oxidation of ketones and aldehydes by oxygen-and periodic compounds - oxidation with other reagents - selective oxidative cleavages at functional groups - cleavage of glycols-oxidative decarboxylations - oxidations at unfunctionalized carbon.

Unit - III Reductions

C-C multiple bonds: Hydrogenation using heterogeneous and homogeneous catalysts - enantioselective hydrogenation - partial reduction of alkynes - hydrogen transfer from diimide.

Carbonyl groups: Group III hydride donor reagents - comparative reactivity of common hydride donors - stereoselectivity of hydride reduction - enantioselective reduction of carbonyl compounds-reduction of other functional groups - Group IV hydride donors - silicon hydrides - hydride transfer for carbon-reduction reactions involving hydrogen atom donors-dissolving metal reductions-addition of hydrogen - reductive removal of functional groups-reductive coupling of carbonyl compounds - reductive deoxygenation of carbonyl groups to methylene - reduction of carbonyl compounds to alkenes-reductive elimination and fragmentation.

Unit - IV Reactions of Enolates

Generation of enolates - regioselective and stereoselective enolate formation-solvent effects on enolate structure and reactivity - alkylation of highly stabilized and ketone enolates -

(15 Hours)

(15 Hours)

(15 Hours)

alkylation of aldehydes, esters, acids, amides and nitriles-alkylation of dianions - intramoleular alkylation of enolates - enantioselectivity in alkylation reactions - enamines and imine anions - conjugate addition of enolates - conjugate addition with tandem alkylations - conjugate addition by enaolate equivalents - facial selectivity - addition of organometallic reagents and cyanide ions.

Unit - V Reactions of Carbon Nucleophiles

(15 Hours)

Aldol addition and condensation reactions - regio and stereoselectivity in aldol reactions of aldehydes and ketones-aldol addition reactions of enaolates of ester and other carbonyl derivatives - Mukaiyama aldol condensation - facial selectivity - intramolecular aldol condensation - Robinson annulation - Mannich reaction - additions to *N*-acyl iminium ions - amine catalyzed condensation reactions - Claisen and Dieckmann reactions - Wittig reaction - reactions of alpha-trimethylsilylcarbanions with carbonyl compounds - Julia olefination-reactions involving sulfur ylides and related nucleophiles - nucleophilic addition - cyclization of alpha-haloesters.

Books for Study

- Francis Carey A, Richard J. Sundberg, Advanced Organic Chemistry, Part B: Structure and Mechanisms, 5th Edition, Springer (India) Pvt Ltd., New Delhi, India, 2007.
 Unit-II Chapter 12 Unit-III Chapter 5 Unit IV Chapters 1 & 2 Unit V Chapter 2
- Michael Smith B and Jerry March, March's Advanced Organic Chemistry, 6th Edition, John-Wiley and Sons, New York, 2007. Unit-I Chapter 6
- 3. Reinhard Bruckner, Organic Mechanisms Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin, Heidelberg, 2010. Unit V Chapter 5

Books for References

- 1. Peter Sykes, *Guide Book to Mechanism in Organic Chemistry*, 6th Edition, ELBS with Longmann, 1997.
- 2. Jonathan Clayden, Nick Greeves, and Stuart Warren, *Organic Chemistry*, Oxford University Press, New York, 2012.
- 3. Stanley Pine H, Organic Chemistry, 5th Edition, Tata-Mcgraw Hill, New Delhi, 2006.

Web Resources



Reaction Mechanism







Oxidation Reactions

Enolate Reactions

Nucleophilic Addition

Semester	Co	urse c	ode	Title of the Course					H	Iours	Credits
п	21PCH2CC04						RGANI TRY - II	-		5	4
Course Outcomes	comes (POs) (PSOs)					comes	Mean Score of COs				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	2.2
CO-1	2	3	3	2	2	3	2	2	2	1	2.0
CO-2	2	2	2	2	1	2	2	2	2	2	2.2
CO-3	2	3	2	2	2	2	3	2	2	2	2.0
CO-4	2	2	2	2	1	2	2	2	2	2	2.0
CO-5	3	2	2	2	1	3	2	2	2	1	2.0
	Mean overall Score										

Semester	Course Code	Title of the Course	Hours	Credits
II 21PCH	21PCH2CP03	Core Practical 3: INORGANIC	1	3
	211 C112C1 05	CHEMISTRY PRACTICAL-II	+	3

CO No.	CO No. CO-Statements On completion of the course, the graduates will be able to	
CO-1	discuss the basics of titrimetric analysis.	K2
CO-2	discuss the methods of preparation of complexes.	K2
CO-3	illustrate various methods of characterization of complexes.	К3
CO-4	identify the components of a binary inorganic mixture.	K4
CO-5	recommend a suitable thermal method for the quantification of metal cations.	K5

Unit-I Basic Principles of Titrimetric Analysis

Titrimetric analysis - classifications of reactions in titrimetric analysis - Standard solutions -Equivalents, normality and oxidation numbers - Preparation of standard solutions - Primary and secondary standards - redox titrations - complexation titrations.

Unit-II Basic Principles of Gravimetric and Thermo Gravimetric Analyses (5 Hours) Introduction to gravimetric analysis - precipitation methods - the colloidal state supersaturation and precipitate formation - the purity of the precipitate: co-precipitation - of the precipitate: thermogravimetric method of analysis.

Unit-III Methods of preparation and characterization of complexes (5 Hours)

Preparatory methods of coordination complexes - characterization methods - conductance measurements - magnetic measurements - potentiometric measurements - polarimetry - UV-Visible spectra

Unit-IV Estimations of Metal Ions in a Binary Mixture

- a) Quantitative analysis of a mixture of iron (volumetry) and copper (gravimetry)
- b) Quantitative analysis of a mixture of copper (volumetry) and nickel (gravimetry)
- c) Quantitative analysis of a mixture of calcium (volumetry) and magnesium (gravimetry)
- d) Quantitative analysis of a mixture of calcium and magnesium (both by volumetry)
- e) Quantitative analysis of a mixture of iron (volumetry) and zinc (gravimetry)
- f) Quantitative analysis of a mixture of copper (volumetric) and zinc (gravimetry)

Unit-V Preparation and Characterization of Selected Complexes

- a) Preparation and characterization of hexamminecobalt(III) chloride
- b) Preparation of tetramminecopper(II) sulphate
- c) Preparation of *tris*-(thiourea)copper(I) chloride
- d) Preparation of potassium tris-(oxalato)chromate(III) trihydrate

28

(5 Hours)

(30 Hours)

(15 Hours)

Books for Study

- Inorganic Laboratory Manual, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli-2 Unit IV and Unit V
- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5thEdition, Longman Scientific & Technical, Essex, England, 1989. Unit I Chapter 10 Unit II Chapter 11
- 3. Pass G and Sutcliffe H, *Practical Inorganic Chemistry*, 2nd Edition, Chapman and Hall, London, 1974.

Unit III *Chapter 18, 20, 21 and 22*

Unit V Chapters 6 and 9

Books for Reference

1. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002-3098, USA, 2014

Web Resources



Coordination Chemistry



Gravimetric Analysis

Semester	Course Code 7				Т	itle of the Course				Hours	Credits	
п	21PC	CH2CF	P03	INORGANIC CHEMISTRY PRACTICAL-II						4	3	
Course Outcomes	Pı	rogran	nme O (POs)	Outcomes Programme Specific Outcom						omes Mean Score of		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs	
CO-1	2	2	3	2	1	2	2	3	2	1	2.0	
CO-2	3	2	2	2	3	3	2	2	2	3	2.3	
CO-3	2	2	3	3	2	2	2	3	3	2	2.4	
CO-4	3	2	2	1	2	3	2	2	1	2	2.0	
CO-5	2	3	2	2	2	2	3	2	2	2	2.2	
Mean overall Score							2.18 (Medium)					

SCHEME OF VALUATION

INTERNAL

CIA			100 N	Iarks
Cumu	lative m	ark of Regular Practical Class	ses	40 Marks
Record	ł			10 Marks
Two C	IA tests	5		50 Marks
For Each CLA	A Test	100 marks		
Test		10 Marks		
Result	S	90 Marks (60 Marks for Estin	mations & 30	Marks for Preparation)
Scheme of va	luation	,		i ,
Inorganic Est	timation	IS		
Thirty	Marks	each for the volumetric and gr	avimetric estir	nations
Gravimetry			Volumetry	
<2% Error	30 Ma	rks	<1% Error	30 Marks
3%	25 Ma	rks	2%	25 Marks
4%	20 Ma	rks	3%	20 Marks
>4%	15 Ma	rks	4% and abov	e 15 Marks
Preparation				
T ' C	1	1 C 1 1 1		

Fifteen marks each for the crude and re-crystallized samples

EXTERNAL

Total	100 Marks
Test	10 Marks
Results	90 Marks (60 Marks for Estimations & 30 Marks for Preparation)
Scheme of valuation	

Inorganic Estimations

Thirty Marks each for the volumetric and gravimetric estimations

Gravimetrv

Gravimetry		Volumetry	
<2% Error	30 Marks	<1% Error	30 Marks
3%	25 Marks	2%	25 Marks
4%	20 Marks	3%	20 Marks
>4%	15 Marks	4% and above	15 Marks

Preparation

Fifteen marks each for the crude and re-crystallized samples

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCH2CP04	Core Practical 4: PHYSICAL CHEMISTRY PRACTICAL- II	4	3

CO.	CO-Statements	Cognitive Levels
No.	On successful completion of this course, students will be able to	(K-Level)
CO-1	describe the concept electrode potential.	K1
CO-2	understand the concept of salting out constant.	K2
CO-3	learn the concepts and measurement of equivalent conductance.	K2
CO-4	apply the concepts of potentiometric titrations.	K3
CO-5	experiment the concepts of conductometric titrations.	K4

Unit –I Principle Behind Experiments (8 Hours)

Standard electrode potential - dissociation constant -conductometric acid-base and precipitation titrations- saponification of ethyl acetate by conductivity- potentiometric acid-base, precipitation and redox titrations - effect of NaCl on solubility of benzoic acid-solubility of sparingly soluble salt- equivalent conductance of a strong electrolyte at infinite dilution.

Unit -II Preparation of Solutions

Preparation and standardization of HCl, CH₃COOH, NaOH, KCl, KI, AgNO₃ and NaCl.

Unit - III Cycle I

- 1. Conductometric acid-base titration mixture of acids.
- 2. Conductometric precipitation titration iodide and chloride mixture.
- 3. Determination of second-order rate constant for saponification of ethyl acetate by conductivity.

Unit - IV Cycle II

- 1. Potentiometric acid-base titration mixture of acids.
- 2. Potentiometric precipitation titration iodide and chloride mixture.
- 3. Salting out constant effect of NaCl on solubility of benzoic acid.
- 4. Determination of standard electrode potential of zinc and copper.

Unit - V Cycle III

- 1. Potentiometric redox titration
- 2. Solubility of sparingly soluble salt by (i) Conductivity and (ii) Potentiometry
- 3. Determination of equivalent conductance of a strong electrolyte at infinite dilution.
- 4. Dissociation constant of weak acid by conductivity method.

Books for Study

1. Lab Manual, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli.

- 2. Venkateswaran V, Veeraswamy R and Kulandaivelu A R., *Basic Principles of Practical Chemistry*, 2nd Edition, Sultan Chand & sons, New Delhi, 1997.
- 3. Daniels, Mathews F, Howard J and John Warren W, *Experimental Physical Chemistry*, 7th Edition, Mc Graw Hill, New York, 1970.
- 4. Findlay A, Practical Physical Chemistry, 7th Edition, Longman, London, 1959.

(16 Hours)

(16 Hours)

(4 Hours)

(16 Hours)

Web Resources





Conductometric precipitation titration

Saponification of ethyl acetate by conductivity

Semester	Co	urse co	ode		Tit	le of the	f the Course		Но	urs	Credits
II	21P	CH2C	P04	Core Practical 4: PHYSICAL CHEMISTRY PRACTICAL- II					2	4	3
Course Outcomes	Prog	ramm	e Outc	omes (nes (POs) Programme Specific Outcomes (PSOs)					Mean Score	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	2	2	1	3	3	2	2	1	2.2
CO-2	3	2	2	2	2	3	2	2	2	2	2.2
CO-3	3	3	3	3	2	3	3	3	3	2	2.8
CO-4	3	3	2	2	2	3	2	2	2	2	2.3
CO-5	3	2	3	2	1	3	3	2	2	3	24
Mean overall Score								2.38 (High)			

SCHEME OF VALUATION INTERNAL

CIA

Cumulative mark of Regular Practical Classes Two CIA tests **100 Marks** 50 Marks

50 Marks

For Each CIA Test 100 marks Procedure 10 Marks Record 10 Marks Viva 10 Marks Results 70 Marks Table 10marks Calculation 10 marks Graph 10 marks Results 40 marks Scheme of valuation

<2% Error	40 Marks
3%	30 Marks
4%	20 Marks
>4%	10 Marks
/ + /0	10 Marks

EXTERNAL

Total	100 Marks
Procedure	10 Marks
Viva	10 Marks
Results	80 Marks
Table	10marks
Calculation	10 marks
Graph	10 marks
Results	50 marks
Scheme of va	luation
<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

Semester	Course code	Title of the Course	Hours	Credits
II	21PCH2SP01	SELF PACED LEARNING: SELECTED TOPICS IN ORGANIC CHEMISTRY	-	2

CO. No.	CO-Statements On successful completion of the course, students will be able to	Cognitive levels (K - level)
CO-1	recall and understand the concepts of green chemistry.	K1 & K2
CO-2	analyze the types of errors in analyses.	K3
CO-3	comprehend the skeletal rearrangements in organic molecules.	K4
CO-4	analyze the mechanism of various photochemical reactions.	K5
CO-5	predict the hybridization of different molecules.	K6

Unit-I Error Analysis

Error Analysis - Significant figures - rounding off the values - accuracy and precision- errors - classification of errors - constant errors and proportional errors - determinate errors (systematic errors) and indeterminate (random and accidental) - minimization of errors: calibration of apparatus, analysis of standard samples, running a blank determination, and independent analysis.

Average, range, median, average deviation, relative average deviation and standard deviation, variance, coefficient of variation - the normal error curve - testing of significance: F-test, t-test and Q-test - confidence limit - method of least squares.

Unit-II Structure and Properties

Hybridization - Electronegativity - dipole moments - polarity of solvents - hydrogen bonding - Bonds weaker than Hydrogen Bonding - Addition Compounds - Acids and Bases - HSAB Theory. Electronic Effects - inductive, resonance and hyperconjucative effects and their influence - rules of resonance - tautomerism - steric effects.

Unit-III Rearrangements Involving Intermediates

Classifications - mechanisms and applications of the following rearrangements: Wagner-Meerwein in tandem and cascade rearrangements - Tiffeneau-Demjanov ring expansion - Pinacol-Pinacolone - semi-pinacolone - Baeyer-Villiger, Favorskii, Fries, Beckmann, Hoffmann, Curtius, Lossen, Schmidt, Neber, Stevens, Bamford-Stevens reaction- Von Richter, Sommelet-Hauser and Smiles rearrangements - di-*pi* methane and its related rearrangements.

Unit-IV Photochemical reactions

Photochemistry - Fundamental concepts - Jablonskii diagram - photosensitization - photo chemistry of carbonyl compounds: - - photocycloaddition: - photochemistry of alkenes photochemical rearrangements: - photolysis of diazo compounds - photo substitution reactions: - photochemistry of dienes and aromatic compounds

Unit-V Green Chemistry

The twelve principles, atom economy for addition, elimination, substitution reactions ant its calculation, green starting materials, green reagents, green catalysts, green solvents and green reactions.

Books for Study

- Smith M B, and March J, March's Advanced Organic Chemistry, 6th Edition, John-Wiley and Sons, New York, 2007. Unit I Chapter 1-3
- Bruchner R, Advanced Organic Chemistry Reaction Mechanisms Reactions, Stereochemistry and Synthesis, 6th Edition, Springer-Verlag, Berlin, Heidelberg, 2010. Unit II Chapter 11
- 3. Clayden J, Greeves N, and Warren S, *Organic Chemistry*, Oxford University Press, New York, 2012.

Unit III Chapter 36

4. Morrison R T and Boyd R T, Organic Chemistry, 7th Edition, Allyn and Bacon Ltd., New York, 2011.

Unit III Chapter 36

5. Anastas P T, *Text Book on Green Chemistry*, Oxford University Press, UK, 2006. Unit V Chapters 1-5

Book for References

- 1. Gould E S, *Mechanism and Structure in Organic Chemistry*, Holt-Reinhart and Winston, New York, 1959.
- 2. Smith M B, and March J, *March's Advanced Organic Chemistry*, 6th Edition, John-Wiley and Sons, New York, 2007.

Semester	Co	urse co	ode		Tit	le of the	Course	•	Ho	ours	Credits	
II	II 21PCH2SP01 S						SELF-PACED LEARNING: SELECTED TOPICS IN ORGANIC CHEMISTRY					
Course Outcomes	Prog	ramm	e Outc	omes (nes (POs) Programme Specific Outcomes (PSOs)							
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos	
CO-1	3	3	2	2	1	3	2	3	2	1	2.2	
CO-2	3	3	2	2	1	3	2	3	2	2	2.3	
CO-3	2	2	2	2	2	2	2	2	2	2	2.0	
CO-4	3	2	3	2	1	3	2	2	2	1	2.1	
CO-5	3	3	3	2	2	3	3	2	2	2	2.5	
								Mea	n overal	ll Score	2.22 (High)	

Semester	Course code	Title of the Course	Hours	Credits
II	21SPS2ES02A	DSE -2: INTERDISCIPLINARY CORE:SPECTROSCOPY AND GROUP THEORY	5	4

CO. No.	CO-Statements	Cognitive levels
	On successful completion of the course, students will be able to	(K - level)
CO- 1	describe the concept of rotational and vibrational spectroscopy	K1
CO- 2	learn the concepts of Raman, NMR, ESR, electronic and Mossbauer spectroscopy	K2
CO- 3	apply the concept of group theory in constructing character table	К3
CO- 4	correlate the concept of group theory	K4
CO-5	predict the structures of simple compounds	K5

Unit-I Rotational and Vibrational Spectroscopy

Basic aspects of spectroscopy - characterization of electromagnetic radiation - quantization of energy- microwave spectroscopy - rotation of molecules and selection rules - diatomic molecules - rigid and non-rigid rotator - rotational constant and centrifugal distortion - techniques and instrumentation - vibrational spectroscopy - diatomic molecules, harmonic and anharmonic oscillators - zero point energy - force constant - fundamental absorption and overtones (hot bands, Fermi resonance) - polyatomic molecules - techniques and instrumentation of FT-IR.

Unit-II Raman, NMR, and Mossbauer Spectroscopy

Raman spectroscopy - Raman and Rayleigh scattering - quantum and classical theories of Raman effect - Stokes and anti-stokes lines - pure rotational Raman spectra - vibrational Raman spectra - mutual exclusion rule - polarized and depolarized Raman lines - techniques and instrumentation- NMR - hydrogen nuclei - chemical shift and spin-spin splitting - coupling constant - splitting with and without chemical exchange - interaction between spin and magnetic field - gyro magnetic ratio - instrumentation of NMR - FT NMR- applications of 2D NMR techniques like COSY, NOESY - applications of ¹³C NMR spectroscopy - Mossbauer spectroscopy - principles of Mossbauer spectroscopy - Doppler shift - recoil energy- isomer shift- quadrupole splitting - applications to various compounds.

Unit-III ESR Spectroscopy and Electronic Spectroscopy

ESR - principle - position of ESR absorptions - g value - hyperfine splitting - zero field splitting - ESR spectrum of free radicals and copper salicylaldehyde complexes - electronic spectra - Electronic spectra of diatomic molecules - Born-Oppenheimer approximation - vibrational coarse structure - Franck-Condon principle - dissociation energy and dissociation products - rotational fine structure of electronic vibration - vibration transition - Fortrat diagram- electronic angular momentum in diatomic molecules - spectrum of molecular hydrogen - molecular photoelectron spectroscopy - UV photoelectron spectroscopy and X-ray photoelectron spectroscopy.

Unit-IV Rudiments of Group Theory

Principles of group theory - symmetry elements - symmetry operations - properties of group - abelian, non - abelian and cyclic groups - multiplication tables - classes - subgroups -

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

molecular point groups - Schoenflies symbols - optical activity and dipole moment on the basic of point groups matrices for symmetry operations - reducible and irreducible representations - statement of great orthogonality theorem - construction of character table - explanation of a character table.

Unit-V Applications of Group Theory

(15 Hours)

Applications of group theory - standard reduction formula relating reducible and irreducible representations - hybridization schemes for atoms in molecules of different geometry - AB_4 tetrahedral, AB_3 triangular planar and AB (linear)- symmetries of vibrational modes in non-linear molecules (H₂O, NH₃ and BF₃) - integration method - selection rules in spectroscopy - IR & Raman active - vibration modes -mutual exclusion rule - symmetry in crystals - Hermann - Mauguin symbols - space groups of crystals -translational elements of symmetry - comparison of crystal symmetry with molecular symmetry.

Books for Study

- 1. Banwell C N, *Molecular Spectroscopy*, 2nd Edition, TATA McGraw Hill Co., New Delhi, 2010.
 - **Unit I -III** *Chapter 2,3,4,5,& 6*
- Raman K V, Group Theory and its Applications to Chemistry, Tata Mc Graw-Hill Publishing Company, New Delhi, 1990.
 Unit IV Chapter 1,2,3 & 4
 Unit V Chapter 5,6,7 & 8

Book for References

1. Drago R S, Physical Methods in Inorganic Chemistry, East West Press Ltd, New Delhi, 1971.

- 2. Chang R, Basic Principles of Spectroscopy, Englewood Cliffs, New Jersey, 1978.
- 3. Straughan B P and Walker S, *Spectroscopy*, Volume 1,2,3, Chapman and Hall, A Halstet Press Book, John Wiley & Sons Ins., New York, London, 1975.
- 4. Barrow G M, Introduction to Molecular Spectroscopy, Tata McGraw Hill, New Delhi, 1993.
- 5. Chatwal G R and Anand S K, Spectroscopy, Himalaya Publishing House, Mumbai, 2009.
- 6. Albert Cotton F, Chemical applications of Group Theory, 3rd Edition, Wiley India (P) Ltd., New Delhi, 2010.

Web Resources



Principles of Organic Chemistry



NPTEL-Online Course

Semester	Co	urse co	ode		Tit	le of the	Course)	Ho	urs	Credits	
п	21S	PS2ES	02A	_ 10 _	DSE -2: INTERDISCIPLINARY CORE:SPECTROSCOPY AND GROUP THEORY					5	4	
Course Outcomes	Prog	ramm	e Outc	omes (nes (POs) Programme Specific Outcomes (PSOs)							
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos	
CO-1	3	3	2	2	1	3	2	3	2	1	2.2	
CO-2	3	3	2	2	1	3	2	3	2	2	2.3	
CO-3	3	3	3	2	2	3	3	2	2	2	2.5	
CO-4	3	2	3	2	1	3	2	2	2	1	2.1	
CO-5	2	2	2	2	2	2	2	2	2	2	2.0	
		•						Mea	n overal	ll Score	2.22 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PSS2SE01	SEC: SOFT SKILLS	4	3

Programme Specific Outcomes (PSOs)

After the successful completion of the course, students will learn:

- the dynamics of effective and professional communication skills and put them into daily use
- to write a Professional resume using creative methods of online platforms
- the dynamics of interview skills and GD preparations and presentations in public platforms and present the best of themselves as job seekers
- to understand, analyze and express their personality styles and personal effectiveness in various environments
- to learn and update themselves with the required knowledge in Numerical ability and Test of Reasoning for competitive examinations

Course outcomes (COS)

Upon completion of this course, students will:

- be exposed and trained in various nuances of Soft Skills in a Professional manner responding to the requirements of national and international market
- be able to synthesize the knowledge and practical skills learnt to be personal effective in any managerial positions
- be equipped to construct plans and strategies to work for better human society
- be able to illustrate the problems at work and home and design solutions and maintain a balance of work and home
- be able to connect on a continuum and maintain growth and sustainability and creativity in employment that increases in productivity, profit for individuals and the society.

Module 1: Effective Communication & Professional communication

Effective communication: Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication. JOHARI Window as a tool of effective communication.

Professional Communication: The Art of Listening, The passage, Kinesthetic, Production of Speech, Speech writing, Organization of Speech, Modes of delivery, Conversation Techniques, Good manners and Etiquettes, Different kinds of Etiquettes, Politeness markers.

Module II. Resume Writing & Interview Skills

Resume Writing: Meaning and Purpose. Resume Formats. Types of s Resume. Functional and Mixed Resume, Steps in preparation of Resume, Model resumes for an IT professional Chronological, Types of interviews, Creative resumes using online platforms

Interview Skills: Common interview questions, Dos and Don'ts for an interview, Attitude, Emotions, Measurement, Body Language, Facial expressions, Different types of interviews, Telephonic interviews, Behavioral interviews and Mock interviews (Centralized).

Module III: Group Discussion & Team Building

Group Discussion: Group Discussion Basics, GD as the first criterion for selecting software testers, Essentials of GD, Factors that matter in GD, GD parameters for evaluation, Points for GD Topics, GD Topics for Practice, Tips for GD participation. Video shooting of GD presentation & Evaluation (Centralized)

Team Building: Characteristics of a team, Guidelines for effective team membership, Pedagogy of team building, Team building skills. Team Vs Group - synergy, Types of synergy, Synergy relates to leadership ,Stages of Team Formation, Broken Square-Exercise, Leadership, Leadership styles, Conflict styles, Conflict management strategies & Exercises

Module IV: Personal Effectiveness

Personal Effectiveness: Self Discovery: Personality, Characteristics of personality, kinds of self, Personality inventory table, measuring personality, intelligence and Exercises

Self Esteem: Types -High & Low self esteem, Ways of proving self esteem, Hypersensitive to criticism, activities. Goal setting: Goal setting process, Decision making process & Exercises.

Stress Management: Identifying stress, Symptoms of stress, Responding to Stress, Sources of stress, Coping with stress and Managing stress.

Module V: Numerical Ability

Average, Percentage, Profit and Loss, Problems of ages, Simple Interest, Compound Interest, Area, Volume and Surface Area, Illustration, Time and Work, Pipes and Cisterns, Time and Distance, Problems on Trains, Illustrations, Boats and Streams, Calendars and Clocks.

Module VI: Test of Reasoning

Verbal Reasoning: Number series, letter series, coding and decoding, logical sequence of words, Assertion and Reasoning, Data Sufficiency, Analogy, Kinds of relationships.

Non-Verbal Reasoning: Completion of Series, Classification, analogical, Pattern comparison, Deduction of figures out of series, Mirror Reflection Pattern, Hidden figures, Rotation pattern, Pattern completion and comparison, Sense of direction, Blood relations.

Text cum Exercise book

Melchias G, Balaiah John, John Love Joy (Eds), 2018. Winners in the Making: A primer on soft skills. SJC, Trichy.

References

* Aggarwal, R.S. *Quantitative Aptitude, S.Chand & Sons**.Aggarwal, R.S. (2010). A Modern Approach to Verbal and Non Verbal Reasoning. S.Chand & CO, Revised Edition.
* Covey, Stephen. (2004). 7 Habits of Highly effective people, Free Press.

* Egan, Gerard. (1994). *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/Cole.

* Khera ,Shiv (2003). You Can Win. Macmillan Books , Revised Edition.

Other Text Books

* Murphy, Raymond. (1998). *Essential English Grammar*. 2nd ed., Cambridge University Press.

* Prasad, L. M. (2000). Organizational Behaviour, S.Chand & Sons.

 \ast Sankaran, K., & Kumar, M. Group Discussion and Public Speaking . M.I. Pub, Agra, 5th ed., Adams Media.

* Schuller, Robert. (2010) . Positive Attitudes. Jaico Books.

* Trishna's (2006). How to do well in GDs & Interviews, Trishna Knowledge Systems.

** Yate, Martin. (2005). Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting*

Semester	Course Code	Title of the Course	Hours	Credits
II	21PCH2EG01	GENERIC ELECTIVE-1(WS): INDUSTRIAL PRODUCTS	4	3

CO. No.	CO-Statement On successful completion of this course, students will be able to	Cognitive Level (K -Level)
CO-1	describe manufacturing processes of cement and glass.	K1
CO-2	understand the importance of plastic and fibres.	K2
CO-3	explain the composition and applications of fertilizers.	K3
CO-4	illustrate the preparation and uses of cosmetics.	K4
CO-5	classify dyes, pigments and paints.	K5

Unit-I Cement and Glass

Cement - Composition, different methods of manufacturing and uses -Portland cement -Composition, different methods of manufacturing (Wet and Dry process), uses - Setting of cement, Glass- - Composition, Types, different methods of manufacturing - Melting, Blowing, Pressing, Annealing and finishing- chemical and physical properties of glass.

Unit-II Pigments, Dyes and Paints

Pigments - Classification, Manufacture and uses. Dyes - Classification, preparation, dyeing processes. Paints - Composition, Types, Manufacture and testing of Paints.

Unit-III Fibers, Plastics and Rubber

Fibres - definition-difference between Natural and synthetic fibres-properties of synthetic fibres-Artificial silk, rayon, nylon and Terylene Plastics - composition, Classification, manufacture, properties and uses recycling of plastics Rubber: types of rubber-synthetic rubber- natural rubber - Vulcanizations of Rubber- properties and uses of rubber.

Unit-IV Fertilizers and Fuels

Fertilizers - Types of Fertilizers: Organic and Inorganic fertilizers, Preparation and uses, Fuels - Energy resources - Industrial gases, Water gas, Producer gas, Oil gas, natural gas, coal gas, Gobar gas, Indane gas, Petroleum products and coal products.

Unit-V Cosmetics

Shampoo- composition and its preparation, lipstick -preparation, Face cream and face powder -composition and their preparation. Hair dyes - chemical and herbal dyes. Perfumes and Deodorants.

Books for Study

- 1. Charkarabarthy B N, Industrial Chemistry, Oxford and IBH Publishing. Co. 1st Edition. New Delhi, 2002. **Unit I -III** *Chapter:2,3,4,5,&6*
- 2. Sharma B K, Industrial Chemistry, Goel Publishing House, 1st Edition, New Delhi, 2011. **Unit IV -IV** *Chapter:2,3,4,5,& 6*

Books for Reference

1. Othmer K, Encyclopedia of Chemical Technology, John Wiley and Sons, USA, 1999.

(12 Hours)

(12 hours)

(12 hours)

(12 Hours)

(12 Hours)

Web Resources





Cosmetics

Cosmetics and Additives

Semester	Cou	ırse C	ode		Titl	e of the	Course	e	Ho	urs	Credits
II	21P	CH2E	G01				TIVE- PRODU	1(WS): UCTS	2	4	4
Course Outcomes	Pr	ogran	nme O (POs)		ies	Programme Specific Outcomes (PSOs)					Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	2	2	1	1	2	3	2	2	2	2.0
CO-2	1	2	3	3	2	2	3	1	2	3	2.2
CO-3	2	3	2	2	1	3	2	2	2	2	2.1
CO-4	2	3	2	3	2	2	3	2	2	2	2.3
CO-5	2	3	2	2	3	2	2	3	3	2	2.4
	Mean overall Score								2.20 (High)		

Semester	Course code	Title of the Course	Hours	Credits
III	21PCH3CC05	CORE-5: INORGANIC CHEMISTRY- III	5	4

	CO-Statement	Cognitive
CO No	On successful completion of this course, students will be able to	level
	-	(KLevel)
CO-1	understand the stability of the complexes.	K1
CO-2	know the organometallic complexes and draw their structures.	K2
CO-3	analyze the electronic spectra of the complexes.	K4
CO-4	predict mechanisms of reactions of complexes.	K5
CO-5	predict the structure of the complexes utilizing spectral	K5
	techniques.	

Unit-I Theories of Coordination Chemistry

Crystal field theory - splitting pattern of octahedral, tetrahedral, square planar, trigonal bipyramidal and square pyramidal complexes - magnetic properties, CFSE, high spin-low spin cross over - limitations - structural and thermodynamic effects of inner orbital splitting, Jahn-Teller effect (static, dynamic, elongation and flattening) - ligand field theory - evidences M-L overlap, spin-orbit coupling constant and Racha parameters - MO theory of for octahedral complexes (sigma and pi bonding), tetrahedral and square planar complexes.

Unit-II Basics of Organometallics

Hapticity- 16 and 18 electron rules - applications and limitations - carbonyls- bonding terminal, doubly, triply bridged carbonyls - structure of carbonyls - CO stretching frequencies of carbonyls and mixed carbonyls - carbonyl hydrides - nitrosyls-terminal, bridging and bent - pi complexes with olefins - ferrocene and benzenoid metal complexes - non-benzenoid aromatics as ligands and carbene complexes - fluxional molecules.

Unit-III Reaction Kinetics in Coordination Chemistry

Inert and labile complexes - Stepwise, overall stability constants -Chelate effectmechanisms of substitutions in octahedral complexes-dissociative (D), associative (A), and interchange (I) mechanisms - Aquation (acid hydrolysis) and anation - conjugate base mechanism of base hydrolysis - Substitution reactions in square planar complexes - Trans effect-theories and applications - electron transfer reactions - inner and outer sphere mechanisms- excited state outer sphere electron transfer - mixed valence complexes.

Unit-IV Physical Methods in Coordination Chemistry-I (15 Hours)

Types of magnetic behaviour - magnetic susceptibility measurements - Gouy's methodorbital contribution-spin-orbit coupling and its effects on magnetic properties - Temperature independent paramagnetism (TIP) - spin-crossover phenomena - electronic spectra of complexes-band width and intensity-Sugano-Tanabe and Orgel Diagrams - charge transfer spectra - infrared spectra of Coordination complexes-characteristic frequencies-mode of coordination and interpretation of IR spectra of complexes containing CO, SO₂, carboxylate, ester, amine, amide, DMSO ligands.

44

(15 Hours)

(15 Hours)

(15 Hours)

Unit-V Physical Methods in Coordination Chemistry-II (15 Hours)

NMR - Applications of NMR to inorganic compounds - NMR of metal hydrides (¹H NMR), metal carbonyls(¹³C NMR), ¹⁹F and ³¹P NMR -Applications of NQR spectroscopy to the study of complexes-ESR-zero- field splitting - Krammer's degeneracy - pattern for number of lines of complexes having d^1 - d^9 systems -bis(salicylaldimine) Cu(II), Mn(II) complexes - Mossbauer spectroscopy - quadrupole interactions - magnetic interactions - FeSO₄, FeCl₃, ferro- and ferricyanides, nitroprusside, FeC₂O₄, Fe₃(CO)₁₂.

Books for Study

- 1. Huheey J E, Keiter E A Keiter R L, and Medhi O K, *Inorganic Chemistry Principles* of Structure and Reactivity, 4th Edition, Harper Collins College Publishers, New York, 1993.
 - **Unit I** Chapter 14
- Unit II Chapter 18,6
- Unit IIIChapter 16,17Unit IVChapter 15 Appendix-G
- Drago R S, *Physical Methods in Inorganic Chemistry*, Affiliated East-West Press Private Limited, New Delhi, 1965 (Reprint).
 Unit I Chapter-3 Unit IV Chapter-6,7& Appendix-A
 - **Unit V** *Chapter-8, 9, 10, 11*

Books for Reference

- 1. Cotton F A and Wilkinson G, *Inorganic Chemistry A Comprehensive Text*, 3rd Edition, Interscience Publishers, New York, 1972.
- 2. Purcell K F and Kotz J C, *Inorganic Chemistry*, WB Saunders Company, Philadelphia, 1977.
- 3. Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York, 2014.
- 4. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5thEdition, Pearson Education, Inc., New York, 2014.
- 5. Housecroft C E and Sharpe A G, *Inorganic Chemistry* 4thEdition, Pearson Education Limited, Essex, 2012.
- 6. Lee JD, Concise Inorganic Chemistry, 6th Edition, ELBS, London, 1998.
- 7. Lewis J and Wilkins RG, *Modern Coordination Chemistry*, Interscience Publishers, Inc., New York, 1960.
- 8. Basalo F and Pearson RG, *Mechanisms of Inorganic Reactions*, John-Wiley and Sons Inc., New York, 1960.
- 9. Crabtree RH, *The Organometallic Chemistry of the Transition Metals*, 6thEdition, John-Wiley and Sons Inc., New York, 2014.
- 10. Kazuo Nakamota, *Infrared and Raman Spectra of Inorganic and Coordination Compounds*, Part A and B, 6thEdition, John-Wiley and Sons, Inc. NewYork, 2009.

Web resources



Fluxionality in Organic Chemistry



Magnetic Resonance



Crystal field Theory

Semester	Co	urse c	ode		Titl	e of the	Ho	urs	Credits		
III	21PCH3CC05 [= =					E-5: IN(EMIST			4	5	4
Course Outcomes	Pr	ogran	gramme Outcomes (POs) Programme Specific Outcomes (PSOs)								Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	2	2	3	2	1	2	2	3	2	1	2.0
CO-2	3	2	2	2	3	3	2	2	2	3	2.3
CO-3	2	2	3	3	2	2	2	3	3	2	2.4
CO-4	2	3	2	2	2	3	2	2	2	2	2.2
CO-5	3	2	2	1	2	2	3	2	1	2	2.0
Mean overall Score								2.18 (Medium)			

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCH3CC06	CORE-6: ORGANIC CHEMISTRY-III	6	6

CO. No.	CO-Statements	Cognitive levels
	On successful completion of the course, students will be able to	(K-Level)
CO-1	acquire the knowledge and applications of ¹ H NMR.	K1
CO-2	comprehend the basics of pericyclic reaction.	K2
CO-3	learn the principles, techniques and applications of ¹³ C NMR and ESR.	К3
CO-4	deduce the instrumentation, ionization techniques in mass spectrometry.	K4
CO-5	recognize the mechanisms of rearrangements.	K5

Unit -I ¹HNMR Spectroscopy

¹**H** NMR: Nuclear spin states - mechanism of absorption - chemical shift and shielding -NMR spectrometer continuous wave and FT instrument - chemical equivalence - integrals and integration - chemical environment and chemical shift - local diamagnetic shielding: electronegativity and hybridization effects - acidic exchangeable protons - deuterium exchange and peak broadening-tautomerism - protons on N: amines and amides-magnetic anisotropy -spin-spin splitting (n+1) rule - coupling constants - symbols - spectra of diastereotopic systems - measuring coupling constants - spin system notation: A₂, AB, AX, AB₂, AX₂, A₂B₂, A₂X₂ spin systems -heteronuclear coupling: ¹H-¹⁹F and ¹H-³¹P - PMR absorptions by hydrocarbons and functional groups-Chemical shift reagents-chiral resolving agents - problem solving.

Unit -II ¹³CNMR and ESR Spectroscopy

¹³C NMR:¹³C nucleus-chemical shifts - correlation charts - proton coupled and decoupled ¹³C spectra - nuclear overhauser effect - off resonance decoupling - DEPT experiments.

Two dimensional spectroscopic methods: COSY, HETCOR and NOESY experiments - Magnetic resonance imaging - problem solving.

ESR spectroscopy - basic principle - predicting number of ESR lines for simple organic free radicals such as methyl, ethyl, phenyl and naphthalene radicals.

Unit - III Mass Spectrometry

Basic principles - instrumentation - sampling techniques - ionization methods: EI, CI, desorption ionization techniques (SIMS, FAB, and MALDI), ESI - Mass analysis: magnetic, double focusing, quadrupole and ToF mass analysers - detection and quantization - determination of molecular weight - molecular ion peak - base and meta stable peaks - calculation of molecular formula - fragmentation and structural analysis - fundamental fragmentation processes -Stevenson's rule - α -cleavage-inductive cleavage - two bond cleavage - *retro* Diels-Alder cleavage - McLafferty rearrangements -fragmentation of hydrocarbons - alcohols, phenols, thiols - ethers and sulfides - carbonyl compounds - amines - and nitrogen compounds - halides.

Combined applications of UV-Visible, IR, NMR and Mass spectral techniques for the structural elucidation of organic molecules.

(18 Hours)

(18 Hours)

(18 Hours)

Unit- IV Pericyclic Reactions

Characteristics and types of pericyclic reactions

Cycloaddition reactions: stereochemistry of Diels-Alder reactions - substituent effects on reactivity, regioselectivity and stereochemistry -catalysis by Lewis acid - synthetic applications - enantioselectivity-synthetic applications - diastereoselective using chiral auxiliaries - 1,3-dipolar additions - relative reactivity - regioselectivity - stereoselectivity - transition structures - applications - [2+2] cycloaddition reactions of ketenes and alkenes. Electrocyclic reactions: overview - orbital basis for stereospecificity - FMO and MO

correlation diagram methods - thermal and photochemical reactions - Woodward-Hoffman rules - electrocyclic reactions of charged species - electrocyclization of heteroatomic trienes - rules for electrocyclic reactions.

Unit-V Sigmatropic rearrangements

Types shifts of hydrogen and alkyl groups - [3,3]sigmatropic rearrangement - oxidation of tertiary allylic alcohols - Cope, oxy-cope, anionic cope rearrangements - Claisen rearrangements-ortho ester Claisen, Ireland-Claisen, Ester enolate Claisen and Claisen rearrangement of N,N-dialkylketene - [2,3]-sigmatropic rearrangements - allylic sulfoxides, selenoxides and amine oxides-allylic sulfonium and ammonium ylides - thermal and photochemical - [1,n] H sigmatropic shifts.

Books for Study

- 1. Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, *Introduction to Spectroscopy*, 5th Edition, Cengage Learning, Delhi, 2015.
- 2. Unit I & II Chapter 5-9 Unit III Chapter 3-4
- Carey F A, and SundbergR J, Advanced Organic Chemistry, Part A: Structure and mechanisms, 5th Edition, Springer (India) Pvt Ltd., New Delhi, 2007. Unit IV Chapter 10 Unit V Chapter 10
- Carey F A, and Sundberg R J, Advanced Organic Chemistry, Part B: Structure and Mechanisms, 5th Edition, Springer (India) Pvt Ltd., New Delhi, 2007.
 Unit IV Chapter 6 Unit V Chapter 6
- 5. Bruchner R, Organic Mechanisms Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin, Heidelberg, 2010. Unit V Chapter 12

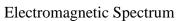
Books for Reference

- 1. Silverstein R M and Bassler G C, *Spectrometric Identification of Organic Compounds*, 4th Edition, John- Wiley and Sons, New York, 1993.
- 2. Kemp W, Organic Spectroscopy, 3rd Edition, ELBS, London, 1987.
- 3. Fleming I, *Spectroscopic Methods in Organic Chemistry*, 4th Edition, Tata-McGraw Hill Publishing Company, New Delhi, 1988.
- 4. Smith M B, and March J, *March's Advanced Organic Chemistry*, 6th Edition, John-Wiley and Sons, New York, 2007.
- 5. Clayden J, Greeves N, and Warren S, *Organic Chemistry*, Oxford University Press, New York, 2012.
- 6. Bruchner R, Organic Mechanisms Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin, Heidelberg, 2010.

(18 Hours)

Web Resources









Mass Spectroscopy

Semester	Course code Title				Course code Title of the Course		Ho	urs	Credits		
III	III 21PCH3CC06 ORGANI				CORE-6: ANIC CHEMISTRY-III			6	6	6	
Course	Pr	ogran	nme O	utcom	ies	Programme Specific Outcomes				omes	Mean
Outcomes			(POs)					(PSOs)			Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	3	2	2	1	2	2	3	2	3	1	2.1
CO-2	1	2	3	3	2	2	3	1	2	3	2.2
CO-3	2	3	2	2	1	3	2	2	1	2	2.0
CO-4	2	3	2	3	2	2	3	2	1	1	2.1
CO-5	2	3	1	2	3	2	2	3	3	2	2.3
Mean overall Score										2.14 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
III 21PCH3CC07	CORE-07:	6	6	
	21PCH3CC07	PHYSICAL CHEMISTRY II	6	U

CO. No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K Level)
		· · · ·
CO-1	memorize and retain the basics of various concepts of kinetics, solution kinetics catalysis and electrodics.	K1
CO-2	understand the underlying principles of kinetics and electrodics.	K2
CO-3	apply the underlying concepts in day to day inventions and application.	К3
CO-4	analyze the intricacies of electrical double layer and evaluate its implications in real life.	K4 & K5
CO-5	create new electrochemical cells and newer electrodes for application.	K6

Unit- I Theories of Reaction Rate

Theories of reaction rates and reaction mechanism - Arrhenius equation - potential energy surfaces and reaction coordinates - collision theory - ARRT(thermodynamic treatment only) application of ARRT to unimolecular, bimolecular and termolecular reactions - kinetic isotope effect- isokinetic relation and temperature - theories of unimolecular reactions -Lindemann and Rice-Ramsperger-Kassel - principle of microscopic reversibility and detailed balancing.

Unit-II Application of ARRT to Solution Kinetics and Catalysis

Application of ARRT to solution kinetics - factors affecting reaction rate in solution- internal pressure - solvent dielectric constant - ionic strength - reactions - Van't Hoff equation and volume of activation - catalysis- characteristics of a catalyst -factors affecting catalytic reactions - types of catalysis - homogeneous catalysis - acid - base catalysis - Van't Hoff and Arrhenius intermediates -mechanism - protolytic and prototropic catalysis laws - acidity functions -Hammett-Zucker hypothesis - catalysis in biological systems- Michaelis-Menten equation - Lineweaver-Burk and Eadie-Hofstee plots - influence of substrate concentrationpH- and temperature on rate - influence of substituent's on reaction rates - Hammett and Taft equations - linear free energy relations.

Unit-III Surface Chemistry and Heterogeneous Catalysis

Surface phenomenon - physical and chemical adsorption - adsorption and free energy relations at interface - Langmuir adsorption isotherm - Gibbs adsorption isotherm - BET isotherm - measurement of surface area - heterogeneous catalysis - mechanism - Langmuir Hinshelwood mechanism - Langmuir-Rideal bimolecular mechanism - role of surface in catalysis.

Unit-IV Debye-Huckel Theory and its Applications

Debye Huckel theory - radius of ionic atmosphere - calculations of thickness of ionic atmosphere - evidences of ionic atmosphere - asymmetry effect -electrophoretic effect -Debye Falkenhagen effect - Wien effect - Debye-Huckel Onsager equation - modification and

(18 Hours)

(18 Hours)

(18 Hours)

(18 Hours)

verification of the equation - Debye-Huckel limiting law - modification and verification - finite ion size model - Huckel-Bronsted equation - calculation of activity coefficient - determination of ion size parameter - solubility - solubility product of sparingly soluble salt - common ion effect - neutral salt effect and solubility - determination of solubility and solubility product.

Unit-V Electrode Kinetics

(18 Hours)

Theories of electrical double layer - electric double layer at the electrode -electrolyte interface - Helmholtz model of double layer - law of electrical neutrality - Gouy - Chapman diffused charged model - desorption theory of double layer - Stern's model, triple-layer theory- electro capillary phenomenon - electrocapillary curves for solutions containing anions, cations and molecular substances - electrocapillary maximum - Lipmann equations and potential - experimental measurement and its calculation - capillary electrometer and contact angle method - electro kinetic phenomena - classification electro-osmosis and electrophoresis - streaming potential and sedimentation potential - kinetics of electrode process - equilibrium and non-equilibrium process - concentration and activation polarization - theory of electrochemical over potential - derivation and verification of the equations - Butler-Volmer equation - Tafel equation.

Books for Study

1. Laidler K J, *Chemical Kinetics*, 3rd Edition, New Delhi TATA McGraw Hill Co. 1984. **Unit I and II** *Chapters 2 and 3*

2. Kuriacose J C and Rajaram J, *Kinetics and Mechanism of Chemical Transformation*, Macmillan & Co, Delhi, 1993. Unit I-III Chapters 5 -10

3. Glasstone S, An Introduction to Electrochemistry, New Delhi, East West Press Pvt. Ltd, 1956. Unit IV and V Chapter 3,4,15 and 16

Books for Reference

1. Castellan G W, Physical Chemistry, 4th Edition, Narosa, New Delhi, 2004.

2. Kapoor K L, A Textbook of Physical Chemistry, Vol. 3 Macmillan, India Ltd, 2013.

3. Huges G, Radation Chemistry, Oxford series, 1973.

4. Antorpov L, *Theoretical Electrochemistry*, 2nd Edition, Mir Publishers, Moscow, 1977.

5. Bockris J O'M and Reddy A K N, *Modern Electrochemistry*, Vol. 1 & 2, 2nd Edition, Plenum Press, New York, 1998.

Web Resources

Electrical Double Layer	Gibbs Adsorption Isotherm

Semester	Co	urse co	ode		Title of the Course				Но	urs	Credits
III21PCH3CC07Course OutcomesProgramme Outcomes				CORE- 07: PHYSICAL CHEMISTRY II						5	6
				omes (POs)	Programme Specific Ou (PSOs)				omes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	1	3	1	1	3	2	2	3	3	1	2
CO-2	2	3	2	3	2	1	2	3	1	3	2.2
CO-3	1	3	1	3	2	2	3	2	1	2	2
CO-4	2	1	3	3	2	2	3	2	2	3	2.3
CO-5	2	3	2	3	2	2	3	2	3	3	2.5
								Mean	overal	l Score	2.2 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCH3CP05	ORGANIC CHEMISTRY PRACTICAL-I	4	3

CO. No.	CO-Statement	Cognitive Levels (K -Level)
On success	ful completion of this course, students will be able to	
CO-1	choose appropriate solvent for the separation of organic binary mixtures.	K1
CO-2	infer the functional group of the compounds based on characteristic reactions.	K2
CO-3	apply the skills of micro level analysis to identify the nature of organic compounds	К3
CO-4	categorize the micro level analysis to identify the functional groups of organic compounds	K4
CO-5	confirm the functional group by preparing a solid derivative	K5

Unit-I Micro Qualitative Analysis of an organic binary mixture (12 Hours) Pilot separation -Ether separation, Bicarbonate separation, Alkali separation and Acid separation, Bulk separation, Preliminary tests- Colour and appearance - solubility tests acidic/basic/neutral nature - tests for aliphatic and aromatic compounds - tests for saturation/unsaturation.

Unit-II Tests for Characteristic elements in organic compounds

Preparation of sodium fusion extract -chemistry of converting organic N/S/halogens into inorganic ion in sodium fusion extract - tests for Nitrogen - tests for sulphur - tests for halogens such as chlorine, bromine and iodine - need for blank test.

Unit-III Analysis of Functional groups-1

Tests for carbonyl functional groups - mono- & dicarboxylic acids, esters, aldehydes and ketones, phenol, sulphanilic acid, alcohol and hydrocarbon

Unit-III Analysis of Functional groups-1 Primary and secondary amines, amide, diamide, anilide, and nitro compounds

Unit-V: Preparation of Derivatives

Confirmation of the functional groups by preparation of solid derivatives/characteristic colour reactions for the functional groups - scientific reporting

Books for Reference

- 1. Ganapragasm N S and Ramamurthy C, *Organic Chemistry Lab Manual*, 2nd Edition, Vishwanathan S Printers and Publishers (P) Ltd., Chennai, 2015.
- 2. Furniss B S, Hannaford A J, Smith P W G, and Tatchell A R, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edition, Pearson publication.

(12 Hours)

(12 Hours)

(12 Hours)

- 3. Venkateswaran V, Veeraswamy R, Kulandaivelu A R, *Basic Principles of Practical Chemistry*, 2nd Edition, Sultan Chand and Sons, New Delhi, 1997.
- 4. Organic Chemistry Lab Manual for Micro Qualitative Analysis, Department of Chemistry, St. Joseph's College, Tiruchirappalli-620 002. (Private circulation).

Web Resource



Organic Analysis-I

Organic Chemistry Practical-I



Organic Analysis-II



Separation of mixtures

Scheme of valuation

Organic Analysis + TLC Preparation

INTERNAL

CIA			100 Marks
	Cumulative mark of Regul	ar Practical Classes	40 Marks
	Record		10 Marks
	Two CIA tests		50 Marks
For E	ach CIA Test	100 marks	
	Solvent for separation	10 Marks	
	Viva/Test	10 Marks	
	Results	80 Marks (40 marks	s for each compound)
Orgai	iic Analysis	`	1 /
0	Solubility	5 Marks	
	Saturation/unsaturation	5 Marks	
	Aromatic/Aliphatic	5 Marks	
	Elements	10 marks	
	Functional Group	10 Marks	
	Derivative	5 marks	
		EXTERNAL	
Total		100 Marks	
	Solvent for separation	10 Marks	
	Test	10 Marks	
	Results	80 Marks (40 marks	s for each compound)
Orgai	iic Analysis	`	1 /
Ū	Solubility	5 Marks	
	Saturation/unsaturation	5 Marks	
	Aromatic/Aliphatic	5 Marks	
	Elements	10 marks	
	Functional Group	10 Marks	

Semester	Course code			Title of the Course					Iours	Credits	
III	21PCH3CP05			ORGANIC CHEMISTRY PRACTICAL- I 4					4	3	
Course Outcomes	Pr	0	me O (POs)	utcom	tcomes Programme Specific Outcomes (PSOs)						Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	2	1	2	3	1	2	3	2	3	3	2.2
CO-2	3	2	1	3	2	3	1	3	3	3	2.4
CO-3	2	3	2	3	2	2	3	2	2	2	2.3
CO-4	3	2	3	3	2	2	3	1	2	3	2.4
CO-5	1	3	2	2	3	2	2	3	3	1	2.2
	Mean overall Score										2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21PCH3ES03A	DSE-3: BIOORGANIC CHEMISTRY	5	4

	CO – Statements	Cognitive
CO. No.	On successful completion of course, students will be able to	Levels (K Level)
CO-1	understand the reactivity of heterocycles.	K1
CO-2	outline the structure and functions of DNA and RNA.	K2
CO-3	apply the separation concepts on aminoacids.	K3
CO-4	identify the mechanism of preparation and reactions of heterocycles.	K4
CO-5	compare the organic reaction mechanism with enzyme mechanism.	K5

Unit-I Heterocycles 1

Hantzsch pyridine synthesis - electrophilic aromatic substitution in pyridine and activated pyridine - nucleophilic substitution in pyridine - pyridone in nucleophilic substitutions - pyridine as catalyst and reagent - pyrones - structures of triazoles, and tetrazole and their tautomers - quinoline and isoquinoline - electrophilic and nucleophilic substitution reactions.

Unit-II Heterocycles 2

Preparation of imidazole- only the structures, numbering and naming of diazins (pyrazine, pyrimidine and pyrazine), azines (oxazine and azepine)-electrophilic aromatic substitution reactions in five membered heterocycles - pyrrole, furan, thiophene and indole - electrophilic addition in furan - lithiation in furan and thiophene - five membered heterocycles in Diels-Alder reactions.

Unit-III Nucleic Acids

Structures and names of nucleosides and nucleotides - ATP - carrier of chemical energy - phosphoryl transfer reaction-mechanisms for phosphoryl transfer reactions - structures of dinucleotides - NAD⁺, NADP⁺, NADH, NADPH and GTP - Nucleic acids - DNA and RNA - primary and double helical structures - base pair - replication - transcription - ribosomal RNA - transfer RNA - translation -base sequencing of DNA - DNA fingerprinting - AZT drug in HIV treatment.

Unit-IV Carbohydrates and Amino Acids

Carbohydrates: The reactions of monosaccharides in basic solutions - oxidation and reduction reactions of monosaccharides - the Wohl degradation - measuring the blood glucose level in diabetes - anomeric effect in glucose.

Amino acids: Separation of amino acids - electrophoresis - TLC - Ion exchange chromatography - Synthesis of amino acids - HVZ reaction - *N*-Phthalimidomalonic ester synthesis - Resolution of racemic mixtures of amino acids - Peptide bonds and disulfide bonds.

Unit-V Enzyme Catalysis and Lipids

Enzyme Catalysis: Types of enzymes - names - Active site - molecular recognition - lock and key model - mechanism of carboxypeptidase A.

Lipids: Fatty acids - omega fatty acids - waxes - fats and oils - PUFA - phospholipids -- prostaglandins - biosynthesis of prostaglandins, thromboxanes, and prostacyclins.

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

Books for Study

- 1. Clayden J, Greeves N and Warren S, *Organic Chemistry*, 2nd Edition, Oxford University Press, New York, 2012.
 - Unit I Chapter 29
 - **Unit II** *Chapter* 8
- 2. Bruice P Y, Organic Chemistry, 4th Edition, Pearson Education, New Delhi, 2012.
 - Unit III Chapter 27
 - Unit IV Chapter 22
 - Unit V Chapter 24

Books for Reference

- 1. Rodwell D, Bender D and Botham K, *Harper's Illustrated Biochemistry*, 31st Edition, McGraw Hill Professional, New York, 2018.
- 2. Stryer L, Berg J M, Tymoczko J L and Gatto G, *Biochemistry*, 9th Edition, W. H. Freeman and Company, New York, 2019.

Web Resources





Nucleic Acids

Semester	Co	urse co	ode		Tit	le of the	Course	9	Ho	urs	Credits
III	21PC	CH3ES	503A	BI	OORG	DSE ANIC	-3: CHEMI	STRY	5	5	4
Course Outcomes	Prog	Programme Outcomes (POs) Programme Specific Outcomes (PSOs)					omes	Mean Score			
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	2	3	2	2	2	3	3	3	2	2.5
CO-2	2	2	2	2	2	3	2	2	2	2	2.1
CO-3	3	3	3	2	2	3	3	3	2	2	2.6
CO-4	3	2	3	3	2	2	3	2	3	2	2.5
CO-5	2	2	2	3	2	2	3	2	2	2	2.2
								Mear	n overal	l Score	2.38 (High)

III	21PCH3ES03B	DSE-3 : PHARMACEUTICALCHEMISTRY	5	4

Title of the Course

	CO – Statements	Cognitive
CO. No.	On successful completion of course, students will be able to	Levels (K Level)
CO-1	recall the chemistry of bioregulatory drugs.	K1
CO-2	understand the therapeutic uses of drugs containing heterocycles.	K2
CO-3	identify the common diseases and their treatments employed.	K3
CO-4	classify drugs based on their biological, chemical characteristics.	K4
CO-5	apply the concept of chemical reactions in designing the drugs.	K6

Unit-I: Introduction to Chemistry of Drugs

Semester Course Code

Drugs - definition- sources- study of drugs -classification (biological, chemical, commercial and utility)-nomenclature of drugs- biotransformation-drug design - factors affecting the stability of drugs- encapsulation - drug delivery systems and sustained release of drugs.

Unit-II: Drugs Containing Heterocycles

Structures and their therapeutic uses of drugs containing pyridine: nikethamide, isoniazid, mepyramine and niacin-thiazole: niridazole, thiabendazole and sulfathiazole - imidazole: azomycin, metronidazole and clotrimazole - indole: seratonine, reserpine, ergotamine and indomethacin- quinoline: chinofon, chloroquine and primaquine.

Unit-III: Common Diseases and their Treatment

Insect borne diseases - Treatment using drugs - Air borne diseases-Treatment using drugs water borne diseases- Treatment using drugs-Digestive disorders - treatment- diseases of respiratory system- treatment-diseases of nervous system - treatment - other common diseases- treatment.

Unit-IV: Name Reactions in Drug Synthesis

Mechanism and uses of Beckmann rearrangement- Fries rearrangement- Schmidt reactionreduction- Clemmensen Reduction-Birch Reduction-Darzen's reaction-Reilev MPV Reaction-Mannich reaction-Michael reaction.

Unit-V: Bioregulatory Drugs

Cardiovascular drugs - Cardiac glycosides - anti arrhythmic drugs -antihypertensive agents antianginal agents. Diabetes and Hypoglycaemic drugs - two types of diabetes - Diabetes insipidus and diabetes mellitus -Control of diabetes - Insulin -Hypoglycaemic agents. Anticonvulsants -Cancer and antineoplastic drugs - Common causes - antimetabolites.

58

(15 hours)

(15 hours)

(15 Hours)

Credits

Hours

(15 Hours)

(15 hours)

Books for Study

1. Clayden J, Greeves N and Warren S, *Organic Chemistry*, 2nd Edition, Oxford University Press, New York, 2012.

Unit I Chapter 29 Unit II Chapter 8

2. Gosh J, Text Book of Pharmaceutical Chemistry, 3rd Edition, S. Chand & Chand Publications,

New Delhi, 1997.Unit I Chapter 2Unit III Chapter 6Unit V Chapter 10

3. George M and Joseph L, *Text Book of Pharmaceutical Chemistry*, Viva Books, New Delhi, 2009. Unit II *Chapter 3*

Books for Reference

- **1.** Srivastava, S K, A Complete Text Book of Medical Pharmacology, Volume I, 2nd Edition, Avichal Publishing Company, Kolkatta, 2012.
- **2.** Srivastava, S K, A Complete Text Book of Medical Pharmacology, Volume II, 2nd Edition, Avichal Publishing Company, Kolkatta, 2012.
- 3. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994.
- 4. Satake M and Mido Y, *Chemistry for Health Science*, Discovery Publishing House, New Delhi, 2003.
- 5. Kar A, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993.

Web Resources



Medicinal Chemistry





Common Diseases

Base Catalyzed Reaction

Semester	Co	urse co	ode		Tit	le of the	ne Course		Ho	urs	Credits
III	21PCH3ES03B			DS	DSE-3 : PHARMACEUTICAL CHEMISTRY				5	5	4
Course Outcomes	Programme Outcomes (POs)				Pro	gramme	e Specifi (PSOs)	c Outco	mes	Mean Score	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	2	2	2	3	3	2	3	2	2.5
CO-2	3	3	3	2	2	3	3	2	3	2	2.6
CO-3	3	3	2	2	2	3	3	2	2	2	2.4
CO-4	3	3	3	3	2	3	2	2	3	2	2.6
CO-5	2	2	2	2	2	2	2	2	3	2	2.1
	Mean overall Score								2.44 (High)		

6	()

Semester	Course code	Title of the Course	Hours	Credits
III	21PCH3EG02	GENERIC ELECTIVE - 2 (BS): HEALTH SCIENCE	4	3

CO. No.	CO-Statements	Cognitive Level
00.100	On successful completion of course, students will be able to	(K -Level)
CO-1	describe the chemistry of respiration and learn the function of body fluids.	K1
CO-2	understand the function of drugs and their mode of action.	K2
CO-3	identify basic nutrients involved in maintenance of good health.	K3
CO-4	classify common infectious and nutrient deficient diseases.	K4
CO-5	explain and discuss the process of digestion.	K5 & K6

Unit-I Health

Health - mental health and physical health - food pyramid - types of malnutrition - causes and remedies - macro and micronutrients - carbohydrates - classification and their biological functions, proteins-classification and their biological functions, vitamins - classification and their biological functions, vitamins - classification and their biological functions, S, Fe, Zn, Se, Mo)

Unit-II Drugs

Drugs - classification of drugs - drugs acting on CNS - general anaesthetics, hypnotics & sedatives, narcotics, antipyretics, antirheumatics, analgesics, anticonvulsants and antitussives - chemotherapeutic drugs - antibiotics, antiseptics and disinfectants - cardiovascular agents - anti cancer drugs - adverse effects of drugs

Unit-III Body Fluids

composition of blood- blood volume, blood groups, functions of blood, blood pressure, anaemia, blood sugar - respiration - oxygen and carbon dioxide transport in blood - haemoglobin -myoglobin - composition of urine - electrolyte balance - Na/K pump

Unit IV Enzymes and Hormones

Enzymes - types and their roles in biochemical reactions - hormones - types and functions - digestion in mouth, stomach, intestine and pancreas

Unit-V Common and Vitamin Deficiency Diseases

Jaundice, cancer, kidney stone - typhoid, dengue, ulcer, goiter, diabetes, rickets, scurvy, beriberi, pellagra, night blindness, Covid-19 - causes - symptoms - diagnosis - vaccines/treatment

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

Books for Study

- 1.Ramani A V, Food Chemistry, MJP Publishers, Chennai, 2009.Unit IChapter 1, 2, 3 and 5Unit IIIChapter 1Unit IVChapter 1
- 2. Ghosh, J A, *Text book of Pharmaceutical Chemistry*, S. Chand and Co. Ltd, 1999. Unit II Chapter 1 Unit V Chapter 1

Books for Reference

- 1. Ashutosh Kar, *Medicinal Chemistry*, Wiley Easterns Limited, New Delhi, 1993.
- 2. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994.
- 3. Parul R. Sheth, *Chemicals of Life*, National Institute of Science Communication (CSIR), 2000.
- 4. Satake M and Mido Y, *Chemistry for Health Science*, Discovery Publishing, House, New Delhi, 2003.

Semester	Co	Course code			Tit	le of the	Course	•	Ho	urs	Credits
III	21PCH3EG02			GE			TIVE - CIENC	• •	4	•	3
Course Outcomes	Prog	ramm	e Outc	omes (POs)	Pro	gramme	e Specifi (PSOs)	c Outco	mes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	2	3	2	2	3	2	3	2	2	2.4
CO-2	2	2	3	2	2	2	2	3	2	2	2.2
CO-3	3	2	3	2	2	3	2	3	2	2	2.4
CO-4	2	2	3	2	2	2	2	3	2	2	2.2
CO-5	3	2	3	2	2	3	2	3	2	2	2.4
	Mean overall Score								2.32 (High)		

Semester	Course code	Title of the Course	Hours	Credits
TX 7	21DCU4CC09	CORE-08:	(6
IV	21PCH4CC08	INORGANIC CHEMISTRY - IV	0	0

	CO-Statements						
CO No	On successful completion of this course, students will be able to	Levels (K-Level)					
CO-1	recall the types of inorganic crystals and their characteristics.	K1					
CO-2	understand various crystal defects.	K2					
CO-3	apply concepts of photochemistry in the reactions of organometallic complexes.	К3					
CO-4	examine metal ion binding biomolecules and explain their functions.	K4 & K5					
CO-5	design metal complexes for anti-cancer activity.	K6					

Unit-I Solid State -I

Unit cell - types of cubic unit cells - three dimension close packed structures - radius ratio rule - indexing of crystal planes (miller indices) crystal structures of sodium chloride, cesium chloride, zinc blende, wurtzite, fluorite, antifluorite, nickel arsenide and rutile - normal and inverse spinels - applications of crystal field theory to predict the structure of spinels - thermodynamics of ionic crystal formation - lattice energy, Madelung constant, solubility, ion size and HSAB - X-ray diffraction - Bragg's law, rotating crystal method and powder method

Unit-II Solid State - II

Defects in solids - stoichiometric defects - Schottky defect, Frenkel defect - nonstoichiometric defects - metal deficiency defect, metal excess defect - theories of bonding in metals - free electron theory, valence bond theory, band theory - semiconductors (p-type and n-type) - diodes, photovoltaic effect and light emitting diodes - super conductivity - low temperature super conducting alloys, theory of super conductivity, high temperature super conductors

Unit-III Inorganic Photochemistry

Laws of photochemistry - photophysical processes - Jablonski diagram - fluorescence - phosphorescence - Kasha's rule - Stoke's shift - types of electronic transitions in transition metal complexes - photochemistry of Cr(III) complexes - photosubstitution - photoaquation - Adamson's rules - photorearrangement - photoredox reactions - photochemistry of organometallic compounds.

Unit IV Bioinorganic Chemistry-I

Structure and function of chlorophyll - photo system-I and photo system-II - light reactions and dark reactions - Mn Catalyzed oxidation of H_2O to O_2 in chlorophyll - role of Mg^{2+} ion-structure and function of haemoglobin - cooperative effect in haemoglobin - role of globin - structure and function of myoglobin - structure and function of cytochrome C.

Unit-V Bioinorganic Chemistry-II

Structure and function of blue copper proteins - structure and function of vitamin B_{12} - *in vitro* and *in vivo* nitrogen fixation - Fe-S proteins - ionophores - ion transport mechanism in

(18 Hours)

(18 Hours)

(18 Hours)

(18 Hours)

(18 Hours)

cell membrane -Na-K pump - role of metal ions in DNA replication, transcription, translation - *cis*-platin and its mode of action in the treatment of cancer

Books for Study

- Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
 Unit I Chapter 7 Unit II Chapter 7
- 2. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996. Unit II *Chapter 3*
- Huheey J E, Keiter E A and Keiter R L, *Inorganic Chemistry Principles of Structure and Reactivity*, 4th Edition, Harper Collins College Publishers, New York, 1993. Unit II Chapter 4 Unit IV & V Chapter 20
- 4. Rohatgi-Mukherjee K K, *Fundamentals of Photochemistry*, New Age International Publishers, New Delhi, 2006. Unit III Chapter 4

Books for References

- 1. Keer H V, Principles of Solid State, Wiley Eastern Ltd, New Delhi, 1993.
- 2. Bertini I, Gray H B, Lippard S J and Valentine J S, *Bioinorganic Chemistry*, University Science Books, California, 1994.
- 3. Azaroff, Introduction to Solids, Tata McGraw Hill Publishing Co., New Delhi, 1994.
- 4. Evans R C, Crystal Chemistry, Cambridge University Press, London, 1964.
- 5. Addison W E, Structural Principles of Inorganic Compounds, Longman, London, 1961.
- 6. West A R, *Solid State Chemistry and its Applications*, 2nd Edition, John-Wiley and Sons Ltd, New York, 2014.
- 7. Wheatly P J, *The Determination of Molecular Structure*, Oxford University Press, London, 1959.
- 8. Purcell K F and Kotz J C, *Inorganic Chemistry*, W B Saunders Company, Philadelphia, 1977.

Web resources











X-ray Diffraction

Crystal Structure

Semiconductor Cyto

Cytochromes

Organometallic Compounds

Semester	Co	urse c	ode	Title of the Course					Ho	urs	Credits
IV	21P	CH4C	C08			08: INORGANIC EMISTRY - IV			(5	6
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	3	2	2	2	2	3	2	2	2	2	2.2
CO-2	1	2	2	3	2	1	2	2	3	2	2.0
CO-3	2	2	3	2	2	2	2	3	2	2	2.2
CO-4	2	2	2	2	3	2	2	2	2	3	2.2
CO-5	2	2	2	3	2	2	2	2	3	2	2.2
Mean overall Score											2.16 (Medium)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCH4CC09	CORE-09: ORGANIC CHEMISTRY-IV	5	5

CO. No.	CO-Statements	Cognitive Levels
	On successful completion of this course, students will be able to	(K-Level)
CO-1	name the synthesis and application of organometallic reagents.	K1
CO-2	overview of modern name reactions.	K2
CO-3	get familiarized with the selectivity in reactions and control them.	K3
CO-4	analyze and explain the methods of synthesizing target molecules.	K4 & K5
CO-5	understand and design the methods of asymmetric synthesis.	K6

Unit-I Retro-synthetic analysis

Synthons and synthetic equivalents - types of synthons: donor and acceptor synthons umpolung reactions - typical examples. Functional Group Interconversion (FGI), Functional Group Addition (FGA) - monofunctional disconnection: alcohol disconnection - alkene disconnection - ketone disconnection - acid and their derivatives disconnection - alkane disconnection - amine disconnection - bifunctional 1,2-, 1,3-, 1,4-, 1,5-, and 1,6disconnections.

Multistep Synthesis:

Illustrative synthesis of Juvabion from 4-methoxyacetophenone and from 4-methoxybenzaldehyde

Unit - II Selectivity in Organic Synthesis

Chemoselectivity:

Chemo-, region-, and stereoselectivity - reactivity of carbonyl groups towards nucleophiles selectivity of hydrides in reduction - selectivity in oxidations - Protecting groups - hydroxyl, amino, carbonyl and carboxylic acid protecting groups

Regioselectivity: Regioselectivity in electrophilic and nucleophilic aromatic substitution, regioselectivity in elimination reactions, electrophilic attack on alkenes, regioselectivity in radical reactions, nucleophilic attack on allylic compounds, electrophilic attack on conjugated dienes and conjugate addition.

Unit - III Asymmetric Synthesis

Chiral auxiliaries - alkylation of chiral enolates - enantiomeric excess-optical purity - chiral reagents and chiral catalysis - asymmteric hydrogenation - asymmetric epoxidation asymmteric dihydroxylation

Diastereoselectivity: prochirality, Cram's rule and chelation effect, diastereoselectivity in aldol reaction, diastereoselective epoxidation.

Unit - IV Organometallic Reagents

Preparation of organometallics: oxidative insertion, deprotonation of alkyne, ortholithiation of functionalized benzene rings, halogen metal exchange, transmetallation - preparation and properties and synthetic applications of organolithium, organomagnesium, organocopper reagents and intermediates - synthesis, features and reactions of organosilicon compounds reactions involving organopalladium intermediates - Heck reaction - cross coupling reactions - Suzuki coupling, Stille coupling, Fukuyama coupling - Negishi coupling, Kumada coupling-Sonogashira reaction-carbonylation reactions - olefin metathesis reactions.

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

Unit - V Name Reactions

Chan-Lam coupling, Hiyama coupling - Corey-Fuchs Reaction, Baylis-Hillman reaction -Biginelli reaction - Mukaiyama aldol reaction - Prins reaction, Mitsunobu reaction - Weinreb ketone synthesis Henry reaction - Hosomi-Sakurai reaction - Norrish Type I and II reactions -Paterno-Buchi and its regioselectivity - Barton reaction - Hofmann - Loeffler-Freytag reaction.

Books for Study

- Carey F A, Sundberg R J, Advanced Organic Chemistry, Part A: Structure and mechanisms, 5th Ed., Springer (India) Pvt Ltd. New Delhi, India, 2007. Unit I Chapter
- Carey F A, Sundberg R J, Advanced Organic Chemistry, Part B: Structure and Mechanisms, 5th Ed., Springer (India) Pvt Ltd. New Delhi, India, 2007. Unit I Chapter 13 Unit II Chapter 3 Unit IV Chapter 7-9
- 3. Clayden J, Greeves N, and Warren S, *Organic Chemistry*, Oxford University Press, New York, 2012.

Unit I	Chapter 28	Unit II (
Unit IV	Chapter 40	Unit V (

Unit II *Chapter 23* **Unit V** *Chapter 48* **Unit III** Chapter 41

Books for Reference

- 1. Warren S, Designing Organic synthesis: The Disconnection Approach, Wiley, New Delhi, 1984.
- 2. Bruchner R, Organic Mechanisms Reactions, Stereochemistry and Synthesis, Springer-Verlag, Berlin, Heidelberg, 2010.
- **3.** Richard O. Norman.C, Coxon J M, *Principles of Organic Synthesis*, 3rd Ed., CRC Press, Boca Raton, Florida, USA, 1993.

Web Resources







Retrosynthesis

Chemoselective

Asymmetric synthesis

Semester	Course code			Title of the Course					Ho	urs	Credits
IV	21P	PCH4CC09 ORGAN					Core 09: IC CHEMISTRY-IV			5	5
Course Outcomes	S Programme Outcomes (POs)						Programme Specific O (PSOs)				Mean Score
(COs)	PO1	PO2	PO3	PO4	PO4 PO5 PSO1 PSO2				PSO4	PSO5	of Cos
CO-1	3	2	3	2	2	2	3	2	2	3	2.4
CO-2	2	3	1	2	3	2	2	3	3	2	2.3
CO-3	3	2	2	2	1	3	2	2	1	2	2.0
CO-4	3	2	2	2	1	2	3	2	3	1	2.1
CO-5	2	3	2	3	2	2	3	2	1	3	2.3
	Mean overall Score										

(15 Hours)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCH4CC10	CORE-10: PHYSICAL CHEMISTRY-III	4	4

CO. No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K-Level)
CO-1	recall and understand the concept of sensors and apply to real life examples	K1 & K2
CO-2	imbibe and apply the concepts of polarography and cyclic voltametry	К3
CO-3	examine the applications of quantum chemistry	K4
CO-4	interpret the concepts of molecular orbital theory to evaluate few organic molecular systems	K5
CO-5	elaborate the concepts and instrumentation of amperometry and electrogravimetry	K6

Unit-I Electrochemical and Biosensors

Basic sensor technology - sensor systems - sensor characteristics - system characteristics - instrument selection - data acquisition and readout introduction - FET & MOSFET - chemical sensor - biosensors - ion exchange membrane electrodes - electrolytic sensors - electrochemical sensors.

Unit-II Electroanalytical Techniques - I

Polarography - experimental setup - advantages of dropping mercury electrode - supporting electrolyte - polarographic peak maxima - types of peak maxima - polarographic peak maxima suppressor - residual current - migration current - diffusion current - polarogram - half wave potential - Ilkovic equation (derivation is not required) - outline of applications (Polarogram of Zn^{2+} and Cd^{2+}) - cyclic voltametry, principle, experimental set up - cyclic voltammogram of Fe^{2+} in H_2SO_4 - anodic peak current - cathodic peak current - electrochemically reversible couple - cathodic peak potential - anodic peak potential - electrochemically irreversible couple - outline of applications.

Unit-III Electro Analytical Techniques II

Amperometry - principle of amperometric titration - different types of current voltage curves - amperometric titration between Pb^{2+} vs $K_2Cr_2O_7$, Pb^{2+} vs SO_4^{2-} , SO_4^{2-} vs Pb^{2+} Ni²⁺ vs DMG-Electrogravimetry - principle - experimental set up - physical characteristics of metal deposits - separation of Cu & Ni - Coulometry - principle, experimental set up - controlled potential coulometric analysis and application - experimental set up for constant current coulometry coulometric - titration of Fe(II) with Cerium(III).

Unit-IV Applications of Quantum Chemistry I

Approximation methods - need for approximation - perturbation theory - time independent perturbation - first order and second order perturbation theory - application of perturbation theory to particle in one dimensional box - anharmonic oscillator and helium atom - principle of variation and its proof - trial function and secular determinant- variation methods and its applications to hydrogen and helium atoms - particle in one dimensional box.

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

Unit-V Applications of Quantum Chemistry II

The Born - Oppenheimer approximation- VB theory of hydrogen molecule and MO theory of hydrogen molecular ion (H_2^+) - coulomb integral- exchange integral and overlap integral-detailed calculation of energy and overlaps- construction of sp, sp² and sp³ hybrid orbitals-Huckel molecular orbital theory - principles and applications to ethylene, butadiene, benzene, cyclobutadiene, trimethylamine, bicyclobutadiene and allyl systems- Hartee - Fock method-self consistent field method and Roothan equations.

Books for Study

1. Willard, Merit, Dean and Settle, *Instrumental Methods of Analysis*, 7th Edition, CBS Publication New Delhi, 2004. **Unit II** *Chapter XVI*

Unit III Chapter XVII & XV

- 2. Kaur, H. Instrumental Methods of Chemical Analysis, Revised 4th Edition, Pragati Prakashan Educational Publishers, 2010.
 Unit II Chapter 37
 Unit-III Chapter 3, 36 & 40
- 3. Anatharaman R, *Fundamentals of Quantum Chemistry*, McMillan, New Delhi, 2001. Unit IV and V Chapter 5 - 7
- Prasad R K, *Quantum Chemistry*, Revised 4th Edition, New age international (P) Ltd., New Delhi, 2008. Unit IV and V Chapter 5&6
- 5. Department Study Material, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirapalli. Unit I

Books for Reference

- 1. Vogel A I, Text book of Quantitative Inorganic Analysis, ELBS, 1978.
- 2. McQuarrie D A, *Quantum Chemistry*, 2nd Indian Edition, Viva Books Private Ltd., 2008.
- 3. Levine I N, Quantum Chemistry, 6th Edition, PHI Learning Private Limited, 2009.
- 4. Noel M and Vasu K I, Cyclic Voltammetry and the Frontiers of Electrochemistry, Oxford and IBH, 1990.
- 5. Kissinger P T and Heinman, *Laboratory Techniques in Electroanalytical Chemistry*, Editors, Marcel, Dekker, Inc., New York, 1984.
- 6. Puri Sharma and Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., 47th Edition, 2017.

Web resources

Polarography	Cyclic voltammetry-I	Cyclic voltammetry-II	Coulometry

(12 Hours)

Semester	Co	urse c	ode	Title of the Course					H	ours	Credits
IV	CORE-10: PHYSICAL CHEMISTRY-III						4	4			
Course Outcomes	Pr	ogran	nme O (POs)		ies	Prog	ramme	omes	Mean Score of		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	3	3	2	2	2	3	2	2	2	1	2.2
CO-2	2	2	2	2	2	2	2	2	2	1	1.9
CO-3	3	2	2	2	2	3	2	2	2	1	2.1
CO-4	2	3	2	2	2	2	3	2	2	2	2.2
CO-5	2	2	2	2	2	2	2	2	2	1	1.9
Mean overall Score											

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCH4CP06	ORGANIC CHEMISTRY PRACTICAL- II	4	3

CO.	CO-Statements	Cognitive							
No.		Levels							
<u> </u>	On successful completion of this course, students will be able to	(K-Level)							
CO-1	describe the principles of quantitative analysis in organic chemistry	K1							
CO-2									
CO-3	K3								
CO-4	estimate the phenol, Aniline and Glucose	K5							
CO-5	prepare organic compounds <i>via</i> single and double stage method	K6							
 Detern Estima Estima 	Quantitative Analysis Organic Compounds nination of saponification value of edible oil. ation of iodine value of oil. ation of phenol ation of aniline.	(12 Hours)							
2. Estima	Quantitative Analysis Organic Compounds ation of ketone. ation of glucose. ation of ascorbic acid.	(12 Hours)							
 Prepa Prepa Prepa Prepa 	I Preparation of Organic Compounds (Single-Stage) ration of acetanilide from aniline aration of <i>p</i> -nitroaniline from acetanilide aration of <i>p</i> -bromoaniline from acetanilide aration of methyl nitrobenzoate from methyl benzoate	(12 Hours)							
 Prepar Prepar Prepar Prepar 	 4. Preparation of methyl introbenzoate from methyl benzoate Unit - IV Preparation of Organic Compounds (Two-stage) 1. Preparation of orange-II dye 2. Preparation of <i>p</i>-nitroaniline 3. Preparation of methyl orange dye 4. Preparation of <i>p</i>-bromoaniline 								
 Prepar Prepar 	Preparation of Organic Compounds (Two-stage) ration of 1,3,5-tribromobenzene ration of acetyl salicyclic acid (aspirin) ration of methyl red	(12 Hours)							

Book of References

- 1. Ganapragasm N S and Ramamurthy C, *Organic Chemistry Lab Manual*, 2nd Edition, Vishwanathan S Printers and Publishers (P) Ltd., Chennai, 2015.
- Furniss B S, Hannaford A J, Smith P W G, and Tatchell A R, Vogel's Textbook of Practical Organic Chemistry, 5th Edition, Pearson publication.
- Venkateswaran V, Veeraswamy R, Kulandaivelu A R, Basic Principles of Practical Chemistry, 2nd Edition, Sultan Chand and Sons, New Delhi, 1997.

4. Organic Chemistry Lab Manual for Micro Qualitative Analysis, Department of Chemistry, St. Joseph's College, Tiruchirappalli-620 002, (Private circulation).

Web Resources





Estimation of Phenol

Preparation of Orange II Dye

			Scheme of Valuat	ion
(Organio	c Chem	istry Practical-II	Estimation and preparation
	C		INTERNAL	
CIA				100 Marks
	Cumul	lative m	ark of Regular Practical Classes	40 Marks
	Record	t		10 Marks
		CIA test		50 Marks
For E			100 marks	
	Proced	lure	10 Marks	
			10 Marks	
	Result			and 20 marks for preparation)
0	ic Estin			
	Error			
2%		50 Ma		
3%		40 Ma		
4%		30 Ma		
>4%		20 ma	rks	
Prepa				
10 ma	rks each	n for the	e crude and recrystallized samples EXTERNAL	
Total			100 Marks	
	Proced	lure	10 Marks	
	Test		10 Marks	
	Result	S	80 Marks (60 marks for estimation	and 20 marks for preparation)
Organ	ic Estin	nations		
<1% E	Error	60 Ma	rks	
2%		50 Ma	rks	
3%		40 Ma	rks	
4%		30 Ma	rks	
>4%		20 ma	rks	

Preparation

10 marks each for the crude and recrystallized samples

Semester	er Course code Title of the Course				Но	urs	Credits					
IV	IV 21PCH4CP06					ORGANIC CHEMISTRY PRACTICAL- II					3	
Course Outcomes	Prog	ramm	e Outc	comes (POs) Programme Specific O (PSOs)				c Outco	mes	Mean Score		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs	
CO-1	2	1	2	3	3	2	3	2	3	3	2.4	
CO-2	1	2	3	3	2	3	3	3	3	3	2.6	
CO-3	2	3	2	3	2	2	3	2	2	2	2.3	
CO-4	3	2	3	3	2	2	3	1	2	3	2.4	
CO-5	2	3	2	2	3	2	2	3	3	1	2.3	
	Mean overall Score											

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCH4ES04A	DSE-4: SELECTED TOPICS IN INORGANIC AND PHYSICAL CHEMISTRY- I	5	4

	CO-Statements	Cognitive
CO. No.	On successful completion of this course, students will be able to	Levels (K -Level)
CO-1	know the different types of organometallic reactions	K1
CO-2	discuss the role of organometallic complexes in catalytic processes	K2
CO-3	illustrate the industrial importance of compounds of main group elements	К3
CO-4	Identify the importance of partial molar properties	K4
CO-5	explain the concepts of fugacity and activity	K5 & K6

Unit-I Types of organometallic reactions

Oxidative addition - addition of H-H, C-H, C-C, X-X and R-X bonds. Reductive elimination cis-elimination, C-H elimination and dinuclear reductive eliminations. Insertion and deinsertion - 1, 1-insertion (carbonyl insertion or alkyl migration), 1,2-insertion (betaelimination), insertion into M-H, M-C bonds. Nucleophilic addition to the ligand - addition to CO, carbene and pi-ligands. Metathesis reactions.

Unit-II Homogeneous catalysis by transition metal complexes

Key steps in homogeneous catalysis - catalyst activation, substrate coordination, oxidative addition, reductive elimination, nucleophilic attack on substrate and product dissociation. The hydroformylation reaction - Co and Rh catalyzed hydroformylation reactions. The Wacker-Smidt synthesis of acetaldehyde, Hydrogenation of alkenes, carbonylation of methanol, Pd catalyzed C-C bond forming reactions, Reduction of Carbon Monoxide (Fischer-Tropsch Synthesis), oligomerization and polymerization reactions.

Unit-III Chemistry of the main group elements

Allotropy, synthesis, structure and bonding, industrial importance of the compounds of the s and *p* block elements.

Unit-IV Chemical Thermodynamics I

Partial molar properties - molarity and mole fraction - partial molar quantities - methods of determination of partial molar volume - chemical potential - Gibbs-Duhem equation chemical potential of mixture of gases - chemical potential in terms of U, H - variation of chemical potential with temperature and pressure - determination of partial molar properties from apparent molar properties - free energy of mixing - entropy of mixing and volume of mixing- fugacity - definition - methods of determination - variation of fugacity with temperature, pressure and composition - Duhem-Margules equation - fugacity of solids, liquids and mixture of gases - determination of fugacity in gas mixtures (Lewis-Randall Rule).

Unit-V Chemical Thermodynamics II

Activity and activity coefficients - definition - standard state- reference state- choice of standard state for gases, liquids and solids, liquid solvent and solute - dependence of activity

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

on temperature and pressure - determination of activity coefficient of non-electrolyte - mean ionic activity - determination of activity coefficient of electrolytes by freezing point method.

Books for Study

- 1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
- Unit-I Chapter 14 Unit-II Chapters 14 Unit-III Chapters 8
 2. Kuriakose J C and Rajaram J C, Thermodynamics, Shoban Lal Co., Jalandar, 1999. Unit IV and VChapter 8 and 10

Books for Reference

- 1. Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 7th Edition, Oxford University Press, London, 2018.
- 2. Spessard G O and Miessler G L, *Organometallic Chemistry*, 2nd Edition, Oxford University Press, New York, 2010.
- 3. Gupta M C, *Statistical Thermodynamics*, 2nd Edition, New Age International Publishers, Chennai, 1998.
- 4. McQuarrie D A, *Statistical Thermodynamics*, 1st Indian Edition, Viva Books Private Ltd., New Delhi, 2003.

Web resources





Organometallic Chemistry

Applications

Semester		Cou	irse C	ode			Tit	le of th	e Cou	rse	Hours	Credits
IV 21PCH4ES04A							DSE-4:SELECTED TOPICS IN INORGANIC AND PHYSICAL CHEMISTRY- I					4
Course Outcomes	Pro	ogran	nme () (PO)	Outcor	nes	Pro	ogram	me Spe (PS		utcomes		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		Scores of Os
CO-1	3	3	2	2	2	3	3	2	2	2	2	2.4
CO-2	3	2	2	2	1	3	2	2	2	1	2	2.0
CO-3	2	2	2	2	2	2	2	2	2	2	2	2.0
CO-4	2	2	2	2	3	2	2	2	2	3	2	2.2
CO-5	2	3	2	2	2	2	3	2	2	2	2	2.2
	CO-5 Z S Z Z S Z Z Mean Overall Score											.16 dium)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PCH4ES04B	DSE-4:	5	4
1 V	211 СП4Е504D	SELECTED TOPICS IN CHEMISTRY	5	4

	CO-Statements	Cognitive
CO. No.	On successful completion of this course, students will be able to	Levels (K- Level)
CO-1	know the different types of measurements and instrumentation	K1
CO-2	understand the importance of operational amplifiers	K2
CO-3	understand the basics of non- equilibrium thermodynamics	K2
CO-4	apply the concepts of non-equilibrium thermodynamics	K3
CO-5	explain the basics of digital electronics	K4

Unit-I Measurement and Instrumentation

Introduction - the nature of a measurement - choice of a method of measurement - control of variables - basic design patterns - general properties of modules - propagation of uncertainty - single channel design- limit of detection and amplification - automatic operation and computer control

Unit-II Operational Amplifiers

The operational amplifier - limitations on amplifier performance -mathematical operations - differentiation - integration - measurement of current and voltage - precise control of current and voltage

Unit-III Digital Electronics

Binary logic concepts - logic gates - multivibrators - counters - wave shaping - analog to digital converters - instruments and digital computers

Unit-IV Non-equilibrium Thermodynamics-I

Introduction to non-equilibrium thermodynamics - methods of study of non-equilibrium thermodynamics - mass conversion de-Donder equation - energy conservation - entropy production in systems involving heat transfer - entropy production in chemical reactions - affinity and equilibrium constant - affinity and Gibbs free energy - affinity and rate derivations - coupled and non-coupled reaction systems - entropy production and entropy flow in open system - Onsager theory -phenomenological relations - an introduction - characteristics of direct and cross coefficients - rate expression using Onsager equation - kinetic approach - thermodynamic approach - derivation of Onsager reciprocity relation using a cyclic coupled reaction (Proof of L12 = L21).

Unit-V Non-equilibrium Thermodynamics-II

Linear law - condition for coupled and non-coupled reactions with reference to cross coefficients - decomposition of cyclohexane and linear law - non coupled reaction - isomerization of xylene - coupled reaction - reaction taking place in liver - experimental verification of Onsager's reciprocity relation - thermoelectricity - Seebeck effect - Peltier effect - electro kinetic effect - thermo molecular pressure difference - L12 = L21 by transference number method - irreversible thermodynamics and biological systems.

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

Books for Study

- Strobel H A, Chemical Instrumentation: A systematic Approach, 2nd Edition, Addision Wesley Publishing Company, London, 1973 Unit I Chapter 1 Unit II Chapter 7 Unit III Chapter 9
- Kuriakose J C and Rajaram J C, *Thermodynamics*, Shoban Lal Co., Jalandar, 1999.
 Unit IV and V Chapter Appendix A & B

Books for Reference

- 1. Skoog D A, Holler J F and Crouch S R, *Principles of Instrumental Analysis*, 7th Edition, Boston, 2018.
- 2. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002-3098, USA, 2014.
- Gupta M C, *Statistical Thermodynamics*, 2nd Edition, New Age International Publishers, Chennai, 1998.
- 4. McQuarrie D A, *Statistical Thermodynamics*, 1st Indian Edition, Viva Books Private Ltd., New Delhi, 2003.

Web Resources



Chemical Process Instrumentation

Semester	Cou	rse coo	le		Tit	tle of th	e Cour	se		Hours	Credits
IV	21PC	DSE-4: PCH4ES04B SELECTED TOPICS IN CHEMISTRY							5	4	
Course	Pr	ogram	me Oı	utcom	es	Prog	ramme	Specif	ic Out	comes	Mean
Outcomes		((POs)					(PSOs)			Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	3	3	2	2	1	3	2	3	2	1	2.2
CO-2	3	2	2	2	2	3	2	2	3	2	2.2
CO-3	2	2	2	2	1	2	2	2	2	1	1.8
CO-4	3	3	2	2	2	2	3	3	2	2	2.4
CO-5	2	3	2	2	2	2	2	3	2	2	2.2
	Mean overall Score										

Research: Definition - search for knowledge - role of theory-research hypothesis and null
hypothesis - populations and sampling - purposes of research - types of educational research:
fundamental research - applied research - action research - descriptive research, assessment,
and evaluation.

discover synthetic skills in carrying out research problem.

design new research problems and carry out systematically.

Unit-II Problem identification and Research Design

Course Code

21PCH4PW01

Semester

IV

CO. No.

CO-1

CO-2

CO-3

CO-4

CO-5

Scientific research problem: Definition, objectives, purposes and components of research problem-ethics in research.

Title of the Course

PROJECT WORK

AND VIVA VOCE

CO-Statement

identify current chemical literature and other search engines

appraise scientific writing and presentation skill for preparing

On successful completion of this course, students will be able to

relate and understand the basic aspects of research.

Unit-III Chemical Literature Survey

judiciously.

project reports.

Introduction to the chemical literature-non-patent primary literature: communications, articles, reviews, conference papers, reports, abstracts and preprints-chemical patents. Searching using text: beyond web search engines-searching by structure and substructure.

Unit-IV Project Work-Lab

Identification of research problem - collection of materials -preliminary analysis - finalizing the methodology - execution of the research work - collection of data and evidences finalizing the results.

Unit-V Compilation of Report

Scientific Writing and Effective Presentation: Requirement of scientific communications: eliminating wordiness and jargon-tautology, redundancy, imprecise words, superfluous phrases - style of writing-footnotes and end notes- referencing stylesbibliography-journal abbreviations (CAS source index) -abbreviations used in scientific writing-Effective presentation: slide presentation and poster presentation- Report preparation:

76

Unit-I Introduction and Fundamentals of Research

(5 hours)

(70 hours)

(5 hours)

(5 hours)

(5 hours)

Hours 6

5 Cognitive

Credits

Level

(K - level) K1 & K2

K3

K4

K5

K6

Format of the Research Report

- I. Title Page
 - Title
 - Author's name and institutional affiliation
 - Running head

II. Introduction (no heading)

- Statement of the problem
- Background/review of literature
- Purpose and rationale/hypothesis
- III. Method
 - 1.Apparatus or instrumentation
 - 2. Procedure
- IV. Results
 - Tables and figures, as appropriate (these follow the author note)
 - Statistical/ analytical presentation
- V. Discussion
 - 1.Support or nonsupport of hypotheses
 - 2. Practical and theoretical implications
 - 3. Summary and Conclusions

VII. References

VIII. Appendix (if appropriate)

Books for Study

- 1. Best J W, Kahn J V, *Research in Education*, 10th Edition. Pearson Education Inc. 2006, USA.
 - Unit I Chapters 1Unit II Chapters 2Unit V Chapter 3
- Currano, J and Roth, D (editors), Chemical Information for Chemists: A Primer, Royal Society of Chemistry, 2013. Unit III Chapters 1-5
- 3. Coghill, A M and Garson, L R (editors), *The ACS Style Guide: Effective Communication of Scientific Information*; 3rd Edition, American Chemical Society: Washington, DC, Oxford University Press, NY, 2006. **Unit V** Style guide

Books for Reference

- 1. Dominoswki, R L, *Research Methods*, Prentice Hall, 1981.
- 2. Ebel, H F, Bliefert, C and Russey, W E, *The Art of Scientific Writing*, VCH, Weinheim, 1988.
- 3. Dawson, C, Introduction to Research Methods: A practical guide for anyone undertaking a research project 5th Edition, Robinson, 2019.

Web Resources



Guide to Web Resources

Semester	Co	urse co	ode		Title of the Course					urs	Credits
IV	21P	CH4P	W01			ECT W VIVA V	ORK A OCE	ND		5	5
Course Outcomes	Prog	ramm	e Outc	omes (es (POs) Programme Specific Outcomes (PSOs)						Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	2	2	3	3	3	2	2	2	2.5
CO-2	2	2	2	2	3	2	3	2	2	3	2.3
CO-3	3	2	2	2	3	3	3	2	2	3	2.5
CO-4	2	3	2	2	3	2	3	2	2	3	2.3
CO-5	3	3	2	3	3	3	3	2	3	3	2.8
Mean overall Score									2.48 (High)		

Scheme of Evaluation

Scheme of Evaluation	1
Internal examination	100 marks
Review of literature	15 marks
Experimental work	30 marks
Manuscript preparation	30 marks
Common viva- voce examination	25 marks
External examination	100 marks
External examiner	(75 marks)
Review of literature	10 marks
Experimental work	20 marks
Manuscript preparation	20 marks
Viva voce examination	25 marks
Internal examiner	(25 marks)
Viva voce examination	25 marks

Semester	Course code	Title of the course	Hours	Credits
IV	21PCH4CE01	COMPREHENSIVE EXAMINATION	-	2

CO. No.	CO-Statements On successful completion of the course, students will be able to	Cognitive Levels (K-Level)
CO-1	recall and understand the concepts of inorganic chemistry	K1 & K2
CO-2	apply various rules and theories of physical chemistry	К3
CO-3	solve the different spectroscopic problems	K4
CO-4	revise the various aspects of inorganic chemistry	К5
CO-5	predict the reactions and mechanisms in the organic synthesis	K6

Unit-I Inorganic Chemistry 1

Transition elements, inner transition elements, ionic bonding, covalent bonding, periodicity and the chemistry of halogens and noble gases, inorganic chains, rings, cages and clusters theories of coordination chemistry, basics of organometallics.

Unit-II Inorganic Chemistry 2

Reaction kinetics in coordination chemistry, types of magnetic behavior, temperature independent paramagnetism, electronic spectra of complexes - error analysis, spinels and anti-spinels, elements of crystallography, crystal structure and properties, bio-inorganic chemistry, blue copper proteins.

Unit-III Physical Chemistry

Laws of thermodynamics - I and II law, Joule Thomson effect - thermo chemistry - Kirchhoff's equation - III law of thermodynamics, radiation chemistry, surface chemistry and heterogeneous catalysis, surface chemistry and heterogeneous catalysis rudiments and applications of group theory, EMF measurements.

Unit -IV Organic Chemistry

Stereochemistry and conformational analysis, molecular rearrangements and name reactions of organic compounds, oxidation and reduction reactions of various organic compounds. covalent bonding & aromaticity, reaction intermediates & methods of determining mechanisms. retrosynthetic analysis, pericyclic reactions - photochemistry- regioselective and diastereoselective reactions, asymmetric synthesis, organometallics in organic synthesis, electroanalytical techniques

Unit V Spectroscopy

Organic Spectroscopy: UV-visible spectroscopy, IR spectroscopy, PMR spectroscopy, ESR spectroscopy, mass spectrometry

Inorganic Spectroscopy: rotational, vibrational, Raman, NMR, Mossbauer ESR and electronic spectroscopy.

Book for Reference

- 1. Cotton F A and Wilkinson G, *Inorganic Chemistry A Comprehensive Text*, 3rd edition, Interscience Publishers, New York, 1972.
- 2. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry* 6th edition, W H Freeman and Company, New York,2014.
- 3. Housecroft C E and Sharpe A G, *Inorganic Chemistry* 4th edition, Pearson Education Limited, Essex, 2012.
- 4. Ebsworth EAV, *Structural Methods in Inorganic Chemistry*, 3rd edition, Great Britain, ELBS, 1987.
- 5. March J, Advanced Organic Chemistry, 4th edition, John-Wiley and Sons, New York, 1992.
- 6. Kemp W, *Organic Spectroscopy*, 3rd edition, ELBS, London, 1987.
- 7. Jonathan Clayden, Nick Greeves, and Stuart Warren, *Organic Chemistry*, 2nd Edition, Oxford University Press, New York, 2012.
- 8. Final I L, *Organic Chemistry* Volume I and II, Sixth Edition, ELBS with Longmann, Singapore(1997)
- 9. Laidler K J, *Chemical Kinetics*, 3rd Edition, New Delhi TATA McGraw Hill Co., 1984.
- 10. Drago R S, *Physical Methods in Inorganic Chemistry*, New Delhi, East West Press Ltd, 1971.

Web Resources



EMF-Measurements

Semeste	er	Cou	rse cod	e	Ti	tle of th	e Cours	se	Hours	/Week	Credits
IV		21PC	H4CE	01	COMPREHENSIVE EXAMS				-		2
Course	Prog	gramm	e Outc	omes	(PO)	Prog	gramme	e Specifi (PSO)	c Outco	mes	
Outcomes (COs)	s					Mean Scores of COs					
CO-1	3	3	2	2	3	3	2	3	2	1	2.3
CO-2	3	2	2	2	1	3	2	3	2	1	2.1
CO-3	2	3	2	2	2	2	2	3	2	3	2.2
CO-4	3	2	2	2	2	2	2	2	2	2	2.1
CO-5	3	3	2	2	2	2	3	3	2	2	2.4
								Mean	Overall	Score	2.2 (High)

M. Sc. CHEMISTRY SYLLABUS - 2018

SCHOOL OF EXCELLENCE with CHOICE BASED CREDIT SYSTEM (CBCS)



SCHOOL OF PHYSICAL SCIENCES St. JOSEPH'S COLLEGE (Autonomous)

Special Heritage Status Awarded by UGC Accredited at 'A' Grade (3rd cycle) by NAAC College with Potential for Excellence Conferred by UGC DBT-STAR & DST-FIST Sponsored College **TIRUCHIRAPPALLI - 620 002, INDIA**

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POSTGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014-15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows the enhanced academic mobility and enriched employability of the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives.

- Optimal utilization of resources both human and material for the academic flexibility leading to excellence.
- Students experience or enjoy their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) a uniqueness of the choice-based credit system.
- Human excellence in specialized areas
- Thrust in internship and / or projects as a lead towards research and
- The multi-discipline nature of the newly evolved structure (School System) caters to the needs of stake-holders, especially the employers.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally, one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of 110 credits as mentioned in the table below. The total number of minimum courses offered by a department are given in the course pattern.

POSTGRADUATE COURSE PATTERN (June 2018 onwards)

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
	I-IV	Core Courses		84	68	
		Theory	12-14			
		Practical	3-6			
1	Π	Self-Paced Learning	1	-	2	81
1	Ш	Interdisciplinary Core	1	6	5	81
	IV	Comprehensive Examination	1	-	2	
		Project Work	1	6	4	
2	I-III	Core Electives	3	12	12	12
	II	IDC (Soft Skills)	1	4	4	
3	Ш	IDC (WS)	1	4	4	12
		IDC (BS)	1	4	4	
4	I	Extra Credit Courses-1 (MOOC)	1	-	(2)	
4	III	Extra Credit Courses-2 (MOOC)	1	-	(2)	(4)
5	IV	Outreach Programme (SHEPHERD)	1	-	5	5
		TOTAL		120		110 (+4 extra credits

Note: IDC: Inter-Departmental Courses, BS: Between School, WS: Within School

However, there could be some flexibility because of practical, field visits, tutorials and nature of project work. For PG courses, a student must earn a minimum of 110 credits. The total number of courses offered by a department is given above.

Course Pattern

The Post-Graduate degree course consists of five vital components. They are core course, core electives, IDCs, Extra credit courses, and the Outreach Programme.

Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practicals, Inter disciplinary core, self paced learning, comprehensive examination, Project work, field visits, library record and etc.

Inter-disciplinary Core

Inter-disciplinary Core should be shared by the various Departments of every School. This course should be opted by all the students belonging to the particular school. Each department of the respective school should allocate themselves the schedule and the units of the course.

Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are three core electives. They are offered in different semesters according to the choice of the school.

Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL etc.

Inter-Departmental Courses (IDC)

IDC is an interdepartmental course offered by a department / School for the students belonging to other departments / school. The objective is to provide mobility and flexibility outside the parent department / School. This is introduced to make every course multi-disciplinary in nature. It is to be chosen from a list of courses offered by various departments.

There are three IDCs. Among three, one is the Soft-Skill course offered by the JASS in the II Semester for the students of all the Departments. The other one is offered "With-in the school" (WS) and the third one is offered "Between the school" (BS). The IDCs are of application oriented and inter disciplinary in nature.

Subject Code Fixation

The following code system (9 characters) is adopted for Post Graduate courses:

Year of	PG Code of	Semester	Specification	Running number
Revision	the Dept		ofPart	in the part
\downarrow	\downarrow	\downarrow	\downarrow	\downarrow
18	P ##	x	x	xx
18	РСН	1	1	01

For Example :

I MSc - Chemistry, first semester 'Inorganic Chemistry-I' The code of the paper is 18PCH1101.

Thus, the subject code is fixed for other subjects.

Specification of the Part

- I Core Courses: (Theory, Practical, Self paced Learning, Inter-disciplinary Core, Core, Comprehensive Examination, Project work)
- II Core Electives
- III Inter Departmental Courses (WS, Soft Skill & BS)
- IV Extra credit courses
- V Outreach Programme (Shepherd)

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distributi	on of CIA Marks
Passing Minin	num: 50 Marks
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
CIA	100

Mid-Semster & End-Semester Tests

Centralised - Conducted by the office of Controller of Examinations

- 1. Mid-Semester Test & End-Semester Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A; PART-B; and PART-C
- 2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
- 3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
- 4. The 10 marks of PART-A of Mid-Semester and End-Semester Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS; TRUE/ FALSE; and FILL-IN BLANKS.
- 5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.
- 6. English Composition once a fortnight will form one of the components for UG General English

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: Objective MCQs only (30 Marks)

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected

Part-B & C: Descriptive (70 Marks)

Part-B: $5 \times 5 = 25$ marks; inbuilt choice; **Part-C:** $3 \times 15 = 45$ marks; 3 out of 5 questions, open choice.

The Accounts Paper of Commerce will have

Part-A: Objective = 25 marks

Part-B: 25 x 3 = 75 marks

Duration of Examination must be rational; proportional to teaching hours 90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

GRADING SYSTEM

1. Grading

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in the following Table-1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by Semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) respectively. These two are calculated by the following formulae:

$$\mathbf{GPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \quad \mathbf{WAM} \text{ (Weighted Averag Marks)} = \quad \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

where,

'C_i' is the Credit earned for the Course-i,

'G' is the Grade Point obtained by the student for the Course 'i',

'M' is the marks obtained for the course 'i', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

2. Classification of Final Results

- i) The classification of final results shall be based on the CGPA, as indicated in the following Table-2.
- ii) For the purpose of Classification of Final Results, the candidates who earn the CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 and 8.99, 7.00 and 7.99, 6.00 and 6.99, and 5.00 and 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good', and 'Above Average' respectively.
- iii) Absence from an examination shall not be taken as an attempt.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	О
80 and above but below 90	9	A+
70 and above but below 80	8	А
60 and above but below 70	7	B+
50 and above but below 60	6	В
Below 50	NA	RA

Table-2: Final Result

CGPA	Classification of Final Results	Corresponding Grade
9.00 and above	О	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	А	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	В	Above Average
Below 5.00	RA	Re-appearance

Credit based weighted Mark System is to be adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

A Pass in Outreach Programme (SHEPHERD) will continue to be mandatory although the marks will not count for the calculation of the CGPA.

Declaration of Result:

Mr./Ms.	has successfully completed the Post Graduate
in	programme. The candidate's Cumulative Grade Point
Average (CGPA) is	and the class secured
by completing the min	mum of 110 credits.
The candidate has also	acquired (if any) extra credits offered
by the parent departm	ent courses.

M. Sc. Chemistry

Course Pattern - 2018 Set

Sem	Code	Courses	Hours	Credits
	18PCH1101	Inorganic Chemistry-I	6	5
	18PCH1102	Organic Chemistry-I	6	5
	18PCH1103	Physical Chemistry-I	6	5
	18PCH1104	Lab Course: Organic Chemistry-I	4	3
_	18PCH1105	Lab Course: Physical Chemistry Practical-I	4	3
Ι	18PCH 1301	IDC-I (WS): Industrial Products	4	4
	18PCH1401	Extra credit course-I (MOOC)	-	(2)
		Total for Semester-I	30	25+(2)
	18PCH2106	Inorganic Chemistry-II	6	5
	18PCH2107	Organic Chemistry-II	6	5
	18PCH2108	Physical Chemistry-II	6	5
тт	18PCH2109	Lab Course: Organic Chemistry Practical-II	4	3
п	18PCH2110	Lab Course: Physical Chemistry Practical-II	4	3
	18PCH2111	Self- Paced Learning:	-	2
		Selected Topics in Physical Chemistry		
	18PSS2301	IDC-II: Soft-Skills	4	4
		Total for Semester-II	30	27
	18PCH3112	Inorganic Chemistry-III	6	5
	18PCH3113	Organic Chemistry-III	6	5
	18SPS3101A	Interdisciplinary Core: Spectroscopy and Statistical Thermodynamics		
	18SPS3101B	Interdisciplinary Core: Spectroscopy **	6	5
	18SPS3101C	Interdisciplinary Core:		_
Ш		Sensors and Transducers		
	18PCH3201A	Core Elective-IA: Analytical Chemistry	4	4
	18PCH3201B	Core Elective-IB: Chemical Instrumentation	(4)	(4)
	18PCH3202A	Core Elective IIA:		()
		Lab Course: Inorganic Chemistry-I	4	4
	18PCH3202B	Core Elective-IIB:		
		Characterization of Coordination Complexes	(4)	(4)
	18PCH3302	IDC-III (BS): Health Chemistry	4	4
	18PCH3402	Extra credit course-II (MOOC)	-	(2)
		Total for Semester -III	30	27+(2)
	18PCH4114	Inorganic Chemistry-IV	4	4
	18PCH4115	Organic Chemistry-IV	4	4
	18PCH4116	Physical Chemistry-III	4	4
	18PCH4117	Lab Course: Inorganic Chemistry-II	4	3
	18PCH4203A	Core Elective-IIIA: Natural Products	4	4
IV	18PCH4203B	Core Elective-IIIB: Pharmaceutical Chemistry	(4)	(4)
	18PCH4118	Comprehensive Examination	-	2
	18PCH4119	Project Work	10	5
		Total for Semester -IV	30	26
	18PCW4501	Outreach Programme (SHEPHERD)	-	5
		Total Hours & Credits (HV)	120	110+(4

Programme Outcomes (POs):

- 1. Graduates are prepared to be creators of new knowledge leading to innovation and **entrepreneurship employable** in various sectors such as private, government, and research organizations.
- 2. Graduates are trained to evolve new technologies in their own discipline.
- 3. Graduates are groomed to engage in lifelong learning process by exploring their knowledge independently.
- 4. Graduates are framed to design and conduct experiments /demos/create models to analyze and interpret data.
- 5. Graduates ought to have the ability of effectively communicating the findings of Physical sciences; incorporating with existing knowledge.

Programme Specific Outcomes (PSOs):

- 1. Human and Social Values and Responsibilities in the context of learning Chemistry
- 2. Communicative Skills and the Creative scientific mind towards learning chemistry
- 3. Positive approach towards Environment and Ecology from the Chemistry perspective
- 4. Critical thinking and the Analytical mind, students develop for the in depth knowledge in advanced-level Chemistry
- 5. The relevance of extension of Chemistry in the social context for solving social issues
- 6. Employability Skills shall enable the students to find jobs in corechemistry and other related fields
- 7. Entrepreneurial Skills shall empower the students to start their own industries / business in core-chemistry fields
- 8. Analytical or Experimental Skills make the students capable of doing higher-level research works in the emerging fields of chemistry.

Semester I	
18PCH1101	

Hours/Week: 6 Credits : 5

INORGANIC CHEMISTRY-I

Course Outcomes:

- 1. The chemistry of transition and inner transition elements are learnt
- 2. Important compounds of transition metals and their applications are learnt
- 3. The fundamentals and instrumentation of nuclear chemistry are learnt
- 4. The applications of nuclear chemistry in theoretical and analytical fields are learnt
- 5. Concept of nuclear energy is understood
- 6. Importance and need of nuclear energy to the expanding human society is understood
- 7. Disposal techniques of nuclear wastes and safety in working with nuclear energy are understood
- 8. Various atomic power projects in India are learnt

Unit I: Transition Elements (18 hr)

Transition elements – General characteristics – atomic, ionic radii – variation along the period and group – variable valency, colour, magnetic properties, non-stoichiometry, catalytic property, formation of alloys, complexing tendency – Stabilization of unusual oxidation states.

Unit II: Inner Transition Elements (18 hr)

Inner transition elements – position in the periodic table – electronic configuration, oxidation states, solubility, colour and spectra, magnetic properties – Separation of lanthanides – lanthanide contraction: Causes and consequences – Gadolinium break, shift reagents – Extraction of thorium and uranium. Comparison of actinides and lanthanides

Unit III: (18 hr)

Selected Compounds of *d*-block Selected Compounds of *d*-block elements (Structure only): Chromium (II) acetate, Manganese (III) acetate, Manganese (III) oxalate, $[\text{Re}_2\text{Cl}_8]^2$ >, $[\text{Nb}_6\text{Cl}_{12}]^{2+}$, $[\text{Mo}_6\text{Br}_8]^{4+}$, Prussian Blue, Turnbull's Blue, $[\text{Ni}(\text{DMG})_2]$, [Zn(EDTA)]

Fundamentals of Nuclear Chemistry The nucleus – subatomic particles and their properties - nuclear binding energy – nuclear structure – Liquid drop model and nuclear shell model – n/p ratio - nuclear forces - Modes of radioactive decay – alpha, beta and gamma decay – orbital electron capture – nuclear isomerism – internal conversion

Unit IV: Instrumental Techniques in Nuclear Chemistry [ONLINE] (18 hr)

Q value of nuclear reaction, Coloumbic barrier, nuclear cross section, threshold energy and excitation function – Different types of nuclear reactions fragmentation, nuclear fission, nuclear fusion – proportional counter, Geiger-Muller counter, scintillation counter and Cherankov counter. Linear accelerators – cyclotron, synchrotron

Unit V: Applications of Fission, Fusion and Trace Elements (18 hr)

Characteristics of fission reactions – product distribution, theories of fission – fissile and fertile isotopes – nuclear fusion and stellar energy– Nuclear wastes – nuclear reprocessing – radiation hazards and prevention. Applications of isotopes – neutron activation analysis – isotopic dilution analysis – Uses of tracers in structural and mechanistic studies, agriculture, medicine and industry – Radio carbon dating - hot atom chemistry – Atomic Power Projects in India.

Textbooks

- 1. Huheey J E, Keiter E A and Keiter R L, *Inorganic Chemistry Principles* of *Structure and Reactivity*, 4th Ed., Harper Collins College Publishers, New York, 1993.
- 2. Glasstone S, *Source Book on Atomic Energy*, Affiliated East West Press Pvt. Ltd. New Delhi, 1967.

References

- 1. Cotton F A and Wilkinson G, *Inorganic Chemistry A Comprehensive Text*, 3rd Ed., Interscience Publishers, New York, 1972.
- 2. Purcell K F and Kotz J C, *Inorganic Chemistry*, W B Saunders Company, Philadelphia, 1977.
- 3. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Ed., W H Freeman and Company, New York, 2014.
- 4. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Ed., Pearson Education, Inc., New York, 2014.
- 5. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Ed., Pearson Education Limited, Essex, 2012.
- 6. Lee J D, Concise Inorganic Chemistry, 6th Ed., ELBS, London, 1998.
- Friedlander G, Macias E S, Kennedy J W and Miller J M, *Nuclear and Radiochemistry*, 3rd Ed., John Wiley and Sons Inc., London, 1981.
- 8. Arniker H J, *Essentials of Nuclear Chemistry*, New Age International Publishers, New Delhi, 2005.
- Choppin G, Liljenzin J, Rydberg J and Ekberg C, Radiochemistry and Nuclear Chemistry, 4th Ed., Elsevier, Amsterdam, 2013.

Credits 5	Mean Score of	COS	3.54	3.69	3.92	3.60	4.31	4.08	4.00	4.08	3.90
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		PSO8	4	5	S	4	4	3	5	3	COs.
	74	PSO7	5	4	n	5	5	4	3	5	Overall Mean Score for COs
ŀ	utcomes	PSO6	4	4	n	4	4	5	3	3	Mean S
Title of the Paper INORGANIC CHEMISTRY-I	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	2	2	4	4	3	5	5	4	Veral
Title of the Paper ANIC CHEMIS	nme Spo (PS	PSO4	3	4	3	3	5	5	3	5	
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Semester I	Course Outcomes	(COs)	C01	C02	C03	C04	CO5	C06	C07	C08	

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Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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Total of Mean Scores Total No. of COs

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Total No. of POs & PSOs

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Mean Score of COs

Semester I 18PCH1102

Hours/Week: 6 Credits : 5

ORGANIC CHEMISTRY-I

Course Outcomes:

- 1. Students learn bonding in organic molecules and the structural implications on properties
- 2. Students get learnt the concept of aromatic character in some molecules
- 3. Students understand the importance of stereochemical aspects of structure and properties
- 4. Students get to know the chemical reactions and the mechanisms via different intermediates
- 5. Students learn the techniques of studying the mechanisms of reactions
- 6. Students understand the nucleophilic substitution reactions shown by organic molecuels
- 7. Students get to know the mechanistic pathways of those nucleophilic substitution reactions
- 8. Students understand the structural and stereochemical implications on nucloephilic substitution reactions

Unit I: Covalent Bonding and Aromaticity (18 Hours)

Hybridization with reference to carbon compounds - shapes of simple organic molecules - bond angle and bond length in organic molecules electronegativity of atoms and groups - dipole moments of molecules applications of dipole moment to study the properties of organic molecules - polarity of solvents - hydrogen bonding - inter and intramolecular hydrogen bonding. Electronic Effects - inductive, resonance and hyperconjucative effects and their influence - rules of resonance - tautomerism - steric effects. Aromatic character: Huckel's theory of aromaticity: three-, four-, five-, six-, seven-, and eight-membered rings - other systems with aromatic sextet concept of homo-aromaticity and anti-aromaticity - Craig's rule and its applications. Consequences of aromaticity – non-alteration in bond length - Resonance energy from heat of hydrogenation, heat of combustion and Huckel's MO calculation. Electron occupancy in MO's and aromaticity -NMR concept of aromaticity and antiaromaticity - diatropic and paratropic compounds

Unit II: Stereochemistry and Conformational Analysis (18 Hours)

Stereoisomerism - principles of symmetry - enantiomers and diastereomers -R, S and E, Z and erythro, three nomenclature – optical activity and chirality – types of molecules exhibiting optical activity – absolute configuration – chirality in molecules with non carbonstereocenters (N, S and P) – molecules with more than one chiral centre. Stereochemistry of molecules with axial chirality – biphenyls, allenes, spiranes and analogues - concept of atropisomerism - Helicity and chirality - Topocity and prostereoisomerism - topocity of ligands and faces - enantiotopic ligands and faces - diastereotopic ligands and faces - Resolution – methods of Resolution. Conformations of mono and disubstituted three-, four-, five-and six- membered ring systems and their optical activity - conformations of decalin. Quantitative correlation between conformation and reactivity - Winstein-Eliel equation and Curtin-Hammett principle.

Unit III: Reaction Intermediates & Methods of Determining Mechanisms (18 Hours)

Structure, stability, generation and reactions of carbocations (classical and non-classical), carbanions, carbenes, nitrenes and free-radicals.

Non-kinetic methods - product analysis and its importance - intermediates and transition states-trapping, testing and detection of intermediates - crossover experiments - isotopic labeling - stereochemical studies.

Kinetic methods: isotope effects - primary, secondary and solvent isotope effect -correlation analysis-linear free energy relationships -Hammett equation-significances of \acute{o} and \tilde{n} - Applications of Hammett equation - Taft equation and its applications.

Unit IV: Nucleophilic Substitutions in Aliphatic and Aromatic Substrates (18 hours)

Aliphatic nucleophilic substitution: $S_N 1$ and $S_N 2$ mechanisms - effect of substrate structure, leaving group, attacking nucleophile and solvent polarity - neighboring group participation - substitution at vinylic and allylic carbons and reactivity - ambient nucleophiles and substrates - hydrolysis of esters - mechanisms - phase transfer catalysis - crown ethers.

Aromatic nucleophilic substitution: S_NAr mechanism- S_N1 (Aromatic) mechanism with evidences - Benzyne mechanism - effect of substrate structure, leaving group, attacking nucleophile and solvent.

Unit V: Selected Topics in Organic Chemistry I (Online) (18 Hours)

Bonding weaker than Hydrogen Bonding - Addition Compounds- Acids and Bases – HSAB Theory. Aromaticity in azulenes, tropones, annulenes, sydnones and fullerenes - alternant and non-alternant hydrocarbons. *Selected reactions of Aliphatic Nucleophilic Substitutions with mechanism*:

Von-Braun, Dieckmann, and Williamson ether synthesis.

Selected reactions of Aromatic Nucleophilic Substitutions with mechanism: Von Richter, Sommelet-Hauser and Smiles rearrangements.

Textbooks

- 1. Clayden J, Greeves N, Warren S and Wothers P, *Organic Chemistry*, Oxford University Press, New York, 2006.
- 2. Stanley H, Pine S H, *Organic Chemistry*, 5th Ed., Tata -Mcgraw Hill, New Delhi, 2006.
- 3. Smith M B, and March J, March's *Advanced Organic Chemistry*, 6th Ed., John-Wiley and Sons, New York, 2007.

References

- 1. Cahn R S, and Derner O C, *Introduction to Chemical Nomenclature*, Butterworth, London, 1968.
- 2. Sykes P, *Guide Book to Mechanism in Organic Chemistry*, 6th Ed., ELBS with Longmann, 1997.
- 3. Eliel E L, *Stereochemistry of Carbon Compounds*, Tata-McGraw Hill Publishing Company, New Delhi, 1998.
- 4. Finar I L, *Organic Chemistry Volume* 2, 6th Ed., ELBS with Longmann, Singapore 1997.
- 5. Nasipuri D, *Stereochemistry of Carbon Compounds*, 2nd Ed., New-Age International Publishers, New Delhi, 1996.

				E	Title of the Paper	he Pape	*				Hours	Credits
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Programme Outcomes (POs)	mes				Progran	nme.Sp (PS	Programme Specific Outcomes (PSOs)	utcome			Mean	Mean Score of
	P04	P05	PSO1	PSO2	PSO3	PS04	PS05	PSO6	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	PSO8		COS
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4		5	2	1	ю	ю	4	3	4	5		3.15
4		5	2	2	4	4	4	4	3	5		3.38
4		5	2	1	4	4	4	3	3	5		3.23
4		5	2	2	3	4	4	3	4	5		3.31
4		5	2	2	3	4	4	3	3	5		3.23
		8					llerov	Moon S	Overall Mean Score for COs	ŰŰ.		3.26

Snecific Outcomes Img. Proo pu 2 Outcome for Matrix 2 Relationshi

Result: The Score for this Course is 3.26 (High Relationship)

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Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling: Total of Values Total No.of POs& PSOs

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Mean Overall Score for COs =

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Mean Score of COs

Semester I 18PCH1103

Hours/Week: 6 Credits: 5

PHYSICAL CHEMISTRY-I

Course Outcomes:

- 1. Students learn and understand the theories of reaction rates
- 2. Students learn the concept of potential energy contour plots
- 3. The concepts and applications of reaction kinetic chemistry are understood
- 4. Acid-base and enzyme catalysis concepts are learnt
- 5. Students learn and understand the concepts of surface catalysis
- 6. The theory of strong electrolytes and its applications is learnt
- 7. Students learn and understand the concepts of electrical double layer
- 8. The concepts of polarization and derivation of Butler -Volmer equation is learnt

Unit I: Theories of reaction rate (18 Hours)

Theories of reaction rates and reaction mechanism - Arrhenius equation -Potential energy surfaces and reaction coordinates - Collision theory - ARRT (thermodynamic treatment only) - Application of ARRT to unimolecular, bimolecular and termolecular reactions - Kinetic isotope effect, isokinetic relation and temperature - Theories of unimolecular reactions - Lindemann and RRK - Principle of microscopic reversibility and detailed balancing.

Unit II: Application of ARRT to solution kinetics (ONLINE) (18 Hours)

Application of ARRT to solution kinetics - Factors affecting reaction rate in solution-. Internal pressure - Solvent dielectric constant - Ionic strength -Hydrostatic pressure - Ion-dipole and dipole-dipole reactions - van't Hoff equation and volume of activation - Catalysis Characterics of a catalyst -Factors affecting Catalytic reactions - Types of Catalysis - homogeneous catalysis - Acid - base catalysis - van't Hoff and Arrhenius intermediates -Mechanism - protolytic and prototropic catalysis laws - Acidity functions -Hammett - Zucker hypothesis - Catalysis in biological systems. Michaelis menten equation - Lineweaver - Burk and Eadie - Hofstee plots - Influence of substrate concentration, pH, and temperature on rate - Influence of substituent's on reaction rates - Hammett and Taft equations - Linear free energy relations.

Unit III: Surface Chemistry and Heterogeneous Catalysis (18 Hours)

Surface phenomenon - Physical and chemical adsorption - Adsorption and free energy relations at interface - Langmuir adsorption isotherm - Gibbs adsorption isotherm - BET isotherm - Measurement of surface area -Heterogeneous catalysis - Mechanism - Langmuir Hinshelwood Mechanism - Langmuir Rideal bimolecular mechanism - Role of surface in catalysis

Unit IV: Debye - Huckel Theory and its Applications (18 Hours)

Debye Huckel theory - Radius of ionic atmosphere - Calculations of thickness of ionic atmosphere - Evidences of ionic atmosphere - Asymmetry effect -Electrophoretic effect - Debye Falkenhagen effect - Wien effect - Debye -Huckel Onsager equation - Modification and verification of the equation -Debye - Huckel limiting law - Modification and verification - Finite ion size model - Huckel - Bronsted equation - Calculation of activity coefficient -Determination of ion size parameter - solubility - Solubility product of sparingly soluble salt - Common ion effect - Neutral salt effect and solubility - Determination of solubility and solubility product.

Unit V: Electrode Kinetics (18 Hours)

Theories of electrical double layer - Electric double layer at the electrode -Electrolyte interface - Helmholtz model of double layer - Law of electrical neutrality – Gouy - Chapman diffused charged model - Adsorption theory of double layer - Stern's model, Triple-layer theory- Electro capillary phenomenon - Electro capillary curves for solutions containing anions, cations and molecular substances - Electro capillary maximum – Lipmann equations and Lipmann potential - Experimental measurement and calculation of Lipmann potential - Capillary electrometer and contact angle method -Electro kinetic phenomena - Classification Electro osmosis and electrophoresis - Streaming potential and Sedimentation potential – Kinetics of electrode process - Equilibrium and non-equilibrium process -Concentration and Activation polarization - Theory of electrochemical over potential - Derivation and verification of the equations - Butler Volmer equation - Tafel equation.

Textbooks

- 1. Laidler K J, *Chemical Kinetics*, 3rd Ed., New Delhi TATA Mc Graw Hill Co. 1984.
- 2. Kuriacose and Rajaram, *Kinetics and Mechanism of Chemical Transformation*, Macmillan & Co, Delhi, 1993.
- Glasstone S, An Introduction to Electrochemistry, New Delhi, East West Press Pvt. Ltd, 1956.

References

- 1. Huges G, Radation Chemistry, Oxford series, 1973.
- Antorpov L, *Theoretical Electrochemistry*, 2nd Ed., Mir publishers, Moscow, 1977.
- 3. Bockris J O'M and Reddy A K N, *Modern Electrochemistry* Vol 1 & 2, 2nd Ed., Plenum Press, New York, 1998.

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Programme Specific Outcomes Mean 01 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8 0
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3 4 3 3 4 3 3.30
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Mean Overall Score for COs = Total of Mean Scores

Total No.of POs& PSOs

Mean Score of COs =

Total of Values

Total No. of COs

81-100%

61-80%

41-60% 3 2.1-3.0

21-40% 2 1.1-2.0 Poor

1-20%

ery High

4.1-5.0

4 3.1-4.0 High

Moderate

ery poor

0.0 - 1.0

Mapping Scale Relation Quality Values Scaling:

Semester I 18PCH1104

Hours/Week: 4 Credits : 3

Lab Course: ORGANIC CHEMISTRY-I

Course Outcomes:

- 1. Students learn the separation of binary organic mixtures
- 2. Students understand the green chemistry concepts
- 3. Students learn the skills of doing microlevel analysis
- 4. Students get to know the methods of qualitative analysis of organic compounds
- 5. Students understand the single stage preparation of organic compounds
- 6. Students learn about the derivative of the organic functional groups

1. Micro Qualitative Analysis of an organic binary mixture

- i. Pilot separation
- ii. Bulk separation
- iii. Analysis of organic compounds
- iv. Preparation of derivatives of the functional groups

2. Semi-micro Preparation of Organic compounds (single-stage and double stage)

- i. Preparation of benzoic acid from toluene
- ii. Preparation of acetanilide from aniline
- iii. Preparation of *p*-nitro aniline from acetanilide
- iv. Preparation of *p*-bromo aniline from acetanilide
- v. Preparation of methyl nitrobenzoate from methyl benzoate

References

- 1. Furniss B S, Hannaford A J, Smith P W G, and Tatchell A R, Vogel's *Textbook of Practical Organic Chemistry*, 5th Ed., Pearson publication.
- 2. Vengataswaran V *et al.*, *Basic Principle of Practical Chemistry* Sultan Chand and sons, New Delhi, 1997.
- 3. Ganapragasm and Ramamurthy, *Organic Chemistry Lab Manual*, 2nd Ed., S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2007.
- 4. Organic Chemistry Lab Manual for Micro Qualitative Analysis, Department of Chemistry, St. Joseph's College, Tiruchirappalli-620002 (Private circulation).

Semester I 18PCH1105

Hours/Week: 4 Credits : 3

Lab Course: PHYSICAL CHEMISTRY-I

Course Outcomes:

- 1. Students learn and understand the effect of ionic strength on the rate constant
- 2. Students learn the concept of Polarimeter
- 3. Students get to know concepts of kinetics of chemical reaction
- 4. Phase rule and its applications are learnt and experimented
- 5. Surface catalysis and adsorption concepts are learnt and experimented. The concept of adsorption isotherm is understood

Regular Experiments

- Neutral salt effect Kinetics of reaction between iodide and Persulphate
 Effect of ionic strength on rate constant.
- 2. Kinetics of iodination of acetone.
- 3. Kinetics of hydrolysis of ester Comparison of acid strengths.
- 4. Determination of Arrhenius parameters Hydrolysis of methyl acetate by acid.
- 5. Phase diagram of naphthalene m-dinitrobenzene system. (Simple eutectic system).
- 6. Freundlich's Adsorption Isotherm Adsorption of acetic acid by charcoal.
- 7. Phase diagram of two-component system forming a compound.

Demonstration experiments

- 1. Kinetic study under low temperature with ultracrystal circulator.
- 2. Partition coefficient Study of $KI + I_2 \rightarrow KI_3$.
- 3. Polarimetry Inversion of Cane sugar.
- 4. Phase diagram of three-component system.
- 5. Heat of solution of oxalic acid by solubility.
- 6. Heat of fusion of naphthalene.
- 7. Partial molar volume of electrolytes.

References

- 1. Venkateswaran V, Veeraswamy R, Kulandaivelu A.R., *Basic Principles* of *Practical Chemistry*, 2nd Ed., New Delhi, Sultan Chand & sons, 1997.
- 2. Daniels *et al., Experimental Physical Chemistry*, 7th Ed., New York, Mc Graw Hill, 1970.
- Findlay A, Practical Physical Chemistry, 7th Ed., London, Longman, 1959.

Semester I 18PCH1301

Hours/Week: 4 Credits : 4

IDC-I (WS): INDUSTRIAL PRODUCTS

Course Outcomes:

- 1. Students learn Industrial products like cement and glass and their manufacturing processes and their uses in day today life
- 2. Students get learnt the concept of dyes, pigments and paints and their preparation and uses
- 3. Students understand the importance of plastic and fibres and their utility
- 4. Students get to know the preparation and uses of fertilizers in the agricultural sector
- 5. Students learn the techniques of studying cosmetic and their uses
- 6. Students understand the recycling of plastic to avoid pollution

Unit-I: Cement and Glass (12 hours)

Cement - Composition, types - Portland cement - Composition, types, manufacture (Wet and Dry process), uses - Setting of cement, Glass- -Composition, Types, methods of manufacturing - Melting, Blowing, Pressing, Annealing and finishing- chemical and physical properties of glass

Unit-II: Pigments, Dyes and Paints (12 hours)

Pigments - Classification, Manufacture and uses; Dyes - Classification, preparation, Dyeing processes; Paints - Composition, Types, Manufacture and testing of Paints.

Unit-III: Fibres, Plastics and Rubber (12 hours)

Fibres – definition-difference between Natural and synthetic fibres-properties of synthetic fibres-Artificial silk, rayon, nylon and Terylene Plastics - composition, Classification, manufacture, properties and uses recycling of plastics Rubber: types of rubber-synthetic rubber- natural rubber - Vulcanizations of Rubber- properties and uses

Unit-IV: Fertilizers and Fuels (12 hours)

Fertilizers - Organic and Inorganic fertilizers, Preparation and uses, Fuels -Energy resources - Industrial gases, Water gas, Producer gas, Oil gas, natural gas, coal gas, Gobar gas, Indane gas, Petroleum products and coal products.

Unit-V: Cosmetics (12 hours)

Shampoo- composition and its preparation, lipstick -preparation, Face cream and face powder -composition and their preparation. Hair dyes – chemical and herbal dyes. Perfumes and Deodorants.

Textbooks

- Charkarabarthy B N, *Industrial Chemistry*, Oxford and IBH Publishing. Co. 1stEdition. New Delhi.
- 2. Sharma B K, *Industrial Chemistry*, Goel Publishing House, 1st Edition, Meerut.

References

1. Kirk Othmer, *Encyclopedia of Chemical Technology*, John Wiley and Sons, 1999.

Hours Credits	Mean Score of	COS	3.54	3.54	3.61	3.54	3.38	3.46	3.51
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		PSO8	5	5	S	5	S	5	r COs
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SLUI	tcomes	PSO6	e	n	4	e	4	3	Iean So
Title of the Paper IDC-1 (WS): INDUSTRIAL PRODUCTS	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	4	e	4	4	4	Overall Mean Score for COs
Title of the Paper	ime Specifi (PSOs)	PSO4	4	ю	ŝ	3	4	4	0
itle of th NDLIST	rogram	PSO3	4	3	4	e S	4	4	
T	I	PSO2	2	2	2	4	2	4	
DC-1 /		PS01	2	4	4	2	4	2	
_		P05	S	5	S	S	5	5	
	Programme Outcomes	P04	4	4	4	4	4	4	
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Code 18PCH1301	Program	P02	4	4	4	4	4	4	
181		P01	2	2	2	2	2	2	
Semester I	Course	(COs)	C01	C02	C03	C04	C05	C06	

Specific Outcomes Programme and Outcomes Programme for Course Outcomes, **Relationship Matrix**

Result: The Score for this Course is 3.51 (High Relationship)

Note:	

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	æ	4	v
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Duality	Very poor	Poor	Moderate	High	Very High

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	Valu	tes Scaling:	
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	Total No. of POs & PSOs		Total No. of COs

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Semester II 18PCH2106

Hours/Week: 6 Credits: 5

INORGANIC CHEMISTRY-II

Course Outcomes:

- 1. Concept of ionic bonding is understood
- 2. Various types of chemical forces and their effects on the physical properties of substances are learnt
- 3. Theories of covalent bonding are learnt
- 4. Methods of prediction of structures of polyatomic molecules are understood
- 5. Applications of electromotive force in inorganic chemistry are learnt
- 6. Various concepts of acids and bases and the basis of Hard-Soft-Acid-Base theory are learnt
- 7. Chemistry of non-aqueous solvents is understood
- 8. Structures and properties of inorganic chains, rings, cages and clusters are understood

Unit-I: Ionic Bonding (18 hr)

Effective nuclear charge - shielding - Slater's rule - Born-Lande equation -Born Haber cycle and its applications - Radius ratio - polarization- Fajan's rule - results of polarization. Electronegativity - determination - methods of estimating charges, electronegativity equalization - Types of chemical forces - van der Waals forces - hydrogen bonding - effects of chemical forces - melting and boiling points, solubility and hardness

Unit-II: Covalent Bonding (18 hr)

Octet rule - Valence bond theory - resonance - conditions of resonance formal charge - hybridization - Molecular orbital theory - symmetry and overlap – molecular orbitals in homonuclear diatomic molecules: O₂, B₂, N₂ and C₂ – MO treatment of hetero nuclear diatomic molecules: CO and HCl – VSEPR theory: methane, ammonia, water, PCl₃F₂ (Bent's rule), SF₄, BrF₃, TeF_5^- , $ICI_2^- >$, $ICI_4^- >$, XeF_2 , XeF_4 , XeF_6 , XeO_3 , XeO_4 , XeO_7F_2 , $XeOF_4$, phosphorus trihalides, ammonia and NX, dipole moments, OF, and COF,. Bond angle - *s*, *p* character relationship – energetics of hybridization. Unit-III: Acids and Bases [ONLINE] (18 hr)

Electrode potentials and electromotive forces - applications - Acid-base concepts: Bronsted-Lowry, Lux-Flood, Usanovich, Lewis, solvent system and generalised acid base concepts - Measures of acid-base strength steric effect and solvation effects F-strain and B-strain - Hard and soft acids and bases - acid base strength - hardness and softness - symbiosis

-Theoretical basis of hardness and softness, electronegativity and hardness and softness Types of solvents, types of reactions - autoionisation, neutralisation, precipitation, solvation, solvolysis and complex formation. Liq. NH₂, liq. SO₂, HF and H₂SO₄ as solvents - alkali metals in liq. NH₃

Unit-IV: Periodicity and the chemistry of halogens and noble gases (18 hr)

Periodicity: The use of *p*-orbitals in *pi*-bonding – $p\pi$ - $p\pi$ bonding in heavier non-metals - the use of d orbitals by non-metals - experimental evidence of $p\pi$ - $d\pi$ bonding – comparison of $p\pi$ bonding in phosphine complexes and oxides – experimental evidences for *d*-orbital contraction and participation Chemistry of halogens and noble gases: Interhalogen compounds polyhalide ions - oxyacids of heavier halogens -structure and reactivity of noble gas fluorides

Unit V: Inorganic chains, rings, cages and clusters (18 hr)

Silicate minerals - ortho-, pyro-, and meta-silicates - pyroxene, amphiboles - two-dimensional silicates - talc, mica and three dimensional aluminosilicates, feldspar, zeolites, ultramarine - Silicones-preparation, properties and uses – Iso- and hetero-polyacids – Structures of [TeMo₄O₂₄]⁶⁻ and $[Mo_7O_{24}]^{6-}$ ions and $[PMo_{12}O_{40}]^{3-}$ ion – Polymeric sulphur nitride, phosphonitrilic compounds-trimers and tetramers - homocyclic inorganic ring systems – Concept of multi-centered bond – structure of B₂H₂, B₂H₁₀, $[B_{12}H_{12}]^{2-}$, B_6H_{10} , B_8H_{12} , $B_{10}H_{14}$ – Wade's rules, *closo*, *nido*, *arachno* boranes and carboranes – The "styx" code.

Textbooks

- 1. Cotton F A and Wilkinson G, Inorganic Chemistry A Comprehensive Text, 3rd Ed., Interscience Publishers, New York, 1972.
- 2. Huheey J E, Keiter E A and Keiter R L, Inorganic Chemistry Principles of Structure and Reactivity, 4th Ed., Harper Collins College Publishers, New York, 1993.

References

- 1. Purcell K F and Kotz J C, Inorganic Chemistry, W B Saunders Company, Philadelphia, 1977.
- 2. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, Inorganic Chemistry 6th Ed., W H Freeman and Company, New York, 2014.
- 3. Miessler G L, Fischer P J and Tarr D A, Inorganic Chemistry, 5th Ed., Pearson Education, Inc., New York, 2014.
- 4. Housecroft C E and Sharpe A G, Inorganic Chemistry 4th Ed., Pearson Education Limited, Essex, 2012.
- 5. Lee J D, Concise Inorganic Chemistry, 6th Ed., ELBS, London, 1998.

INORGANIC CHEMISTRY-II 6 5 Programme Specific Outcomes Mean Score of (PSOs)
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PSO1 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8 CO8
5 5 5 3 3 5 3 3.77
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3 3 5 5 3 3 3 3 3.46
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Mean Overall Score for $COs = \frac{Total of Mean Scores}{Total of Mean Scores}$

Total No.of POs& PSOs

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Mean Score of COs

Total of Values

Total No. of COs

81-100%

61-80%

41-60% 3 2.1-3.0

21-40% 2 1.1-2.0

1-20%

4 3.1-4.0 High

Moderate

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ery poor

0.0 - 1.0

Mapping Scale Relation Quality

Values Scaling:

Very High 4.1-5.0

Semester II	Hours/Week: 6
18PCH2107	Credits : 5

ORGANIC CHEMISTRY-II

Course Outcomes:

- 1. Students learn the characteristic features of electrophilic substitutions
- 2. Students understand the different kinds of electrophilic mechanisms in both aromatic and aliphatic compounds
- 3. Students learn the addition reactions in carbon-carbon unsaturated bonds
- 4. Students get to know the addition reactions to carbon-hetero atom multiple bonds
- 5. Students have sufficient knowledge on the mechanisms of elimination reactions and their name reactions
- 6. Students have better knowledge on the synthetic uses of the different oxidants and reductants used in organic synthesis
- 7. Students get to know the classifications, mechanisms and applications of various molecular rearrangements
- 8. Students prepare and learn some selected topics by themselves through online study

Unit-I: Aliphatic & Aromatic Electrophilic Substitution Reactions (18 hr)

Aliphatic electrophilic substitution: S_E 1 and S_E 2 and S_E i mechanisms - effect of substrate structure, leaving group, attacking nucleophile and solvent polarity - selected reactions - migration of double bonds - halogenation of aldehydes and ketones - Stork-Enamine reaction - decarboxylation of aliphatic acids - Haloform reaction.

Aromatic electrophilic substitution: Arenium ion mechanism - theory of orientation and reactivity - selected reactions: Vilsmeir-Haack reaction - Jacobsen reaction - Bischler-Napieralski reaction - Pechmann reaction - Houben-Hoesch reaction.

Unit II: Addition and Elimination Reactions (18 Hours)

Addition reactions to carbon-carbon multiple bonds: addition mechanisms - electrophilic, nucleophilic and free-radical additions - cyclo addition - orientation and reactivity - selected reactions - Birch reduction of alkyne, enone and aromatic substrates - Diels-Alder reaction – Hydroboration - Michael reaction.

Addition reactions to carbon-hetero atom multiple bonds: Addition mechanisms - orientation and reactivity - selected name reactions - Acyloin ester condensation, Aldol condensation, Benzoin condensation, Darzen's

condensation, Mannich, Stobbe and Cannizaro reaction - Claisen reaction - Knovenegal reaction – Aldol condesation - Benzoin condensation. *Elimination reactions:* E1, E2 and E1_cB mechanisms-spectrum of E1, E2 and E1cB mechanisms, orientation and reactivity - Bredt's rule - selected reactions - dehydration of alcohols – dehydrohalogenation - Chugav reaction - Hofmann exhaustive methylation - Cope elimination - Shapiro reaction - Extrusion reactions.

Unit III: Oxidation and Reduction Reactions (18 Hours) Oxidations:

Weingberg scheme of redox reactions - synthetic uses of the following oxidants – DDQ, PCC, PDC, Jones reagent, chromyl chloride, MnO_2 , SeO_2 , $KMnO_4$, CrO_3 , $Pb(OAc)_4$, peracids, ozone, periodate, $KBrO_3$, Thallium nitrate, OsO_4 , RuO_4 , Lemieux-Johnson reagents - Prevost-Woodward reactions. *Reductions:* Dehydrogenating reagents - catalytic hydrogenation - synthetic uses of the following reductants - NaNH₂, Wilkinson's catalyst, NaBH₄, ('BuO)₃AlH, NaBH₃CN, R₃SnH, Me₃SiCl, alkali metals (Na, Li) Mg-Hg, hydrazine, MPV reduction, Clemmensen reduction, Wolf-Kishner reduction.

Unit-IV: Molecular Rearrangements and Name Reactions (18 Hours)

Classifications - mechanisms and applications of the following rearrangements: Baeyer-Villiger, Beckmann, Curtius, Dienone-Phenol, Favorskii, Fries, Lossen, Neber, Schmidt, Stevens, Tiffenev-Deminov ring expansion, Bamford-Stevens reaction.

Unit-V: Selected Reactions in Organic Chemistry (ONLINE) (18 Hours)

Selected reactions of aromatic electrophilic subsutitution: Nitration-Nitrosation – Sulphonation – Halogenation - Friedel Craft's reactions -Gattermann reaction - Gattermann Koch reaction - Reimer - Tiemann reaction. Selected reactions of free-radical: Hunsdiecker, Kolbe, Meerwein arylation, Hoffmann-Loffler-Fretag reaction.

Textbooks

- 1. Clayden J, Greeves N, Warren S and Wothers P, *Organic chemistry*, Oxford University Press, New York, 2006.
- 2. Stanley H and Pine S H, *Organic chemistry*, 5th Ed., Tata–McGraw Hill, New Delhi, 2006.
- 3. Smith M B, and March J, March's *Advanced Organic Chemistry*, 6th Ed., John-Wiley and Sons, New York, 2007.

icaling:	tean Overall Score for $COs = \frac{Total of Mean Scores}{Total No. of COs}$
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Relation 0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality Very poor	Poor	Moderate	High	Very High

Result: The Score for this Course is 3.27 (High Relationship) Note:

Credits 5	Mean Score of	ŝ	3.38	3.23	3.31	3.15	3.38	3.23	3.31	3.23	3.27	
Hours 6	Mean											
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r TRY-I	Specific O (PSOs)	PSO5	4	4	3	4	4	4	4	4	Overall Mean Score for COs	
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07	Programme Outcomes (POs)	P03	1	1	-				-	1		
Code 18PCH2107	Progra	P02	4	4	4	4	4	4	4	4		
18]		P01	2	2	7	12	0	5	7	2		
Semester II	Course Outcomes	(COs)	C01	C02	C03	C04	CO5	C06	C07	C08		

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

References

- 1. Sykes P, *Guide Book to Mechanism in Organic Chemistry*, 6th Ed., ELBS with Longmann, 1997.
- 2. Eliel E L, *Stereochemistry of Carbon Compounds*, Tata-McGraw Hill Publishing Company, New Delhi, 1998.
- 3. Nasipuri D, *Stereochemistry of Carbon Compounds*, 2th Ed., New-Age International Publishers, New Delhi, 1996.
- 4. Kalsi P S, *Stereochemistry: Conformation and Mechanism*, 4th Ed., New-Age International Publishers, New Delhi, 1997.
- 5. Finar I L, *Organic Chemistry* Volume I and II, 4th Ed., ELBS with Longmann, Singapore, 1997.

Semester II 18PCH2108

Hours/Week: 6 Credits : 5

PHYSICAL CHEMISTRY-II

Course Outcomes:

- 1. Students learn and understand the concept of classical mechanics
- 2. Hydrogen atomic spectrum is learnt and understood
- 3. The concepts of mathematics of quantum chemistry is learnt
- 4. Students learn and understand the concepts of Schrodinger equation
- 5. The concept of probability distribution is learnt
- 6. Students learn and understand the concept of group theory
- 7. Students understand the concept of building a character table
- 8. The concept of hybridization and crystal symmetry is learnt.

Unit-I: Classical Mechanics (ONLINE) (18 Hours)

Conservation Principles- Conservation of linear momentum, angular momentum and energy. Equations of motion - Newtonian, Lagrangian and Hamiltonian. Failure of Classical mechanics - Black body radiation, Photoelectric effect - Heat capacity of substances, Hydrogen atomic spectrum. Wave particle dualism, de-Broglie equation, Compton effect -Uncertainty principle and its applications - Conversion of classical wave equation into Schrodinger wave equation.

Unit-II: Mathematics for Quantum Chemistry (18 Hours)

Functions - Definition, Classification, Linearly dependent and independent functions, odd and even functions. Inner product, Normalization, Orthogonality, ortho normal functions, Kronecker delta, Proper function -Eigen functions - need for normalization. Review of vectors and vector spaces. Operators - Linear and non-linear operators. Commutation relationship, Construction of operators-Linear momentum, Angular momentum and energy operators, Commutation relation among angular momentum operators, Hermitian operators and their properties, Anti Hermitian - Postulates of quantum mechanics.

Unit-III: Basic Quantum Chemistry (18 Hours)

Solution of the Schrodinger equation for exactly solvable problems - Particle in a 1D and 3D boxes - Harmonic oscillator and Rigid rotor, Tunneling, One dimensional potential barrier and wells - Solution of the Schrodinger equation for the hydrogen atom - Radial and angular probability distributions - Atomic orbital and electron spin - Pauli's exclusion principle.

Unit-IV: Rudiments of Group Theory (18 Hours)

Principles of Group theory - Symmetry elements - Symmetry operations -Properties of group - Abelian, non - Abelian and cyclic groups - Multiplication Tables - Classes - Subgroups - Molecular point groups - Schoenflies symbols - Optical activity and dipole moment on the basic of point groups-Matrices for symmetry operations - Reducible and irreducible representations - Statement of Great Orthogonality theorem - Construction of Character Table - Explanation of a Character Table.

Unit-V: Applications of Group Theory (18 Hours)

Applications of Group theory - Standard reduction formula relating reducible and irreducible representations - Hybridization schemes for atoms in molecules of different geometry - AB_4 tetrahedral, AB_3 triangular planar. Symmetries of vibrational modes in non-linear molecules (H₂O, NH₃ and BF₃) - Integration method - Selection rules in spectroscopy - IR & Raman active - Vibration modes -Mutual exclusion rule - Symmetry in crystals -Hermann - Mauguin symbols - Space groups of crystals -Translational elements of symmetry - Comparison of crystal symmetry with molecular symmetry.

Text Books

- 1. Prasad R K, *Quantum Chemistry*, 5th Ed., New Delhi, Wiley Eastern Ltd, 1992.
- 2. Anderson J M, *Mathematics of Quantum Chemistry*, 1st Ed., Massachusetts, W.A. Benjamine Inc., 2005.
- 3. Kuriakose J C and Rajaram J C *Thermodynamics*, Jalandar, Shoban Lal Co., 1996.

References

- 1. Donald A McQuarrie, *Quantum Chemistry*, Indian *Ed.*, Viva Books Private Ltd., 2007.
- 2. Levine I N, *Quantum Chemistry*, 6th Ed., Prentice Hall of India, Pvt. Ltd., 2009.
- 3. Atkins P W, Molecular Quantum Mechanics, Clarendon, 1973.
- 4. Raman K.V, *Group Theory and its Applications to Chemistry*, Tata Mc Graw-Hill Publishing Company, 1990.

Credits	S	Mean Score of COs		3.54	3.23	3.23	3.46	3.30	3.31	3.15	3.77	3 37		
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Code	18PCH2108 Programm	Programme Outcomes (POs)	P02	4	4	4	4	4	3	3	4			
181			PO1	n	3	3	n	3	4	4	3			
Semester	Π	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	C07	CO8			

Specific Outcomes amme. Proo pu Outeo 2 Outcome for Course Matrix 2 Relatio

Result: The Score for this Course is 3.37 (High Relationship)

Note:

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Scale	-	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling: Total of Values Total No.of POs& PSOs

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Mean Overall Score for COs =

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Mean Score of COs

Semester II 18PCH2109

Hours/Week: 4 Credits: 3

Lab Course: ORGANIC CHEMISTRY-II

Course Outcomes:

- 1. Students understand the quantitative analysis in organic chemistry
- 2. Students know the estimation of organic compounds
- 3. Students understand the double stage organic preparations
- 4. Students get to know the chromatographic techniques
- 5. Students learn the chemical characterization of oils, proteins and dyes

I. Quantitative Analysis Organic Compounds

- 1. Determination of saponification value of oil.
- 2. Estimation of iodine value of oil.
- 3. Estimation of phenol
- 4. Estimation of aniline.
- 5. Estimation of ketone.
- 6. Estimation of glucose.
- 7. Estimation of nitrogen by Kjeldhal method
- 8. Estimation of ascorbic acid.

11. Micro Preparation of an Organic Compounds (Two-stage)

- 1. Preparation of orange-II dye
- 2. Preparation of *p*-nitroaniline
- 3. Preparation of methyl orange dye
- 4. Preparation of *p*-bromoaniline
- 5. Preparation of 1,3,5-tribromobenzene
- 6. Preparation of acetyl salicyclic acid
- 7. Preparation of methyl red
- 8. Preparation of gango dye

References

- 1. Ganapragasam and Ramamurthy G, Organic Chemistry Lab Manual, 2nd Ed., S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2007.
- 2. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, Vogel's Textbook of Practical Organic Chemistry, 5th Ed., Pearson Publication.
- 3. Vengataswaran V et al., Basic Principle of Practical Chemistry, Sultan Chand and sons, New Delhi, 1997.
- 4. Organic Chemistry Lab Manual for Micro Qualitative Analysis, Department of Chemistry, St. Joseph's College, Tiruchirappalli (Private circulation).

34

Semester II	Н	ours/Week: 4
18PCH2110		Credits : 3

Lab Course: PHYSICAL CHEMISTRY-II

Course Outcomes:

- 1. Students learn and understand the concept Electrode potential
- 2. The concept of Salting out constant is learnt
- 3. Students learn and understand the concepts of Conductometric titrations
- 4. Students learn and understand the concepts of Potentiometric titrations
- 5. The concepts and measurement of equivalent conductance is learnt
- 6. Redox properties of ionic species is well understood

Experiments

- 1. Salting out constant Effect of NaCl on solubility of Benzoicacid.
- 2. Dissociation constant of weak acid by conductivity method.
- 3. Determination of second-order rate constant for saponification of ethyl acetate by conductivity.
- 4. Conductometric acid-base titration mixture of acids dibasicacid.
- 5. Conductometric precipitation titration iodide and chloridemixture.
- 6. Potentiometric precipitation titration mixture of iodide, bromide and chloride versus silver nitrate.
- 7. Potentiometric Redox titration.
- 8. Determination of standard electrode potential of Zinc and Copper.
- 9. Solubility of sparingly soluble salt by (i) Conductivty and (ii) Potentiometry.
- 10. Determination of equivalent conductance of a strong electrolyte at infinite dilution.

Demonstration Experiments

- 1. Measurement of dipole moment with dipole meter.
- 2. Measurement of ultrasonic velocity by ultrasonic interferrometer.
- 3. Determination of Copper and Nickel by electro gravimetry.
- 4. Polarographic determination of Zinc ion and Cadmium ion.

References

- 1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., *Basic Principles* of *Practical Chemistry*, 2nd *Ed.*, New Delhi, Sultan Chand & sons, 1997.
- 2. Daniels *et al., Experimental Physical Chemistry*, 7th *Ed.*, New York, McGraw Hill, 1970.
- 3. Findlay A, *Practical Physical Chemistry*, 7th *Ed.*, London, Longman, 1959.

Semester II 18PCH2111

Hours/Week: -Credits : 2

Self-paced Learning: SELECTED TOPICS IN PHYSICAL CHEMISTRY

Course Outcomes:

- 1. Students learn and understand the concept of Partial molar properties and Fugacity
- 2. The concept of laws of thermodynamics and activity is learnt
- 3. The Concepts of basics of thermodynamics is learnt
- 4. Radiation chemistry and its concept are understood
- 5. Corrosion and its applications is learnt and understood
- 6. Students learn and understand the concept of Renewable sources of energy

Unit-I: Chemical Thermodynamics-I

Partial molar properties – Molarity and mole fraction – Partial molar quantities - Methods of determination of partial molar volume - Chemical potential -Gibbs-Duhem equation - Chemical potential of mixture of gases - Chemical potential in terms of U, H - Variation of chemical potential with temperature and pressure - Determination of partial molar properties from apparent molar properties - Free energy of mixing - Entropy of mixing and volume of mixing. Fugacity – Definition - Methods of determination - Variation of fugacity with temperature, pressure and composition - Duhem-Margules equation -Fugacity of solids, liquids and mixture of gases - Determination of fugacity in gas mixtures (Lewis-Randall Rule).

Unit-II: Chemical Thermodynamics-II

Activity and activity coefficients - Definition - Standard state, reference state, choice of standard state for gases, liquids and solids, liquid solvent and solute – Dependence of activity on temperature and pressure -Determination of activity coefficient of non electrolyte – Mean ionic activity - Determination of activity coefficient of electrolytes by freezing point method.

Laws of thermodynamics - I law and II law of thermodynamics based on Reversible isothermal process of ideal and real gases – Irreversible isothermal process of ideal and real gases-Reversible adiabatic process of ideal and real gases - Irreversible adiabatic process of ideal and real gases - problems in I and II laws of thermodynamics.

Unit-III: Chemical Thermodynamics III

Joule Thomson effect - Thermo chemistry - Kirchoff's equation - III law of thermodynamics -Determination of ÄH by Bomb Calorimeter – Determination

of density and viscosity of liquids and liquid mixtures - Determination of volume of mixing by relative density method - Ultrasonic interferometer and its application.

Unit-IV: Radiation Chemistry and Corrosion

Radiation chemistry - Sources of high energy radiations - Interaction of high energy radiations with matter - Detection of radiations - Dosimeters - Primary and secondary processes. Radiolysis of water - Hydrated electron - G value. Corrosion – definition – costs of corrosion – economic losses – human life and safety – types of corrosion- dry corrosion – wet corrosion – mechanisms - galvanic corrosion – concentration cell corrosion – atmospheric corrosion – soil corrosion – pitting corrosion - inter-granular corrosion-water line corrosion – stress corrosion – microbial corrosion.

Unit-IV: Renewable sources of Energy and Overpotential

Significance of renewable sources of energy – types of renewable sources of energy – Solar energy – Wind energy – Hydroelectric energy – Geothermal – biomass – Advantages and disadvantages – Overvoltage – Hydrogen over voltage – mechanism of hydrogen evolution reaction – pH and metal depositions – Applications of Hydrogen overpotential.

Textbook

1. Kuriakose J. C and Rajaram J.C, *Thermodynamics,* Jalandar Shoban Lal Co., 1999.

References

- 1. Gupta M.C, *Statistical Thermodynamics*, 2nd Ed., New Age International Publishers, Chennai, 1998.
- Francis W. Sears and Gerhard L. Salinger, *Thermodynamics, Kinetic theory and statistical Thermodynamics*, 3rd Ed., Narosa Publishing House, Chennai, 1998.
- 3. Glasstone S, *Thermodynamics for Chemists*, New Delhi, East West Affiliated Pvt. Ltd, 1969.
- 4. Donald McQuarrie, *Statistical Thermodynamics*, Indian Edition, Viva Books Private Ltd., NewDelhi, 2003.
- 5. Ferrell L Hill, *Introduction to Statistical Thermodynamics*, Addison-Wesley Publishing Company, INC, London., 1962.
- 6. Web resources and e-content.

Hours Credits - 2	Mean Score of	COS	3.54	3.69	4.53	3.60	3.92	4.08	3.89
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Semester II	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	C06	

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11

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Values Scaling:

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Very High

3.1-4.0 High

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21-40% 2 1.1-2.0

Poor

0.0-1.0 Very poor

4.1-5.0

81-100%

61-80%

41-60%

1-20%

Mapping

Scale Relation Quality

Semester II		Hours/Week: 4
18PSS2301		Credits : 4
	IDC: SOFT SKILLS	

Course Outcomes:

- 1. Students are taught the various nuances of grooming such as, good manners and etiquettes and they are trained to practice them in the class rooms.
- 2. Students are empowered with public speaking skills via extempore speeches and prepared speeches, presented before the class and assessed by the trainer as well as the companions which eventually helps build self confidence of the students.
- 3. Students learn the different types of resumes and different types of interview skills and write and print their own resumes and present before the interview panel for their mock interview.
- 4. Students actively learn the ten parameters of group discussion, perform on the stage with their colleagues, which is videotaped, reviewed and evaluated.
- 5. As students go through their teenage, self discovery becomes a tool to develop their personality facilitated with scientific psychological personality tests.
- 6. Students are guided to knowing their SWOT (Strengths, Weaknesses, Opportunities and Threats)and setting their short term and long term goals for their lives.

Module 1: Basics of Communication: Definition of communication, Process of Communication, Barriers of Communication, Non-verbal Communication, Effective Communication: The Art of Listening, Exercises in Kinesthetics, Production of Speech, Organization of Speech, Modes of delivery, Conversation Techniques, Dialogue, Good manners and Etiquettes, Politeness markers & Listening links.

Module II: Resume Writing: What is Resume? Types of Resume? Chronological, Functional and Mixed Resume, Steps in preparation of Resume, structure and framework for writing resume, Intensive training / personalized training on resume writing. **Interview Skills**: Common interview questions, Attitude, Body Language, The mock interviews, Phone interviews, Behavioral interviews.

Module III: Group Discussion: Group Discussion Basics, GD Topics for Practice, Points for GD Topics, Case-Based and Article based Group Discussions, Points for Case Studies, and Notes on Current Issues for GDS & Practicum with video coverage. **Team Building:** Team Vs Group – Synergy, Stages of Team Formation, Broken Square-Exercise, Win as much as you win-Exercise, Leadership – Styles, Work ethics.

Module IV: Personal Effectiveness: Self Discovery, Self Esteem, Goal setting, Problem-solving, Conflict and Stress Management

Module V: Numerical Ability: Average, Percentage, Profit and Loss, Problems on ages, Simple Interest, Compound Interest, Area, Volume and Surface Area, Time and Work, Pipes and Cisterns, Time and Distance, Problems on Trains, Boats and Streams, Calendar, Clocks, Permutations and Combinations, Probability.

Module VI: Test of Reasoning: Series Completion, Analogy, Data Sufficiency, Blood Relations, Assertion and Reasoning, Logical Deduction, Direction. **Non-Verbal Reasoning**: Series, Classification

Text Book

1. Melchias, G., Balaiah John., John Love Joy (Eds) 2015. *Winners in the making*. St.Joseph's College, Trichy-2

References

- 1. Aggarwal, R. S. Quantitative Aptitude, S. Chand & Sons
- 2. Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*. S. Chand & Co, Revised Edition.
- 3. Covey, Stephen. (2004). 7 Habits of Highly effective people, Free Press.
- 4. Egan Gerard (1994). *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/ Cole.
- 5. Khera, Shiv (2003). You Can Win. Macmillan Books, Revised Edition.
- Murphy, Raymond. (1998). Essential English Grammar. 2nd ed., Cambridge University Press.
- 7. Prasad, L. M. (2000). Organizational Behaviour, S. Chand & Sons.
- 8. Schuller, Robert. (2010). Positive Attitudes. Jaico Books.
- 9. Trishna's (2006). *How to do well in GDs & Interviews*, Trishna Knowledge Systems.
- 10. Yate, Martin. (2005). Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting.

Modules	Topics	Examinati	on Pattern
wiodules	Topics	CIA	Online
Ι	Basics of Communication	15	5
II	Resume Writing & Interview Skills	15	5
III	Group Discussion & Team Building	10	5
IV	Personal Effectiveness	10	5
V	Numerical Ability (Common Session)	5	10
VI	Test of Reasoning (Common Session)	5	10
	Total	60	40

Semester III	Hours/Week: 6
18PCH3112	Credits : 5

INORGANIC CHEMISTRY-III

Course Outcomes:

- 1. Theories of bonding in coordination compounds are learnt
- 2. Basics of organometallics and structure and bonding in organometallic compounds are understood
- 3. Mechanisms of reactions of complexes are learnt
- 4. Industrial applications of organometallic catalysts are learnt
- 5. Different types of magnetic behaviors and their measurement are learnt
- 6. Origin of electronic spectra of complexes and their interpretations are understood
- 7. Applications of infrared spectroscopy to the study of coordination chemistry is understood
- 8. Applications of NMR, ESR and Mossbauer spectrometric methods to the field of coordination chemistry are learnt

Unit-I: Theories of Coordination Chemistry (18 hr)

Crystal field theory – Splitting pattern of octahedral, tetrahedral, square planar, trigonal bipyramidal and square pyramidal complexes – Magnetic properties, CFSE, high spin-low spin cross over – limitations – Structural and thermodynamic effects of inner orbital splitting, Jahn-Teller effect (static, dynamic, elongation and flattening) – Ligand Field theory – Evidences for M-L overlap, spin-orbit coupling constant and Racha parameters – MO theory of Octahedral complexes (sigma and pi bonding) – MO of tetrahedral and square planar complexes.

Unit-II: Basics of Organometallics (18 hr)

Hapticty – 16 and 18 electron rules-applications and limitations – Carbonyls – bonding – terminal, doubly, triply bridged carbonyls – structure of carbonyls – CO stretching frequencies of carbonyls and mixed carbonyls – Carbonyl hydrides – Nitrosyls-terminal, bridging and bent – Pi complexes with olefins – ferrocene and benzenoid metal complexes – Nonbenzenoid aromatics as ligands and carbone complexes – fluxional molecules

Unit-III: Reaction Kinetics in Coordination Chemistry [Online] (18 hr)

Inert and labile complexes – Stepwise, overall stability constants – Chelate effect – mechanisms of substitutions in octahedral complexes – Dissociative (D), Associative (A), and Interchange (I) mechanisms – Aquation (acid

hydrolysis) and anation – Conjugate base mechanism of base hydrolysis – Substitution reactions in square planar complexes – Trans effect-theories and Applications - Electron transfer reactions – inner and outer sphere mechanisms – Catalysis by organometallic compounds – oxidative addition – insertion – hydrogenation (Wilkinson's catalyst) – hydroformylation – Wacker process – Fischer-Tropsch reaction – Zeigler-Natta Catalyst

Unit-IV: Physical Methods in Coordination Chemistry-I (18 hr)

Types of magnetic behaviour – magnetic susceptibility measurements – Gouy method – Orbital contribution – Spin-orbit coupling and its effects on magnetic properties – Temperature independent paramagnetism (TIP) – Electronic spectra of complexes – bandwidth and intensity –Sugano-Tanabe and Orgel Diagrams – charge transfer spectra – Infrared spectra of Coordination complexes – characteristic frequencies – mode of coordination and interpretation of IR spectra of complexes containing ClO_4 , SO_4^2 , CO_3^2 , ester, amine, amide, DMSO ligands

Unit-V: Physical Methods in Coordination Chemistry-II (18 hr)

NMR – Applications of NMR to inorganic compounds – NMR of metal hydrides (¹H NMR), metal carbonyls(¹³C NMR), ¹⁹F and ³¹P NMR – Applications of NQR spectroscopy to the study of complexes–ESR – zero-field splitting – Krammer's degeneracy – pattern for number of lines of complexes having d^1 - d^9 systems –bis(salicylaldimine) Cu(II), Mn(II) complexes – Mossbauer spectroscopy – quadrupole interactions – magnetic interactions – FeSO₄, FeCl₃, ferro- and ferricyanides, nitroprusside, Fe₃(CO)₁₂, $I_2Br_2Cl_4$

Textbooks

- Huheey J E, Keiter E A and Keiter R L, *Inorganic Chemistry Principles* of Structure and Reactivity, 4th Ed., Harper Collins College Publishers, New York, 1993.
- 2. Sutton D, *Electronic Spectra of Transition Metal Complexes*, McGraw Hill, Australia, 1968.
- Drago R S, *Physical Methods in Chemistry*, 3rd Ed., W. B. Saunders Company, London, 1992.

References

- 1. Cotton F A and Wilkinson G, *Inorganic Chemistry A Comprehensive Text*, 3rd Ed., Interscience Publishers, New York, 1972.
- 2. Purcell K F and Kotz J C, *Inorganic Chemistry*, W B Saunders Company, Philadelphia, 1977.

- 3. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, Inorganic Chemistry, 6th Ed., W H Freeman and Company, New York, 2014.
- 4. Miessler G L, Fischer P J and Tarr D A, Inorganic Chemistry, 5th Ed., Pearson Education, Inc., New York, 2014.
- 5. Housecroft C E and Sharpe A G, Inorganic Chemistry 4th Ed., Pearson Education Limited, Essex, 2012.
- 6. Lee J D, Concise Inorganic Chemistry, 6th Ed., ELBS, London, 1998.
- 7. Lewis J and Wilkins R G, Modern Coordination Chemistry, Interscience Publishers, Inc., New York, 1960.
- 8. Basalo F and Pearson R G, Mechanisms of Inorganic Reactions, John-Wiley and Sons Inc., New York, 1960.
- 9. Crabtree R H, The Organometallic Chemistry of the Transition Metals, 6th Ed., John-Wiley and Sons Inc., New York, 2014.
- 10. Kazuo Nakamota, Infrared and Raman Spectra of Inorganic and Coordination Compounds, Part A and B, 6th Ed., John-Wiley and Sons, Inc. New York, 2009.
- 11. Straughn B P and Walker S, Spectroscopy Volumes 1,2 and 3, Chapmann and Hall, London, 1976.
- 12. Ebsworth EAV, Structural Methods in Inorganic Chemistry, 3rd Ed., Great Britain, ELBS, 1987.
- 13. Parish R V, NMR, NOR, EPR, and Mossbauer Spectroscopy in Inorganic Chemistry, Ellis Harwood Limited, London, 1990.
- 14. Gibbs T C, Principles of Massbauer Specroscopy, Chapman and Hall, London, 1976.

Frogramm 5 PSO1 PSO2 PSO3 PS 4 4 4 4 4 5 3 3 5 5 3 3 3 3 3 3
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Values Scaling:

Total No.of POs& PSOs

Mean Score of COs =

Total of Values

81-100%

61-80%

41-60% 3 2.1-3.0

21-40% 2 1.1-2.0

1-20%

Mapping Scale Relation Quality

Semester III		
18PCH3113		

Hours/Week: 6 Credits : 5

ORGANIC CHEMISTRY-III

Course Outcomes:

- 1. Students learn concepts and applications of UV-Vis spectroscopy
- 2. Students get learnt the concept IR spectroscopy and are able to find out the IR stretching frequency of organic functional groups
- 3. Students learn the principles, techniques and applications the of NMR and ESR spectroscopy for the structural elucidations
- 4. Students get to know the instrumentation, ionization techniques and fragmentation patterns, of chemical compounds using mass spectrometry
- 5. Students analyse and design the strategies of the retrosynthtic approach to synthesize organic molecules.
- 6. Students understand stereo chemical implications of pericyclic reaction in organic synthesis.
- 7. Students get to know the mechanistic pathways of DA, sigmatropic and electrocyclic reaction
- 8. Students understand the structural and stereochemical implications on photochemical reactions

Unit-I: Organic Spectroscopy – I (Online) (18 Hours)

UV-visible spectroscopy: electromagnetic spectrum – energy-wavelength relationship - basic principles of electronic transitions - chromophore, auxochrome – differentiating geometrical and positional isomers - Woodward-Fischer rules applied to conjugated dienes, \dot{a} - and \hat{a} -unsaturated carbonyl compounds & aromatic systems. Factors influencing the chromophoric absorption - applications.

ORD and CD-the concept of circularly polarized light - causes of optical activity - atomic and conformational asymmetry - ORD and CD - octant rule, *alpha*-haloketone rule and their applications - Cotton effect and ORD curves - applications to determine the absolute configurations of monocyclic ketones and steroids.

IR spectroscopy: Hooke's Law - types of vibrations - characteristic group frequencies and factors influencing them – inter-, and intra-molecular hydrogen bonding - conformational aspects in cyclic 1, 2- and 1, 3- diols - Finger print region - applications of IR towards identifying the organic compounds

Unit-II: Organic Spectroscopy – II (18 Hours)

PMR spectroscopy – principle - magnetically active nuclei - number of signals – position of signals (chemical shift) - peak area and proton counting - magnetic non-equivalence of protons - types of coupling and coupling constants (J) - correlation of chemical shift with structure - spin decoupling of exchangeable protons - ¹³C NMR spectroscopy - Basic principles - broad band and off-resonance decoupling – NOE, DEPT.

ESR spectroscopy - basic principle - predicting number of ESR lines for simple organic free radicals such as methyl, ethyl, phenyl and naphthyl radicals.

Mass spectrometry- basic principles – instrumentation - parent ion peak, base and meta stable peaks - calculation of molecular formula - Nitrogen rule – McLafferty rearrangement - fragmentation patterns of various classes of organic compounds

Unit-III: Retrosynthetic analysis (18 Hours)

Synthons and synthetic equivalents - types of synthons: donor and acceptor synthons - umpolung reactions - typical examples. Functional Group Interconversion (FGI), Functional Group Addition (FGA) - monofunctional disconnection: alcohol disconnection - alkene disconnection-ketone disconnection - acid and their derivatives disconnection - alkane disconnection - amine disconnection: Bifunctional disconnection: 1,2; 1,3; 1,4; 1,5 and 1,6-bifunctional disconnection.

Unit-IV: Pericyclic reactions (18 Hours)

Pericyclic reactions: characteristics – types of pericyclic reactions –Diels-Alder reaction-[4+2] cycloaddition – General description of Diels-Alder reaction- stereochemistry of Diel-Alder reaction- FMO and MO correlation diagram methods to cycloaddition reactions – regioselectivity in inter and intra molecular Diels-Alder reactions, Woodward-Hoffmann rules for Diels-Alder reactions and their applications to simple systems – the Alder-ene reaction: cycloadditions involving hydrogen transfer- photochemical [2+2] cycloaddition reaction-Regioselectivity of photochemical [2+2] cycloaddition reaction-thermal [2+2] cycloaddition reaction -1,3-dipolar addition

Sigmatropic reactions: [3,3]-sigmatropic rearrangement - Cope, oxy-cope, anionic Cope rearrangements - Claisen rearrangements - *ortho* ester Claisen, Ireland-Claisen, Ester enolate Claisen and Claisen rearrangement of *O*-allyl-*N*,*N*-dialkyl ketene aminals. [2,3]-sigmatropic rearrangement – thermal [1,n]

H sigmatropic and photochemical [1,n] H sigmatropic shifts Electrocyclic reaction: rules for electrocyclic reactions - Nazarov cyclization

Unit-V: Photochemical reactions (18 Hours)

Photochemistry - Fundamental concepts - Jablonskii diagram – photosensitization – laws of photochemistry - types of photochemical reactions – photochemistry of carbonyl compounds: - Norrish type-I and type-II reactions - photocycloaddition: Paterno-Buchi reaction - photochemistry of alkenes - photochemical rearrangements: Di-*pi* methane rearrangement – photo-Fries rearrangement- \dot{a} , *b*-epoxy ketone - valence isomerization - photolysis of diazo compounds - photo substitution reaction: Barton reaction – Hofmann-Loefftier - Freytag reaction- photochemistry of dienes and aromatic compounds

Textbooks

- 1. Pavia D L, Lampman, G M, Kriz G S, and Vyvyan J R, *Spectroscopy*, Indian Edition, Cengage Learning, New Delhi, 2007.
- 2. Silverstein R M and Bassler G C, *Spectrometric Identification of Organic Compounds*, 4th Ed., John- Wiley and Sons, New York, 1993.
- 3. Clayden J, Greeves N, Warren S, and Wothers P, *Organic Chemistry*, Oxford University Press, New York, 2006.

References

- 1. Kemp W, Organic Spectroscopy, 3rd Ed., ELBS, London, 1987.
- 2. Smith M B, and March J, March's *Advanced Organic Chemistry*, 6thEd., John-Wiley and Sons, New York, 2007.
- 3. Fleming I, *Spectroscopic Methods in Organic Chemistry*, 4th Ed., Tata-McGraw Hill Publishing Company, New Delhi, 1988.
- 4. Pine S H, *Organic chemistry*, 5th Ed., Tata -McGraw Hill, New Delhi, 2006.
- 5. Warren S, *Designing Organic synthesis: The Disconnection Approach*, Wiley, New Delhi, 1984.
- 6. Morrison R T, Boyd R N, and Bhattacharjee, *Organic Chemistry*, 7th Ed., Pearson India, 2011.

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Mean Score of COs

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Values Scaling:

Total No. of COs

5 4.1-5.0 Very High

4 3.1-4.0 High

41-60% 3 2.1-3.0 Moderate

Poor

0.0-1.0 ery poor

81-100%

61-80%

21-40% 2 1.1-2.0

1-20%

Mapping Scale Relation Quality

Semester III	
18SPS3101A	

Hours/Week: 6 Credits : 5

Interdisciplinary Core:

SPECTROSCOPY AND STATISTICAL THERMODYNAMICS

Course Outcomes:

- 1. Students learn and understand the concept of Molecular spectroscopy
- 2. The concept of FT-IR is well understood
- 3. The concepts of Raman Spectroscopy is well understood
- 4. Students learn and understand the concepts of NMR spectroscopy
- 5. The concepts of probability distribution is understood
- 6. The concept of statistical thermodynamics is understood
- 7. Students learn and understand the concept of partial molar properties
- 8. The application of statistical thermodynamics is understood

Unit-I: Rotational and Vibrational Spectroscopy (18 hr)

Basic aspects of Spectroscopy - Characterisation of electromagnetic radiation - Quantization of energy. Microwave Spectroscopy - Rotation of molecules and selection rules, Diatomic molecules - Rigid and non-rigid rotator, Rotational constant and centrifugal distortion - Techniques and instrumentation. Vibrational spectroscopy - diatomic molecules, Harmonic and anharmonic oscillators - zero point energy - force constant - fundamental absorption and overtones (hot bands, fermi resonance) - Polyatomic molecules - Techniques and instrumentation of FT-IR.

Unit-II: Raman and NMR and Mossbauer Spectroscopy (18 hr)

Raman spectroscopy - Raman and Rayleigh scattering - Quantum and Classical theories of Raman effect - Stokes and anti-stokes lines - Pure rotational Raman spectra - Vibrational Raman spectra - Mutual exclusion rule - Polarized and depolarized Raman lines - Techniques and instrumentation. NMR - Hydrogen nuclei - Chemical shift and spin-spin splitting - Coupling constant (*J*). Splitting with and without chemical exchange - Interaction between spin and magnetic field - Gyromagnetic ratio – Instrumentationof NMR - FT NMR- Applications of 2D NMR techniques like COSY, NOESY. Applications of C¹³ NMR spectroscopy - Mossbauer spectroscopy principles of Mossbauer spectroscopy, Doppler shift, Recoil energy, Isomer shift, Quadrupole splitting - Applications to various compounds.

Unit-III: ESR spectroscopy & Electronic Spectroscopy (18 hr)

ESR - Principle - Position of ESR absorptions - g value - Hyperfine splitting - Zero field splitting - ESR spectrum of free radicals and copper salicyaldehyde complexes.

Electronic spectra - Electronic spectra of diatomic molecules – Born Oppenheimer approximation - Vibrational coarse structure - Franck - Condon Principle - Dissociation energy and dissociation products - rotational fine structure of electronic vibration - vibration transition - Fortrate Diagram. Electronic angular momentum in diatomic molecules - Spectrum of molecular hydrogen - Molecular photoelectron spectroscopy - UV photo electron spectroscopy and X-ray photo electron spectroscopy.

Unit-IV: Fundamentals of Statistical Thermodynamics (Online) (18 hr)

Statistical method - Microstates, macro states - Permutations and combinations - Combinatory rule - Probability theorems – Ensembles - Phase space - Thermodynamic probability - Statistical equilibrium - Maxwell-Boltzmann statistics - Derivation of M.B. statistics - Relationship between entropy and probability - Heat capacity of solids - Einstein and Debye models - Statistical meaning of third law of thermodynamics.

Unit-V: Applications of Statistical Thermodynamics (18 hr)

Partition functions - Molar, translational, rotational and vibrational partition functions of diatomic and polyatomic molecules - Separation of partition function according to forms of energy-Partition function and vibrational energy - Total partition function - Electronic partition function-Derivation of thermodynamic quantities E, S, A, H, G, K and Cp, Cv using partition function-Sackur-Tetrode equation – Bose Einstein statistics - Fermi Dirac statistics - Electronic heat capacity of gases - Equipartition of energy - Classical and quantum statistical theory of heat capacities - Heat capacities for diatomic molecule - Rotational heat capacity of hydrogen molecule - Nuclear spin statistics - Nuclear spin entropy- Quantum statistics.

Textbooks

- 1. Banwell C N, *Molecular spectroscopy*, 2nd Ed., New Delhi, TATA McGraw Hill Co., 2010.
- 2. Kuriakose J. C and Rajaram J.C, *Thermodynamics,* Jalandar Shoban Lal Co., 1999.

References

- 1. Drago R S, *Physical Methods in Inorganic Chemistry*, New Delhi, East West Press Ltd, 1971.
- 2. Chang R, *Basic Principles of Spectroscopy*, New Jersey, Englewood Cliffs, 1978.
- 3. Straughan B P and Walker S, *Spectroscopy Volume 1,2,3*, New York, London Chapman and Hall, A Halstet Press Book, John Wiley & Sons Ins. 1975.

Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs	
Valu	Total of Values	Total No.of POs & PSOs	
	Moon Soons of COs -		

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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Semester III	Course Outcomes	(COs)	C01	C02	C03	C04	C05	C06	C07	C08	

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

- 5. Gurdeep R Chatwal and Sham K Anand, *Spectroscopy*, Himalaya Publishing House, 2009.
- 6. Gupta, M. C., *Statistical Thermodynamics*, 2nd Edition, New Age International Publishers, Chennai, 1998.
- 7. Donald McQuarrie, *Statistical Thermodynamics*, Indian Edition, Viva Books Private Ltd., New Delhi, 2003.

Semester III 18SPS3101B

Hours/Week: 6 Credits : 5

IDC: SPECTROSCOPY

Course Outcomes:

- 1. Understand the aspects of rotational spectroscopy and its techniques.
- 2. Understand the theory and principles of vibrational spectroscopy and its techniques.
- 3. Comprehend the basics of Raman and their instrumentation techniques.
- 4. Understand the physics behind NMR and ESR spectroscopy and its instrumentation.
- 5. Perceive the theory and principles of electronic and X-ray spectroscopy.
- 6. Understand Mossbauer spectroscopic techniques and hyperfine spectral lines.
- 7. Understand phosphorescence and fluorescence.
- 8. Analyze the structure of compounds by various spectroscopic techniques.

Unit-I: ROTATIONAL SPECTROSCOPY

Basic aspects of spectroscopy-characterization of EM radiation, quantization of energy Microwave spectroscopy-rotation of molecules and selection rules, diatomic molecules; Rigid diatomic molecule - intensities of spectral lines-effect of isotppe substitution - Non-rigid rotator (rotational constant-centrifugal distortion constant) - polyatomic molecules -techniques and instrumentation - Chemical analysis.

Unit-II: INFRA-RED SPECTROSCOPY

Vibration Spectroscopy - diatomic molecules; Harmonic and anharmonic oscillators, Zero point energy - force constant - The diatomic vibrating rotator - fundamental vibrations and overtones (hot bands, Fermi resonance)

- Influence of rotation on polyatomic molecules Analysis by IR techniques
- Techniques and instrumentation.

Unit-III: RAMAN SPECTROSCOPY

Raman spectroscopy: Raman Rayleigh scattering- Quantum and Classical theory of Raman effect- Pure rotational Raman spectra - Stokes and anti-Stokes lines – Raman activity of vibrations - mutual exclusion principle-overtones and combinations vibrations- vibrational Raman spectra-rotational fine structure-Polarized and depolarized Raman lines- Structure determination-Techniques and instrumentation.

Unit-IV: SPIN RESONANCE SPECTROSCOPY

Nature of spinning particles - Interaction between spin and magnetic field -Gyromagnetic ratio-The Larmor Presession - NMR: Hydrogen nuclei chemical shift - spin-spin splitting - coupling constant - Chemical analysis by NMR - CNMR Spectroscopy – Instrumentation - FT-NMR - ESR- Principle - position of ESR absorptions - g value - hyperfine splitting - zero field splitting - ESR spectrum of free radicals and complex

Unit-V: ELECTRONIC AND MOSSBAUER SPECTROSCOPY

Born-Oppenheimer approximation - vibrational coarse structure - Frank-Condon Principle - dissociation energy and dissociation product- vibration transitions - Fortratdiagram-electronic structure of diatomic molecules electronic angular momentum in diatomic molecules -spectrum of Molecular hydrogen - Photo electron spectroscopy - UV photo electron spectroscopy - X-ray photo electron spectroscopy. Mossbauer Spectroscopy - Principle -Doppler shift - recoil energy - isomer shift - quadrupole splitting - hyperfine splitting - Applications.

Books for Study:

1. Colin N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy, TMH Edition, 4th Edition (1994).

Unit	Book	Sections
Ι	1	1.1, 1.2, 1.3, 2.1, 2.2, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4.1, 2.4.2, 2.5, 2.6
II	1	3.1.1, 3.1.2, 3.1.3, 3.2, 3.3, 3.5.1, 3.5.2, 3.6.1, 3.6.3, 3.7.1, 3.7.2, 3.8.1, 3.8.3
III	1	4.1, 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.4.1, 4.4.2, 4.4.3, 4.5, 4.6,
IV	1	7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6, 7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.2.5, 7.3.1, 7.3.2, 7.4, 7.4.1, 7.4.2, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.5.5,
V	1	6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.7, 6.2.1, 6.2.2 6.2.3, 6.2.4, 6.4, 5.5, 6.5, 6.5.1, 6.5.2, 9.1, 9.2.1, 9.2.2, 9.2.3

Books for Reference:

- 1. Straughan, B.P and Walker.S, Spectroscopy Vol. 1,2,3, Chapman and hall, London (1996).
- 2. Gurdeep R. Chatwal and Sham K. Anand, Spectroscopy, Himalaya Publishing House (2009).

Credits 5	Mean Score of	ŝ	3.59	3.63	3.61	3.46	3.55	3.30	3.76	3.23	151
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Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Scores

Mean No. of

of Total Total

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Mean Overall Score for COs

Total No.of POs & PSOs Totalof Values

Score of COs

Mean

Semester IV 18SPS3101C

Hours/Week: 6 Credits : 5

SENSORS AND TRANSDUCERS

Course Outcomes

- 1. Understand the working principles of various transducers.
- 2. Characterize and measure the non electrical quantities
- 3. Acquire knowledge of measurement techniques of thermal conductivity
- 4. Enhance the knowledge on integrated sensors.
- 5. Able to understand the usage of electrolytic sensors
- 6. Learn about biosensors and MEMS based sensors
- 7. Design the signal conditioning circuits used in bio- instrumentation
- 8. To analyze the operations of various sensors used in industries and commercial applications.

Unit-I: TRANSDUCERS (15 hr)

Introduction to measurement - Direct and indirect measuring methods -Accuracy - Errors - Transducers - Resistive transducers - Potentiometers -Non-linear potentiometers function generators - Strain gauges - Types of strain gauges - Resistance thermometers - Variable inductance transducers - Linear variable differential transformer - Capacitive transducers - Piezo electric transducers - Hall Effect transducers - Magneto resistors

Unit-II: MEASUREMENT OF NON-ELECTRICAL QUANTITY (14 hr)

Measurement of vibrations - Seismic transducers - Measurement of flow rate - Measurement of thickness - Measurement of humidity - Measurement of sound using microphones - Measurement of pH value - Measurement of thermal conductivity - Measurement of pressure.

Unit-III: INTEGRATED SENSORS

(14 hr)

LM 35 temperature sensor - DS18s20 1-wire digital thermometer - TSOP 17 photo modules for PCM remote control system - MOC3041 zero cross optoisolators - TL173L linear hall effect sensor - KMZ51 magnetic field sensor - MPXV5004G pressure sensor - A1425 analog speed sensor - LM1830 water level sensor - HC610 humidity sensor - ICM105A VGA CMOS sensor

Unit-IV: BIOSENSORS AND MEMS BASED SENSORS (15 hr)

Introduction - FET & MOSFET chemical sensor - Bio sensors - Ion exchange membrane electrodes - Oxygen electrodes - CO2 electrodes enzyme electrode - Construction - ISFET for glucose, urea - Electrolytic sensors - Optical sensor - Fiber optic sensors - ADXL 335 accelerometer - MPU 6050 IMU Sensor.

Unit-V: SIGNAL CONDITIONING CIRCUITS (14 hr)

Signal conditioning basics - type of signal conditioning: analog and digital - analog signal conditioning amplification - attenuation - level shifting -Clippers - clampers - data sampling and optimization - Filters: RC filter active filter - Wheatstone bridge - AC bridges- noise reduction techniques. Comparators - Schmitt trigger for noise removal - Current amplification isolation.

Books for study

- 1. A.K. Sawhney, "A course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai & Co. publishers, 2011.
- 2. N.Mathivanan, "PC Based Instrumentation: Concepts and Practice", PHI, 2007.

Books for Reference

- 1. H. S. Kalsi, "Electronic Instrumentation", Tata McGraw-Hill publishers
- 2. Albert D. Helfrick and William D.Cooper, "Modern Electronic Instrumentation and Measurement techniques", New Delhi: Prentice Hall of India, 1995.

Unit Book Sections Ι

- 25.2 25.91
- Π 1 25.11 - 25.13,25.16,25.17,25.19,25.22-25.24,25.28-25.31
- III Lecture notes
- IV Lecture notes
- V $2 \quad 2.1 - 2.5, 2.7,$ lecture notes

Semester III	18	Code 18SPS3101C	IC			SEN	T VSORS	itle of t AND	Title of the Paper S AND TRANSI	Title of the Paper SENSORS AND TRANSDUCERS	IRS			Hours 6	Credits 5
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(COs)	P01	P02	P03	P04	P05	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	PSO8		COS
C01	4	4	с	4	4	4	4	2	3	4	4	4	4		3.7
C02	4	4	e	4	4	3	4	2	3	2	4	3	5		3.5
C03	4	4	m	4	4	4	4	2	4	4	4	m	5		3.8
C04	5	4	e	4	4	e	4	2	4	4	4	e	4		3.7
C05	5	4	ю	4	4	4	4	2	4	ю	4	ю	4		3.7
C06	5	4	e	4	4	4	4	2	e	с	4	e	4		3.6
C07	5	4	n	4	4	4	4	2	Э	ы	4	б	4		3.6
C08	5	4	e	4	4	4	4	2	3	ю	4	m	4		3.6
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Total of Mean Scores

Mean Overall Score for COs =

Total No.of POs & PSOs

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Mean Score of COs

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Values Scaling:

Total No. of COs

81-100%

61-80% 4 3.1-4.0 High

41-60%

21-40% <u>ر</u> 1.1-2.0

1-20%

Very High 4.1-5.0

2.1-3.0 Moderate

Poor

ery poor

0.0-1.0

Mapping Scale Relation Quality

Semester III 18PCH3201A

Hours/Week: 4 Credits : 4

Core Elective-IA:

ANALYTICAL CHEMISTRY

Course Outcomes:

- 1. The nature of errors in analyses and their types are learnt
- 2. Methods of minimization of errors in analytical measurements are understood
- 3. Statistical methods in error analysis are learnt
- 4. Validation methods of experimental data are understood
- 5. Fundamentals and applications of thermo-analytical techniques are learnt
- 6. Various chromatographic techniques their theory, instrumentation, types and applications are learnt

Unit-I: Error Analysis – I (ONLINE) (12 hr)

Significant figures – rounding off the values – accuracy and precision– errors – classification of errors – constant errors and proportional errors – determinate errors (systematic errors) and indeterminate (random and accidental) – minimization of errors: calibration of apparatus, analysis of standard samples, running a blank determination, and independent analysis.

Unit-II: Error Analysis – II (12 hr)

Average, range, median, average deviation, relative average deviation and standard deviation, variance, coefficient of variation – the normal error curve – testing of significance: F-test, t- test and Q-test – confidence limit – method of least squares

Unit-III: Thermoanalytical Methods and Colorimetry (12 hr)

General Characteristics of thermo-analytical methods – Thermogravimetic analysis – Principle, instrumentation and applications – Factors affecting thermogram – Differential Thermal Analysis- DTA instrumentation and applications – Differential scanning calorimetry – Principle, instrumentation and applications. Colorimetry – fundamental laws – deviations from Beer's law – instrumentation and applications of spectrophotometry

Unit-IV: Instrumental Methods of Analysis (12 hr)

Principle, instrumentation and applications of fluorimetry, phsophorimetry Flame photometry and atomic absorption spectrophotometry – Theory, instrumentation, interferences and applications.

Unit-V: Chromatography (12 hr)

Principles of chromatography – retardation factor – plate theory – column efficiency – Classification of chromatographic techniques – Principle, instrumentation and applications of gas chromatography (GC), thin-layer chromatography (TLC) and high-performance liquid chromatography (HPLC)

Textbooks

- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5th Ed., Longman Scientific & Technical, Essex, 1989.
- Gary D Christian, Analytical Chemistry, 6th Ed., John Wiley & Sons Inc., 2004.

References

- 1. Gopalan R, Subramanian P S, Rengarajan K, *Elements of Analytical Chemistry*, 3rd Ed., Sultan Chand & Sons, New Delhi, 2003.
- 2. Skoog D A, Holler F J and Crouch S R, *Principles of Instrumental Analysis*, 6th Ed., Thompson Brooks/Cole, Belmont CA, 2007.
- Skoog D A, West D M, Holler F J and Crouch S R, Fundamentals of Analytical Chemistry, 9th Ed., Brooks/Cole, Belmont CA, 201Chromatography4.

Hours Credits 4 4	Mean Score of	COs	4.07	3.61	3.85	3.46	3.77	3.46	3.70
Hours 4	Mea								
		PSO8	5	4	n	3	3	ŝ	COs
RT		PS07	5	4	n	3	5	S	Overall Mean Score for COs
EMIST	itcomes	PSO6	3	3	n	3	3	s	Mean S
Title of the Paper Core Elective-IA: ANALYTICAL CHEMISTRT	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	5	3	5	5	3	S	Verall
Title of the Paper : ANALYTICA	nme Specifi (PSOs)	PSO4	5	3	5	5	5	æ	
itle of tl ANAL	rogran	PSO3	3	4	5	3	5	æ	
T ive-IA:		PSO2	3	3	с	3	5	æ	1
e Electi		PSO1	4	5	ю	5	3	æ	1
Cor		P05	5	5	5	3	3	æ	
	rtcomes	PO3 P04	5	3	5	3	3	£	1
11A	Programme Outcomes (POs)		4	4	4	3	3	æ	
Code 18PCH3201A	Progra	P02	3	3	n	3	3	æ	
181		P01	3	3	n	3	5	ŝ	1
Semester III	Course Outcomes	(COs)	C01	CO2	CO3	CO4	CO5	C06	

ť Del Result: The Score for this Course is 3.7 (High Relationship)

Note:

Aapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

:

	Total of Mean Scores	Total No. of COs	
alues Scaling:	Mean Overall Score for COs =		
Valu	Total of Values	Total No.of POs & PSOs	
	Maan Coom of COs -	MEAL SCOLE OF COS -	

s l

Semester III 18PCH3201B

Hours/Week: 4 Credits:4

Core Elective-IB:

CHEMICAL INSTRUMENTATION

Course Outcomes:

- 1. The nature and choice of methods of measurement are learnt
- 2. Variables that control measurements are understood
- 3. Limits of detection and amplification are learnt
- 4. Concept of operational amplifiers is understood
- 5. Control of current and voltage are understood
- 6. Signal-to-noise ratio is learnt

Unit-I: Measurement and Instrumentation (12 hr)

Introduction - the nature of a measurement - choice of a method of measurement - control of variables - basic design patterns - general properties of modules - propagation of uncertainity - single channel design - limit of detection and amplification - automatic operation and computer control

Unit-II: Operational Amplifiers (12 hr)

The operational amplifier - limitations on amplifier performance mathematical operations - differentiation - integration - measurement of current and voltage - precise control of current and voltage

Unit-III: Signal-to-Noise Optimization [ONLINE] (12 hr)

Sensitivity and detection limits - noise - minimizing noise in a system signal averaging – modulation: chopping – demodulation: phase sensitive detection – other methods of optimizing signal-to-noise ratio

Unit-IV: Digital Electronics (12 hr)

Binary logic concepts - logic gates - multivibrators - counters - wave shaping – analog to digital converters – instruments and digital computers

Unit-V: Instrumentation for Optical Absorption Spectrometry (12 hr)

Visual photometers (colorimeter) - filter photometer - the spectrophotometer - double beam spectrophotometer - recording spectrophotometers - optimal values of adjustable parameters - multiple internal reflection assembly rapid scanning spectrometer - non-dispersive photometers - photometric titration equipment - Fourier transform spectrometers

Textbook

 Strobel H A, Chemical Instrumentation A systematic approach to Instrumental Analysis, 2nd Ed., Addison-Wesley Publishing Company Inc, Philippines, 1973.

References

- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5th Ed., Longman Scientific & Technical, Essex, 1989.
- 2. Skoog D A, Holler F J and Crouch S R, *Principles of Instrumental Analysis*, 6th Ed., Thompson Brooks/Cole, Belmont CA, 2007.

4.1-5.0 Very High

81-100%

61-80% 4 3.1-4.0 High

41-60% 3 2.1-3.0 Moderate

> 2 1.1-2.0 Poor

> > 0.0-1.0 Very poor

Mapping Scale Relation Quality

21-40%

1-20%

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total of Values Total No. of POs & PSOs

Mean Score of COs =

Values Scaling:

Semester III 18PCH3202A

Hours/Week: 4 Credits : 3

Core Elective-IIA:

Lab Course: INORGANIC CHEMISTRY-I

Course Outcomes:

- 1. Qualitative analysis of common metals are learnt
- 2. Qualitative analysis of rare metals are learnt
- 3. Beer-Lamberts' law is understood
- 4. Colorimetric analysis of some common metals are learnt
- 5. Experimental conditions and setup for the general methods of preparation of complexes are learnt
- 6. Preparation methods of some inorganic complexes are understood

Experiments

- 1. Systematic qualitative analysis of mixtures containing 4 cations of which 2 are rare.
- 2. Colorimetric estimation of iron, copper, nickel and manganese.

References

- 1. Svehla G, Vogel's Textbook of Macro and Semimicro Qualitiative Inorganic Analysis, 5th Ed., Longman, London, 1979.
- 2. Ramanujam V, *Inorganic Semi-micro Qualitative Analysis*, 3rd Ed., National Publishing Company, Chennai, 1990.

Semester III 18PCH3202B

Hours/Week: 4 Credits : 4

Core Elective-IIB:

Lab Course:

CHARACTERIZATION OF COORDINATION COMPLEXES

Course Outcomes:

- 1. Determination of metal-ligand ratio is learnt
- 2. Estimation of charges on complexes is understood
- 3. Para and diamagnetic nature of complexes is understood
- 4. Determination of magnetic susceptibility of complexes is learnt
- 5. Uses of electronic spectra in the characterization of complexes are learnt
- 6. Use of IR data in determining the metal-ligand linkage is understood

Experiments

- 1. Job's method of determination of metal-ligand ratio
- 2. Conducivity studies
- 3. Magnetic studies Gouy method
- 4. Electronic spectra
- 5. IR spectral studies

Textbook

1. Svehla G, Vogel's Textbook of Macro and Semimicro Qualitiative Inorganic Analysis, 5th Ed., Longman, London, 1979.

Semester III 18PCH3302

Hours/Week: 4 Credits : 4

IDC-III (BS):

HEALTH CHEMISTRY

Course Outcomes:

- 1. Students learn the importance of basic nutrients and maintenance of good health
- 2. Students understand the classification of carbohydrates, proteins and vitamins
- 3. Students gain knowledge on drugs and their mode of action
- 4. Students learn the functions of body fluids
- 5. Students learn the factors affecting the blood pressure
- 6. Students learn the various digestion processes occurring in mouth, stomach, intestine and pancreas

Unit-I: Health and its maintenance (12 hr)

Health – Mental health and Physical health - Food Pyramid – Types of malnutrition – causes and remedies – Macro and micronutrients - Carbohydrates – Classification and their Biological functions, Proteins-Classification and their Biological functions, Vitamins – Classification and their Biological functions – Minerals (Fe, Ca, P, Na and K) and their biological functions

Unit-II: Drugs and their functions (12 hr)

Drugs – Classification of drugs – Drugs acting on CNS – General Anaesthetics, Hypnotics & sedatives, Narcotics, Antipyretics, Antirheumatics, Analgesics, Anticonvulsants and Antitussives – Chemotherapeutic drugs - antibiotics, antiseptics and disinfectants -Cardiovascular agents - Anti cancer drugs

Unit-III: Body fluids (12 hr)

Blood volume, Blood groups, Functions of blood, blood pressure, anemia, blood sugar, hemoglobin- chemistry of respiration-urine-electrolyte balance

Unit IV: Enzymes, Hormones, Digestion (12 hr)

Enzymes – Types and their action - Hormones and their biological functionsdigestion in mouth, stomach, intestine and pancreas

Unit-V: Common and Vitamin Deficiency Diseases (Online) (12 hr)

Jaundice, Typhoid, Dengue, Ulcer, Goiter, Diabetes, Rickets, Scurvy, Beriberi, Pellagra, Night blindness, – symptoms, causes and treatments.

Textbooks

- 1. Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009.
- 2. Deb A C, *Fundamentals of Biochemistry*, New Central Book Agency, Calcutta, 1994.
- 3. Satake M and Mido Y, *Chemistry for Health Science*, Discovery Publishing, House, New Delhi, 2003.
- 4. Jayashree Ghosh, A *Text book of Pharmaceutical Chemistry*, S. Chand and Co. Ltd, 1999.

Reference

 Ashutosh Kar, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993.

s Credits	Mean Score of	cos	4.07	3.61	3.85	3.46	3.77	3.46	3.70
Hours 4	Mea								
		PSO8	5	4	e	e	e	3	CO_S
		PS07	S	4	б	e	5	5	ore for
TRY	tcomes	PSO6	e	ς	б	e	ю	5	Aean So
r HEMIS	cific Ou Os)	PSO5	S	n	5	S	e	5	Overall Mean Score for COs
Title of the Paper IDC-III (BS): HEALTH CHEMISTRY	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	5	с	5	5	5	3	0
itle of th HEAI	rogram	PSO3	e	4	5	n	5	3	
I (BS)		PSO2	e	ю	б	e	5	3	
IDC-I		PSO1	4	5	б	S	ю	3	
		P05	5	5	5	e	з	3	
	itcomes	P04	5	ю	5	e	ю	3	
02	Programme Outcomes (POs)		4	4	4	3	3	3	
Code 18PCH3302	Prograi	P02	3	3	ю	e	3	3	
18		P01	3	б	б	e	5	3	
Semester	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

20

Result: The Score for this Course is 3.70 (High Relationship)

		11010			
Aapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Duality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total No.of POs & PSOs

Total of Values

11

Mean Score of COs

Semester IV 18PCH4115

Hours/Week: 4 Credits : 4

INORGANIC CHEMISTRY-IV

Course Outcomes:

- 1. Various structures of solid inorganic molecules are understood
- 2. Principles and applications of X-ray diffraction methods are learnt
- 3. Structural preferences of spinels and anti-spinels are understood
- 4. Structures of covalent crystals are understood
- 5. Various crystal defects are understood
- 6. Theories of solids and the concept of super conductivity are learnt

Unit-I: Solid State –I (12 Hours)

Elements of crystallography – space lattices-unit cell – crystal systems – Xray diffraction Bragg's method – Rotating crystal method and powder methods – indexing of crystal planes – Structure of typical lattices such as sodium chloride, cesium chloride, zinc blende, wurzite, rutile, fluorite, antifluorite, pervoskite and ReO₃

Unit-II: Solid State-II (12 Hours)

Spinels and anti-spinels – Applications of CFT – covalent crystals diamond and graphite –Crystal Structure and properties – Types of solids – stoichiometric defects – point, line and plane defects – colour centers – non-stoichiometric defects – n, p semiconductors – structure of solids – free electron and band theory of solids – Electrical conductivity and superconductivity – high temperature superconductors

Unit-III: Photochemistry [ONLINE] (12 Hours)

Laws of photochemistry – Photo physical processes –Jablonski diagram – Fluorescence – Phosphorescence – Kasha's rule – Stoke's shift – Types of electronic transitions in transition metal complexes – Photo chemistry of Cr(III) complexes – Photo substitution – Photo aquation – Adamson's rules – Photo rearrangement – Photo redox reations – *Photochemistry of organometallic compounds*.

Unit IV: Bio-inorganic Chemistry-I (12 Hours)

 $\begin{array}{l} \mbox{Structure and function of chlorophyll-Photo system I and Photo system II \\ - \mbox{light reactions and dark reactions - Mn Catalyzed oxidation of H_2O to O_2 in chlorophyll - Role of Mg^{2+} ion-Structure and function of Haemoglobin - Cooperative effect in Haemoglobin - Role of Globin - Structure and function of Myoglobin - Structure and function of Cytochrome C. \\ \end{array}$

70

Unit-V: Bio-inorganic Chemistry-II (12 Hours)

Structure and function of Blue copper proteins – Structure and function of Vitamin B_{12} – In-*vivo* nitrogen fixaction – Fe-S proteins – Ionophores – Ion transport mechanism in cell membrane –Na-K pump – Role of metal ions in DNA replication, transcription, translation – *Cis*-platin and its mode of action in the treatment of cancer

Textbooks

- 1. Keer HV, Principles of Solid State, Wiley Eastern Ltd, New Delhi, 1993.
- 2. Bertini I, Gray H B, Lippard S J and Valentine J S, *Bioinorganic Chemistry*, University Science Books, California, 1994.
- 3. Rohatgi-Mukherjee K K, *Fundamentals of Photochemistry*, New Age International Publishers, New Delhi, 2006.

References

- 1. Azaroff, *Introduction to Solids*, Tata McGraw Hill Publishing Co., New Delhi, 1994.
- 2. Evans R C, *Crystal Chemistry*, Cambridge University Press, London, 1964.
- 3. Addison W E, *Structural Principles of Inorganic Compounds*, Longman, London, 1961.
- 4. West A R, *Solid State Chemistry and its Applications*, 2nd Ed., John-Wiley and Sons Ltd., New York, 2014.
- 5. Wheatly P J, *The Determination of Molecular Structure*, Oxford University Press, London, 1959.
- Huheey J E, Keiter E A and Keiter R L, *Inorganic Chemistry Principles* of Structure and Reactivity, 4th Ed., Harper Collins College Publishers, New York, 1993.
- 7. Purcell K F and Kotz J C, *Inorganic Chemistry*, W B Saunders Company, Philadelphia, 1977.

Semester IV	18	Code 18PCH4115	5			Z	T ORGA	itle of t NIC C	Title of the Paper ANIC CHEMIST	Title of the Paper INORGANIC CHEMISTRY-IV	Ν			Hours 4	Credits 4
Course		Prograi	mme Ot	Programme Outcomes				rogran	nme Spo	Programme Specific Outcomes	utcome			Mean	Mean Score of
Outcomes		- H-	(POs)						(PS	(PSOs)				Ö	COs
(COs)	P01	P02	P03	P04	P05	PS01	PS02	PS03	PS04	PSO5	PSO6	P04 P05 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	PSO8)	2
C01	б	ю	4	5	5	4	ю	ю	5	S	3	5	5	4	4.07
C02	с	5	4	5	ы	5	5	5	5	4	с	e	5	4	4.23
CO3	б	4	4	5	5	4	4	5	5	5	ю	б	4	4	4.15
CO4	4	3	4	4	3	2	3	4	5	5	4	4	4	4	4.00
CO5	5	3	3	3	3	3	5	5	5	3	3	5	3	3	3.77
CO6	4	5	5	4	3	4	5	4	3	5	5	3	3	4	4.08
)	Dverall	Mean S	Overall Mean Score for COs	COs	4	4.03

Mapping Scale Relation Quality

4.1-5.0 Very High

3.1-4.0 High

2.1-3.0 Moderate

<u>1.1-2.0</u> Poor

0.0-1.0 Very poor

81-100%

61-80%

41-60%

21-40%

1-20%

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Total of Mean Scores

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Score for COs

Mean Overall

Total No. of POs & PSOs

11

Mean Score of COs

Total of Values

Values Scaling:

Total No. of COs

Semester IV	Hours/Week: 4
18PCH4116	Credits : 4

ORGANIC CHEMISTRY-IV

Course Outcomes:

- 1. Students learn and understand the stereochemical aspects of the chemical reactions
- 2. Students can learn and understand the asymmetric synthesis of organic molecules
- 3. Students understand the importance of stereochemical aspects of small ring system
- 4. Students learn the overview of the organic reaction mechanisms.
- 5. Students are motivated to know the concept of green chemistry.
- 6. Students understand the different types of green chemistry solvents

Unit-I: Regioselective and Diastereoselective Reactions (12 hr)

Regioselectivity: Regioselectivity in electrophilic and nucleophilic aromatic substitution, and in elimination reactions, electrophilic attack on alkenes, regioselectivity in radical reactions, nucleophilic attack on allylic compounds, electrophilic attack on conjugated dienes and conjugate addition. Diastereoselectivity: prochirality, Cram's rule and chelation effect, diastereoselectivity in aldol reaction, diastereoselective epoxidation.

Unit-II: Stereoselective Reactions in Cyclic systems (12 hr)

Reactions on small rings - stereochemical control in six membered rings - conformational control in the formation of six membered rings - stereochemistry of bicyclic compounds -fused bicyclic compounds - spirocyclic compounds-reactions with cyclic intermediates or cyclic transition states - stereoselective reactions of acyclic alkene compounds.

Unit III: Asymmetric Synthesis (12 hr)

Asymmteric synthesis-chiral auxiliaries- alkylation of chiral enolatesenantiomeric excess-optical purity-chiral reagents and chiral catalysisasymmteric hydrogenation-asymmetric epoxidation-asymmteric dihydroxylation

Unit-IV: Organometallics in Organic Synthesis (12 hr)

Introduction-Formation of organometallics : Oxidative insertion of Mg and Li into alkyl halides, deprotonation of alkyne, ortholithiation of functionalized benzene rings, halogen metal exchange, transmetallation – Applications Chan-Lam Coupling, Hiyama coupling - Corey-Fuchs Reaction, Me₂CuLi (Gillman's reagent), Heck reaction, Suzuki coupling, Stille coupling, Sonogashira reaction, Fukuyama Coupling - Negishi Coupling, Kumada Coupling

Organo main group chemistry containing Boron, Silicon and Tin: Hydroboration-oxidation-formation of C-O, C-N and C-C bonds-Nucleophilic substitution at silicon, allyl and vinyl silanes, Brook rearrangement, tinlithium exchange reaction and its application.

Unit-V: Green Chemistry (Online) (12 hr)

The twelve principles, atom economy for addition, elimination, substitution reactions ant its calculation, green starting materials, green reagents, green catalysts, green solvents and green reactions

Textbook

- 1. Clayden J, Greeves N, Warren S, and Wothers P, *Organic Chemistry*, Oxford University Press, New York, 2006.
- 2. Pine S H, *Organic Chemistry*, 5th Ed., Tata-McGraw Hill, New Delhi, 2006.
- 3. Morrison R T, Boyd R N, and Bhattacharjee, *Organic Chemistry*, 7th Ed., Pearson India, 2011.
- 4. Anastas P T, *Text Book on Green Chemistry*, Oxford University Press, 2006.

References

- 1. Smith M B and March J, March's *Advanced Organic Chemistry*, 6th Ed., John-Wiley and Sons, New York, 2007.
- 2. Bruice PY, Organic Chemistry, 6th Ed., Prentice Hall, 2013.
- 3. Finar I L, *Organic Chemistry* Vol. I and II, 6th Ed., ELBS with Longmann, Singapore, 1997.

Hours Credits 4 4	Mean Score of	COs	3.38	3.23	3.31	3.15	3.38	3.38	3.30
Hours 4	Mean	•							
		PSO8	5	5	5	5	5	5	· COs
		PSO7	4	4	4	4	3	3	core for
>	tcomes	PSO6	3	m	4	3	4	4	Mean S
Title of the Paper ORGANIC CHEMISTRY-IV	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	4	e	4	4	4	Overall Mean Score for COs
Title of the Paper NIC CHEMIST	nme Specifi (PSOs)	PSO4	4	3	3	3	4	4	
itle of tl IIC CH	rogran	PSO3	4	с	4	3	4	4	
T		PSO2	2	2	2	1	2	2	
0		PSO1	2	2	2	2	2	2	
			5	5	5	5	5	5	
	tcomes	P03 P04	4	4	4	4	4	4	
16	Programme Outcomes (POs)	P03	1		-	1	1	1	
Code 18PCH4116	Progra	P02	4	4	4	4	4	4	
18		P01	2	7	7	2	2	2	
Semester IV	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	C06	

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Result: The Score for this Course is 3.3 (High Relationship)

		Note:	te:		
Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs	
Valu	Total of Values	Total No. of POs & PSOs	
	Maan Soona of COs =		

Semester IV 18PCH4117

Hours/Week: 4 Credits:4

PHYSICALCHEMISTRY-III

Course Outcomes:

- 1. Students learn and understand the concept of EMF and its Applications
- 2. Polarography and its application is well understood
- 3. Students learn and understand the concepts and Instrumentation of Amperometry
- 4. The underlying concepts of Cyclic voltammetry is well understood
- 5. Students learn and understand the concepts of Electrogravimetry and Coulometry
- 6. The concept of applications of quantum chemistry is learnt

Unit I: EMF Measurements and Applications (Online) (12 hr)

EMF and thermodynamics quantities - Nernst equation - Gibb's Helmoltz relation and EMF - Reversible electrodes - Types of electrodes - Hydrogen - Oxygen - chlorine electrodes - metal-metal ion electrode - metal - metal insoluble salt electrode - electrode potentials - Single electrode potential electrochemical series - chemical cells - concentration cells with and without transference- Applications of EMF measurements - Activity coefficients and solubility determination- Storage and Fuel cells.

Unit II: Electroanalytical Techniques - I (12 hr)

Polarography - Experimental set up - Advantages of dropping mercury electrode - Supporting electrolyte - Polarographic peak Maxima - types of peak maximas - Polarographic peak Maxima suppressor - Residual current -Migration current - Diffusion current - Polarogram - Half wave potential -Ilkovic equation (derivation is not required) - Outline of applications (Polarogram of Zn²⁺ and Cd²⁺) - Cyclic voltametry, Principle, Experimental set up - Cyclic voltammogram of Fe²⁺ in H₂SO₄ - Anodic peak current -Cathodic peak current - Electrochemically reversible couple - Cathodic peak potential - Anodic peak potential - Electrochemically irreversible couple -Outline of applications.

Unit-III: Electro analytical Techniques II (12 hr)

Amperometry - Principle of amperometric titration - Different types of current voltage curves - Amperometric titration between Pb²⁺ vs K₂Cr₂O₇ Pb²⁺ vs SO²⁻, SO²⁻ vs Pb²⁺Ni²⁺vs DMG Electrogravimetry - Principle - Experimental set up - Physical characteristics of metal deposits - Separation of Cu & Ni-Coulometry - Principle, Experimental set up - Controlled potential Coulometric analysis and application - Experimental set up for Constant current Coulometry - Coulometric - Titration of Fe(II) with Cerium(III).

Unit-IV: Applications of Quantum Chemistry-I (12 hr)

Approximation methods - Need for approximation - Perturbation Theory -Time independent Perturbation (First order only) - Application of Perturbation theory to particle in one dimensional box - Anharmonic oscillator and helium atom - Principle of variation and its proof - Trial function and secular determinant- Variation methods and its applications to Hydrogen and Helium atoms - Particle in one dimensional box.

Unit-V: Applications of Quantum Chemistry-II (12 hr)

The Born - Oppenheimer approximation, VB theory of hydrogen molecule and MO theory of hydrogen molecular ion (H^{2+}) - Coulomb integral, Exchange integral and Overlap integral, Detailed calculation of energy and overlaps. Construction of sp, sp² and sp³ hybrid orbitals, Huckel molecular orbital theory - Principles and applications to ethylene, butadiene, benzene, cyclobutadiene, trimethylamine, bicyclobutadiene and allyl systems. Hartee - Fock method, Self consistent field method and Roothan equations.

Textbooks

- 1. Willard, Merit, Dean and Settle, *Instrumental Methods of Analysis*, CBS Publication New Delhi, 1986.
- 2. Anatharaman R, *Fundamentals of Quantum Chemistry*, McMillan, New Delhi, 2001.
- 3. Prasad R K, *Quantum Chemistry*, Revised 4rd Ed., New age international (P) Ltd., New Delhi, 2008.
- 4. Donald A McQuarrie, *Quantum Chemistry*, 2nd Indian Edition, Viva Books Private Ltd., 2008.

References

- 1. Vogel A I, Text book of Quantitative Inorganic Analysis, ELBS, 1978.
- Levine I N, Quantum chemistry, 6th Ed., PHI Learning Private Limited, 2009.
- 3. Noel M and Vasu K I, *Cyclic voltammetry and the Frontiers of Electrochemistry*, Oxford and IBH, 1990.
- 4. Kissinger P T and Heinman, Laboratory Techniques in Electroanalytical Chemistry, Editors, Marcel, Dekker, *Inc.*, New York, 1984.
- Puri Sharma and Pathania, *Principles of Physical Chemistry*, Vishal Publishing Co., 47th Edition, 2017.

Programme OutcomesProgramme Specific OutcomesMean Score of(POs)PO3PO4PO5PSO1PSO2PSO3PSO4PSO5PSO7PSO8PO2PO3PO4PO5PSO1PSO2PSO3PSO4PSO5PSO7PSO84433433433.53433333433.4643333333.464333333.323.23
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5 4 3 4 5 3 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
2 3 4 3 4 3 3 4 3 3 4 3 4 3
Overall Mean Seere for COs

Very High

3.1-4.0 High

2.1-3.0 Moderate

<u>1.1-2.0</u> Poor

0.0-1.0 Very poor

4.1-5.0

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Scale Relation Quality

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Total of Mean Scores

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Score f

Mean Overall

Total No.of POs& PSOs

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Mean

Total of Values

Values Scaling:

COs

Total No. of

Semester IV 18PCH4118

Hours/Week: 4 Credits : 3

Lab Course:

INORGANIC CHEMISTRY-II

Course Outcomes:

- 1. Principles behind volumetric and gravimetric techniques are learnt
- 2. Separation of metal ions in binary mixtures are learnt
- 3. Quantification methods of metal ions are learnt
- 4. Estimation of iron and copper are understood
- 5. Estimation of volumetric and gravimetric analysis of Zn are understood
- 6. Simple single stage preparations of some complex compounds are learnt

Experiments

- 1. Quantitative analysis of a mixture of iron (volumetry) and copper (gravimetry)
- 2. Quantitative analysis of a mixture of copper (volumetry) and nickel (gravimetry)
- 3. Quantitative analysis of a mixture of iron (volumetry) and zinc (gravimetry)
- 4. Quantitative analysis of a mixture of copper (volumetric) and zinc (gravimetry)
- 5. Preparation of any three complexes

References

- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5th Ed., Longman Scientific & Technical, Essex, 1989.
- 2. Department Material, St. Joseph' College (Autonomous), Tiruchirappalli-620002.

Semester IV 18PCH4203A

Hours/Week: 4 Credits : 4

Core Elective-IIIA

NATURAL PRODUCTS

Course Outcomes:

- 1. Students know the structure of carbohydrates
- 2. Students learn the mechanism of photosynthesis and citrate cycle
- 3. Students learn the biosynthesis as well as chemical synthesis of proteins
- 4. Students learn the protecting and deprotecting groups of some functional groups
- 5. Students learn how to elucidate the structures of some natural products
- 6. Students study the chemistry of important heterocycles

Unit-I: Carbohydrates (12 hr)

Carbohydrates – Ring structures of glucose and fructose – Fischer's proof for the configuration of D-(+) glucose – Citric acid cycle – Structure of fructose, sucrose, maltose, lactose and cellobiose – Structural difference between starch and cellulose – Uses of cellulose derivatives

Unit-II: Proteins and Nucleic Acids (12 hr)

Amino acids – Synthesis of á-amino acids (Strecker synthesis and Gabriel synthesis) – Peptides – Synthesis of dipeptides and polypeptides (Merrifield resin synthesis) – End group analysis – structure of proteins – primary, secondary, tertiary and quaternary.

$$\label{eq:linear} \begin{split} \text{Nucleic acids - Purine and Pyrimidine bases - nucleosides and nucleotides-structure of DNA-Biosynthesis of proteins} \end{split}$$

Unit-III: Alkaloids, Terpenoids and Antibiotics (12 hr)

Alkaloids: Introduction – occurrence and extraction – classification – structural elucidation of papaverine only.

Terpenoids: Introduction – extraction – isoprene rule - classification – structural elucidation of Zingiberene only.

Antibiotics: Structure-activity relationship of chloramphenicol – structure and medicinal uses of penicillin, streptomycin and terramycin.

Unit-IV: Heterocycles (12 hr)

Preparation, physical properties and reactions of five-membered and sixmembered heterocyclics containing one hetero atom (pyrrole, furan, thiophene & indole, pyridine, quinoline and isoquinoline) – Five-membered heterocycle containing two nitrogen atoms (imidazole) Only the structures and numbering and naming of diazins (pyrazine, pyrimidine and pyrazine), azines (oxazine and azepine).

Unit-V: Hormones (Online) (12 hr)

Hormones – Introduction – chemical nature – Prostaglandins-structure (structural elucidation not required). Structural elucidation of cholesterol (synthesis not required). Sex hormones – Stucture and properties of oestrone, equilinin, androsterone, testosterone (elucidation not required).

Textbooks

1. Finar I L, *Organic Chemistry* Volume I and II, 6th Ed., ELBS with Longmann, Singapore, 1997.

References

- Bruice P Y, Organic Chemistry, 3rd Ed., Pearson Education, New Delhi, 2012.
- 2. Gosh J. *Textbook of Pharmaceutical Chemistry*, S. Chand & Chand publications New Delhi, 1997.
- 3. Anand Solomon K, Chemistry of Natural Products, MJP Publishers, Chennai, 2012.
- 4. Hoffmann R W, Classical Methods in Structural Elucidation of Natural Products, Wiley VCHA, Switzerland, 2014.

Hours Credits	4	Mean Score of	8	4.15	3.85	3.92	3.54	3.85	3.46	3.79	Davelle, The Same for this Course is 3 70 (III:ch Deletion)
			PSO	5	4	3	3	ŝ	3	r COs	
Q	2		PSO7	5	4	3	3	S	5	core fo	
	IDOC	itcomes	PSO6	3	3	3	3	ю	5	Mean S	
r Dag	TLKK	scific Oı Os)	PSO5	5	ы	5	5	я	5	Overall Mean Score for COs	0.000
Fitle of the Paper	Core Elective-IIIA: NAI UKAL PRUDUCIS	Programme Specific Outcomes (PSOs)	PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8	5	4	5	5	5	3	C	l Th
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Code	18PCH4203A	Programme Outcomes (POs)	P02	3	e	3	3	3	3		
101	181		P01	3	Э	3	3	5	3		
Semester	N	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	C06		

Very High

3.1-4.0 High

2.1-3.0 Moderate

1.1-2.0 Poor

Very poor

0.0 - 1.0

Scale Relation Quality

4.1-5.0

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

4

Total of Mean Scores

Mean Overall Score for COs =

Total No. of POs & PSOs

Total of Values

Mean Score of COs =

Values Scaling:

No. of COs

Total

Semester IV 18PCH4203B

Hours/Week: 4 Credits : 4

Core Elective-IIIB PHARMACEUTICAL CHEMISTRY

Course Outcomes:

- 1. Students understand the design, structure and activity relationship of drugs.
- 2. Students learn various modes of spread of common diseases and their treatment.
- 3. Students learn the advanced drugs for new diseases.
- 4. Students learn the mechanism of action of drugs on the biological systems
- 5. Students learn the structure of important drugs
- 6. Students get to know the importance of anti-biotics and anti-septics

Unit-I: Introduction to Chemistry of Drugs (12 hr)

Drugs - definition- sources- study of drugs -classification (Biological chemical, commercial and utility)-Nomenclature of drugs- Biotransformation-Drug design - factors affecting the stability of drugs- Encapsulation – drug delivery systems and sustained release of drugs.

Unit-II: Pharmaceutical Aids (Online) (12 hr)

Preservatives- Antioxidants- Sequestering agents- Emulsifiers- Colorantsm Flavoring agents - Sweeteners – Stabilizers - suspending agents- Ointment bases- Solvents.

Unit-III: Common Diseases and Treatment (12 hr)

Insect borne diseases - Treatment using drugs - Air borne diseases-Treatment using drugs - water borne diseases- Treatment using drugs-Digestive disorders - treatment- diseases of respiratory system- treatment diseases of nervous system - treatment - other common diseases- treatment.

Unit-IV: Pathogenicidal Drugs (12 hr)

Antibiotics - Classification- Chloramphanicol- penicillin-streptomycin-Tetracycline -Macrolides-Erythromycin - Rifamycin- Antiseptics and disinfectants - Phenols Halogen compounds - Analgesics - Antipyretics -Anti -inflammatory agents - Sulpha drugs.

Unit-V: Bio Regulatory Drugs (12 hr)

Cardiovascular drugs - Cardiac glycosides - anti arrhythmic drugs - antihypertensive agents - antianginal agents. Diabetes and Hypoglycaemic

drugs - two types of diabetes – Diabetes insipidus and diabetes mellitus -Control of diabetes - Insulin -Hypoglycaemic agents. Anticonvulsants -Cancer and antineoplastic drugs - Common causes - antimetabolites

Text Books:

- 1. Gosh J, Text Book of Pharmaceutical Chemistry, S. Chand & Chand Publications, New Delhi, 1997.
- Srivastava, S K, A Complete Text Book of Medical Pharmacology, Volumes I and II, 2nd Edition, Avichal Publishing Company, Kolkatta, 2012.

Reference

- 1. Deb A C, Fundamentals of Biochemistry, New Central Book Agency, Calcutta, 1994.
- 2. Satake M and Mido Y, Chemistry for Health Science, Discovery Publishing House, New Delhi, 2003.
- 3. Ashutosh Kar, Medicinal Chemistry, Wiley Easterns Limited, New Delhi, 1993.

Credits 4	Mean Score of	COs	4.15	3.85	3.92	3.54	3.85	3.46	3.79
Hours 4	Mean	•							
X		PSO8	5	4	3	3	3	3	· COs
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CHEN	rtcomes	PSO6	e	e	3	3	3	5	Mean S
r FICAL	Programme Specific Outcomes (PSOs)	PSO5	5	m	2	5	3	5	Overall Mean Score for COs
Title of the Paper HARMACEUT	ıme Specifi (PSOs)	PSO4	5	4	2	5	5	ю	
itle of tl IARM	rogran	PSO3	n	4	5	3	5	ю	
Title of the Paper Core Elective-IIIB: PHARMACEUTICAL CHEMISTRY	1	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	ю	3	4	5	3	
ctive-I		PS01	4	5	4	5	3	с	
ore Ele		P05	5	5	5	3	3	с	
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3B	Programme Outcomes (POs)		4	4	4	3	4	3	
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181		P01	e	n	3	3	5	с	
Semester IV	Course Outcomes	(COs)	C01	C02	CO3	C04	C05	C06	

Result: The Score for this Course is 3.79 (High Relationship)

86

		Note:	te:		
Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

60
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Mean Overall Score for COs = Total of Mean Scores	
Total of Values	Total No. of POs & PSOs
Moon Coono of COs -	

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Notes

B.Sc. CHEMISTRY LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF CHEMISTRY SCHOOL OF PHYSICAL SCIENCES ST.JOSEPH'S COLLEGE (AUTONOMOUS)

Special Heritage Status Awarded by UGC, Accredited at A⁺⁺ Grade (IV Cycle) by NAAC College with Potential for Excellence by UGC, DBT-STAR & DST-FIST Sponsored College Tiruchirappalli - 620 002, Tamil Nadu, India

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS) UNDERGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to maintain and uphold the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014 - 15, to meet and excel the challenges of the 21^{st} century.

Each School integrates related disciplines under one roof. The school system enhances the optimal utilization of both human and infrastructural resources. It also enhances academic mobility and enriches employability. The School system preserves the identity, autonomy and uniqueness of every department and reinforces Student centric curriculum designing and skill imparting. These five schools adhere to achieve and accomplish the following objectives.

Optimal utilization of resources both human and material for the academic flexibility leading to excellence.

Students experience or enjoy their choice of courses and credits for their horizontal mobility.

The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.

Human excellence in specialized areas

Thrust in internship and / or projects as a lead towards research and

The multi-discipline nature of the School System caters to the needs of stake-holders, especially the employers.

Credit system:

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The credits and hours of each course of a programme is given in the table of Programme Pattern. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For UG courses, a student must earn a minimum of 130 credits as mentioned in the programme pattern table. The total number of minimum courses offered by the Department is given in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

OBE is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no single specified style of teaching or assessment in OBE; instead, classes, opportunities and assessments should all help the students achieve the specific outcomes

Outcome Based Education, as the name suggests depends on Outcomes and not Inputs. The outcomes in OBE are expected to be measurable. In fact each Educational Institute can state its own outcomes. The ultimate goal is to ensure that there is a correlation between education and employability

Outcome –Based Education (OBE): is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve, stated objectives and outcomes. It focuses on measuring student performance i.e. outcomes at different levels.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs):

PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Programme Educational Objectives (PEOs): The PEOs of a programme are the statements that describe the expected achievement of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the first few years after Graduation.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC)

A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE)

Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

DSE: Four courses are offered, two courses each in semester V and VI

Note: To offer **one DSE**, a minimum of two courses of equal importance / weightage is a must.

A department with two sections must offer two courses to the students.

One DSE Course may be offered as interdisciplinary course among the departments in a School (Common Core Course) at the PG level.

Generic Elective Courses

An elective course chosen generally from an **unrelated discipline/subject**, with an intention to seek exposure is called a Generic Elective.

Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Two GE Courses are offered one each in semesters V and VI.

(open to the students of other Departments)

The Ability Enhancement Courses (AEC)

"AECC" are the courses based upon the content that leads to Knowledge enhancement; Communicative English, Environmental Science. These are mandatory for all disciplines.

AECC-1: Communicative English: It is a 4 credits compulsory course offered by the Department of English in the first semester of the Degree Programme, Classes are conducted outside the regular class hours.

AECC-2: Environmental Science: is a 2 credit course offered as a compulsory course during the second semester by the Department of Human Excellence.

Skill Enhancement Courses (SECs)

These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme.

These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

There are four courses under this category

SEC-1 is offered in semester **III as a course** Within the Department **(WD)** it is More of main discipline related skills.

SEC-2is offered in semester IV as a course Between schools (BS) Offered to students of other schools (Except the school offering the course)

SEC-3 is offered in semester V as a compulsory course on Soft Skills offered by the Department of Human Excellence, common to all the students of UG programme.

SEC-4 is offered in semester **VI** as a course **Within School (WS)** Open to all the students within the same school (including the students of the parent department)

Self–paced Learning: It is a course for two credits. It is offered to promote the habit of independent/self learning of Students. Since it is a two credit course, syllabus is framed to complete within 45 hours. It is not taught in the regular working hours.

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Comprehensive Examinations: A detailed syllabus consisting of five units to be chosen from the courses offered over the five semesters which are of immense importance and those portions which could not be accommodated in the regular syllabus.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL and etc.

Undergraduate Programme:

Programme Pattern:

The Under Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part -I : Languages (Tamil / Hindi / French / Sanskrit)

Part-II : General English

Part-III : Core Course (Theory, Practicals, Discipline Specific Electives, Compulsory and Optional Allied courses, Project, Self paced courses, Internship , Comprehensive Examinations and field visit /industrial visit/Case Study)

Part-IV: Value Education, Ability Enhancement Courses, Skill Enhancement Courses/ Soft Skills, Generic Electives/ National Cadet Corps etc.

Part-V: Outreach Programme (SHEPHERD).

Ability Enhancement Courses (AEC): There are two Ability Enhancement courses viz AECC and SEC.

Value Education Courses:

There are four courses offered in the first four semesters for the First & Second UG Programme.

Course Coding

The following code system (11 alphanumeric characters) is adopted for Under Graduate courses:

21	UXX	Ν	Ν	XX	NN/NNX
Year of	UG Department	Semester	Part	Part	Running
Revision	Code	number	specification	Category	number/with choice

N:- Numeral X :- Alphabet Part Category GL - Languages (Tamil / Hindi / French / Sanskrit) GE - General English CC - Core Theory; CP- Core Practical WS- Workshop **SP- Self Paced Learning IS-** Internship **FV- Field visit CE-** Comprehensive Examination PW- Project Work& viva-voce **Electives Courses ES** – Department Specific Electives EG- Generic Electives **Allied Courses** AC - Allied Compulsory **AO-** Allied Optional EC - Additional Core Courses for Extra Credits (If any)* **Ability Enhancement Courses** AE - Ability Enhancement Compulsory Courses; Bridge Course and Environment Science SE – Skill Enhancement (WD), (BS), (WS) and Soft skills VE - Value Education/ Social Ethics/Religious Doctrine OR – Outreach SHEPHERD & Gender Studies (Outreach)

SU - AICUF / Nature Club / Fine Arts / NCC / NSS /etc. (Service Unit)

CIA AND SEMESTER EXAMINATION Continuous Internal Assessment (CIA):

Continuous Internal Assessment (CIA).					
Distribution of CIA Marks					
Passing Minimum: 40 Marks					
Library Referencing 5					
3 Components	35				
Mid-Semester Test	30				
End-Semester Test	30				
Total CIA	100				

MID-SEM & END – SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective and Descriptive elements; with the below mentioned question pattern PART-A; PART-B; PART-C and PART D.

2. One of the CIA Component II/III for UG & PG will be of 15 marks and compulsorily a online objective multiple choice question type.

3. The online CIA Component must be conducted by the Department / faculty concerned at a suitable computer centre.

4. The 7 marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS.

5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.

6. English Composition once a fortnight will form one of the components for UG general English

Duration of Examination must be rational; proportional to teaching hours 90 minuteexamination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

S. No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level)		ver Or hinkin			gher O Thinkir		Total
K- LEVELS	K1	K2	K3	K4	K5	K6	%
SEMESTER EXAMINATIONS	15	20	35	30		100	
MID / END Semester TESTS	12	20	35	33		100	

QUESTION PATTERN FOR SEMESTER EX	XAMINATION	
SECTION		MARKS
SECTION–A (No choice ,One Mark) THREE questions from each unit	(15x1 =15)	15
SECTION-B (No choice ,2-Marks) TWO questions from each unit	(10x2 = 20)	20
SECTION-C (Either/or type) (7- Marks) ONE question from each unit	(5x7 =35)	35
SECTION-D (3 out of 5) (10 Marks) ONE question from each unit	(3x10=30)	30
	Total	100

BLUE PRINT OF QUESTION PAPER	FOR	SEM	ESTI	ER E	XAM	INAT	TION
DURATION: 3. 00 Hours.	DURATION: 3. 00 Hours. Max Mark : 100						ark : 100
K- LEVELS	K1	K2	K3	K4	K5	K6	Total
SECTIONS							Marks
SECTION–A (One Mark, No choice)	15						15
(15x1=15)	15						15
SECTION-B (2-Marks, No choice)	10					20
(10x2=20)		10					20
SECTION-C (7- Marks) (Either/or type)		5				35
(5x7=35)			5				33
SECTION-D (10 Marks) (3 out of 5)				3			
(3x10=30)							
Courses having only K4 levels							
Courses having K4 and K5 levels				2	1		30
One K5 level question is compulsory				2	1		
(Courses having all the 6 cognitive levels							
One K5 and K6 level questions can be				1	1	1	
compulsory							
Tota	l 15	20	35		30		100

	QUESTION PATTERN FOR	MID/END TEST	
SECTIONS			MARKS
SECTION-A	(No choice, One Mark)	(7x1 =7)	7
SECTION-B	(No choice, 2-Marks)	(6x2 =12)	12
SECTION-C	(Either/or type) (7- Marks)	(3x7 =21)	21
SECTION-D	(2 out of 3) (10 Marks)	(2x10=20)	20
		Total	60

BLUE PRINT OF QUESTION PAPER FOR MID/END TEST							
DURATION: 2. 00 Hours.					Μ	ax M	ark: 60.
K- LEVE	LS K1	K2	K3	K4	K5	K6	Total
SECTIONS							Marks
SECTION -A	7						07
(One Mark, No choice) $(7 \times 1 = 7)$							
SECTION-B		6					12
(2-Marks, No choice) $(6 \times 2 = 12)$	2)						
SECTION-C			3				21
(Either/or type) (7- Marks) $(3 \times 7 = 21)$)						
SECTION-D				2			
(2 out of 3) (10 Marks) (2x10=20)							
Courses having only K4 levels							20
Courses having K4 and K5 levels				1	1		20
One K5 level question is compulsory							
Courses having all the 6 cognitive levels					1	1]
One K6 level question is compulsory							
Total Marks		12	21	20	•	•	60
Weightage for 100	0% 12	20	35	33			100

Assessment pattern for two credit courses.

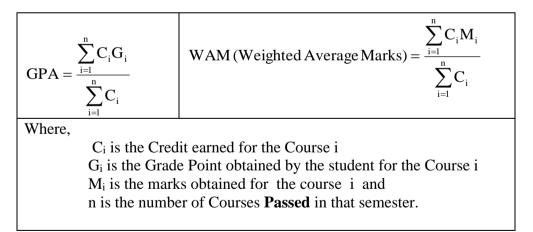
S. No.	Course Title	CIA	Semester Examination			
1	Self Paced Learning Course	25 + 25 = 50	50 Marks (MCQ) (COE)	100		
2	Comprehensive Examinations	25 + 25 = 50	50 Marks (MCQ) (COE)	100		
3	Internship	100		100		
4	Field Visit	100		100		
5	Ability Enhancement Course (AEC) for PG	50 (Three Components)	50 (COE) (Specific Question Pattern)	100		
Assess	nent Pattern for Courses in Pa	rt - IV				
6	Value Education Courses and Environmental Studies	50	50 Marks (For 2.00 hours) (COE)	100		
7	Skill Enhancement Courses(SECs)	50 marks (by Course in-charge) 50 Marks (by an External member from the Department)				
8	SEC: SOFT SKILLS (For UG and PG)	100	(Fully Internal)	100		

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) respectively. These two are calculated by the following formulae:



CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

- i) For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.
- ii) For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management/Literature as Outstanding/Excellent/Very Good/Good/Above Average/Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in the all the Five parts of the Prgoramme.
- iii) Grade in Part –IV and Part-V shall be shown separately and it shall not be taken into account for classification.
- iv) A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.
- v) Absence from an examination shall not be taken an attempt.

Marks Range	Grade Point	Corresponding Grade
90 and above	10	0
80 and above and below 90	9	A+
70 and above and below 80	8	Α
60 and above and below 70	7	B +
50 and above and below 60	6	В
40 and above and below 50	5	С
Below 40	0	RA

Table-1: Grading of the Courses

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result					
9.00 and above	0	Outstanding					
8.00 to 8.99	A+	Excellent					
7.00 to 7.99	Α	Very Good					
6.00 to 6.99	B +	Good					
5.0 0 to 5.99	В	Above Average					
4.00 to 4.99	С	Average					
Below 4.00	RA	Re-appearance					

Credit based weighted Mark System is adopted for the individual semesters and cumulative semesters in the column 'Marks secured' (for 100)

Declaration of Result

Mr./ MS. ______ has successfully completed the Under Graduate in _______ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part – III is ______ and the class secured is ______ by completing the minimum of 130 credits. The candidate has acquired ______ (if any) more credits from SHEPHERD / AICUF/ FINE ARTS / SPORTS & GAMES / NCC / NSS / NATURE CLUB, ETC. The candidate has also acquired ______ (if any) extra credits by attending MOOC courses.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

The Programme Outcomes (POs)/Programme Specific Outcomes(PSOs) are the qualities that must be imbibed in the graduates by the time of completion of their programme. At the end of each programme the PO/PSO assessment in done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

For each Course, there are five Course Outcomes to be achieved at the end of the course. These Course outcomes are framed to achieve the POs/PSOs. All course outcomes shall have linkage to POs/PSOs in such a way that the strongest relation has the weight 3 and the weakest is 1. This relation is defined by using the following table.

Mapping	<40%	\geq 40% and < 70%	$\geq 70\%$
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

Mean Scores of COs = $\frac{1}{\text{Total}}$	Mean Ov	erall Score = $\frac{\text{Sum o}}{\text{Tota}}$	f Mean Scores al No.of COs	
			< 1.2	# Low
Result Mean Ov		Score	\geq 1.2 and < 2.2	# Medium
			≥ 2.2	# High

If the mean overall score is low then the course in charge has to redesign the particular course content so as to achieve high level mean overall score.

Vision

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

Mission

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.
- Nurturing comprehensive learning and best practices through innovative and valuedriven pedagogy.
- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

Programme Educational Objectives (PEOs)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

Programme Outcomes (POs)

- 1. Graduates will be able to apply the concepts learnt, in real life situations with analytical skills.
- 2. Graduates with acquired skills and enhanced knowledge will be employable/ become entrepreneurs or will pursue higher Education.
- 3. Graduates with acquired knowledge of modern tools and communicative skills will be able to contribute effectively as team members.
- 4. Graduates will be able to read the signs of the times analyze and provide practical solutions.
- 5. Graduates imbibed with ethical values and social concern will be able to appreciate cultural diversity, promote social harmony and ensure sustainable environment.

Programme Specific Objectives (PSOs)

- 1. Graduates will be able to understand the concepts in chemistry and apply in real life situations with analytical proficiency.
- 2. Graduates with acquired practical skills and enhanced theoretical knowledge will be employable or entrepreneurs or will pursue higher education.
- 3. Graduates with acquired knowledge of advanced tools in chemistry and communicative skills will be able to contribute effectively as team members.
- 4. Graduates will be able to recognize, analyze, and provide practical solutions to ever demanding chemistry based issues.
- 5. Graduates inculcated with ethical, scientific social responsibility will be able to create sustainable chemical alternatives to the contemporary environmental challenges.

			B.Sc. CHEMISTRY						
			PROGRAMME PATTERN						
			Course Details			Scheme of Exan			
Sem	Part	Code	Hrs	Cr	CIA	SE	Fina		
		21UTA11GL01	General Tamil - I						
	1	21UFR11GL01	French-I		2	100	100	100	
	1	21UHI11GL01	Hindi-I	4	3	100		100	
		21USA11GL01	Sanskrit-I						
	2	21UEN12GE01	General English -I	5	3	100	100	100	
T	3	21UCH13CC01	General Chemistry – I	4	4	100	100	100	
Ι	3	21UCH13CC02	Organic Chemistry – I	3	2	100	100	100	
	3	@	Chemistry Practical–I	3	*				
	3	@	Chemistry Practical–II	3	*				
	3	21UCH13AC01	Allied: Mathematics for Chemistry -I	6	4	100	100	100	
	4	21UEN14AE01	AECC–1: Communicative English	4	100	-	100		
	4	21UHE14VE01	Essentials of Humanity	(6) 2	1	50	50	50	
	1		Total	30	21				
		21UTA21GL02	General Tamil - II						
		21UFR21GL02	French-II			100	100	100	
1	21UHI21GL02	Hindi-II	Hindi-II 4 3						
		21USA21GL02	Sanskrit-II						
2	21UEN22GE02	General English -II	5	3	100	100	100		
3 21UCH23CC03 General Chemistry – II				5	5	100	100	100	
II <u>3</u> 2		21UCH23CP01	Chemistry Practical–I	3	2	100	100	100	
		21UCH23CP02	Chemistry Practical–II 3		2	100	100	100	
	3	21UCH23AC02	Allied: Mathematics for Chemistry-II	6	4	100	100	100	
	4	21UHE24AE02	AECC–2: Environmental studies	2	2	50	50	50	
		21UHE24VE02	Techniques of Social Analysis: 2 1				50	50	
	4		Fundamentals of Human Rights	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					
			Extra Credit Courses (MOOC)–1	_	(2)				
			Total	30	22(2)				
		21UTA31GL03	General Tamil - III	30	22(2)				
	1	21UFR31GL03	French- III	4	3	100	100	100	
		21UHI31GL03	Hindi- III						
		21USA31GL03	Sanskrit- III	-	2	100	100	100	
	2	21UEN32GE03	General English - III	5	3	100	100	100	
III	3	21UCH33CC04	General Chemistry – III	4	3	100	100	100	
111	3	21UCH33CC05 @	Organic Chemistry – II CORE – @: Chemistry Practical–III	4	3	100	100	100	
	3	-	•	3					
		21UCH33AO03A	Allied Optional : Physics-I	4	2	100	100	100	
	3	21UCH33AO03B	Allied Optional : Principles of Electronics-I	4	3	100	100	100	
	5	@	Physics Practical						
		@	Electronics Practical	2					
	4	21UCH34SE01A	SEC –1 (WD): Chemical Instrumentation – I					<u> </u>	
		21UCH34SE01B	SEC –1(WD):Chemical Instrumentation – II	2	1	100	-	100	
		1							
	4	21UHE34VE03A	Professional Ethics–I: Social Ethics - I			50	50	50	

			Extra Credit Courses (MOOC)–2		(2)			
			Total	30	17(2)			
		21UTA41GL04B	Scientific Tamil (SBS, SPS,SCS)					100 100 100 100 100 100 100 100
		21UFR41GL04	French- IV			100	100	100
	1	21UHI41GL04	Hindi- IV	4	3	100	100	100
		21USA41GL04	Sanskrit- IV					
	2	21UEN42GE04	General English - IV	5	3	100	100	100
	3	21UCH43CC06	General Chemistry – IV	4	3	100	100	100
	3	21UCH43CC07	General Chemistry – V	4	3	100	100	100
	3	21UCH43CP03	Chemistry Practical – III	3	2	100	100	100
IV	3	21UCH43AO04A	▲ · · · · · · · · · · · · · · · · · · ·	-				
	3	21UCH43AO04B	Allied Optional: Communication Electronics	4	3	100	100	100
	3	21UCH43AP01A	Allied Optional: Physics Practical	2	2	100	100	100
	3	21UCH43AP01B	Allied Optional: Electronics Practical	2	2	100	100	100
		21UCH44SE02A	SEC –2 (BS): Health Chemistry					100
	4	21UCH44SE02B	SEC –2 (BS): Industrial Chemistry	2	1	100	-	100
	4	21UHE44VE04A	Professional Ethics-II:Social Ethics - II	2	1	50	50	50
	-	21UHE44VE04B		2	1	50	50	50
			Total Inorganic Chemistry – I	30	21			
	3	21UCH53CC08	6	5	100	100	100	
	3	@	Chemistry Practical–IV	4	*			
	3	@	Chemistry Practical–V	4	*			
		21UCH53ES01A	DSE1:Organic Spectroscopy					
	3	21UCH53ES01B	DSE1: Organic Synthesis and Characterization	5	3	100	100	100
		21UCH53ES02A	DSE–2:Physical Chemistry- I	_		100	100	100
V	3	21UCH53ES02B	DSE–2:Physical Chemistry -II	5	3	100	100	100
	3	21UCH53IS01	Internship	_	2	100		100
	3	21UCH53SP01	Self–paced Learning: Essentials of Chemistry	-	2	50	50	50
	3	21UCH53FV01	Field study/ Industrial visit/ Case study	_	1	100		100
	4	21USS54SE03	SEC –3 : Soft Skills	2	1	100	-	100
	4	21UCH54EG01A	GE–1:Chemistry for Competitive	4	3	100	100	100
		21UCH54EG01B	GE–1:Everyday Chemistry					
			Extra Credit Courses (MOOC)-3	_	(2)			
	I	·	Total	30	20(2)			
	3	21UCH63CC09	Chemistry of Biomolecules	6	5	100	100	100
	3	21UCH63CP04	Chemistry Practical–IV	4	3	100	100	100
•	3	21UCH63CP05	Chemistry Practical–V	4	3	100	100	100
VI	3	21UCH63ES03A	DSE-3:Inorganic Chemistry–II					
		21UCH63ES03B	DSE-3:Inorganic Chemistry–III	5	3	100	100	100
	3	21UCH63ES04A	DSE-4:Physical Chemistry III	5	3	100	100	100

			Total (For three years)	180	130(6)			
	5	21UCW65OR01	Outreach Programme (SHEPHERD)		4			
			Total	30	25			
		21UCH64EG02B	GE-2 (BS):Waste Management	4	3	100	100	100
	4	21UCH64EG02A	GE-2 (BS):Food And Nutrition	4	2	100	-	100
	4	21UCH64SE04B	SEC –4 (WS): Advances In Chemistry	2	1	100		100
		21UCH64SE04A	SEC –4 (WS):Trends In Chemistry	2	1	100		100
	3	21UCH63CE01	Comprehensive Examinations	-	2	50	50	50
	3	21UCH63PW01	1UCH63PW01 Project Work and Viva Voce					100
		21UCH63ES04B	DSE–4:Physical Chemistry IV					

@ Practical Exam will be conducted at even semester

*The courses with a scheme of Exam 50 in CIA and SE will be converted to 100 for grading.

	SEC-2: BE	TWEEN SCHOOL 4 th Seme	ester					
	Between schools ((BS)- Offered to students of ot	her scho	ols				
	(Except	the school offering the course	2)		1			
	Course Details							
Offering Department	Course Code	Course Title	Hr	Cr	CIA	SE	Final	
SBS								
Botany	otany 21UBO44SE02 Mushroom Technology					-	100	
SCS								
Computer Science	21UCS44SE02	Data Analysis Using Spreadsheet	2	1	100	-	100	
Mathematics	21UMA44SE02	Numerical Ability	2	1	100	-	100	
Statistics	21UST44SE02	Quantitative Methods	2	1	100	-	100	
Information Technology	21UBC44SE02	Digital Artwork	2	1	100	-	100	
SLAC								
English	21UEN44SE02	English for Competitive Examinations	2	1	100	-	100	
History	21UHS44SE02	Historical Monuments in Tiruchirappalli	2	1	100	-	100	
Tamil	21UTA44SE02A	மேடைப் பேச்சுக்கலை	2	1	100	-	100	
Tamil	21UTA44SE02B	திரைப்படத் திறனாய்வும் குறும்பட உருவாக்கம்	2	1	100	-	100	
SMS								
Commerce	21UCO44SE02A	Personal Finance Management	2	1	100	-	100	
Commerce	21UCO44SE02B	Marketing Skills	2	1	100	-	100	
Commerce	21UCO44SE02C	Event Planning and Management	2	1	100	-	100	
Economics	21UEC44SE02	Financial Economics	2	1	100	-	100	
BBA	21UBU44SE02A	Entrepreneurial Skills Enhancement	2	1	100	-	100	
BBA	21UBU44SE02B	Practical Stock Trading	2	1	100	-	100	
CommerceCA	21UCC44SE02	Practical Banking in India	2	1	100	-	100	
SPS								
Chemistry	21UCH44SE02A	Health Chemistry	2	1	100	-	100	
Chemistry	21UCH44SE02B	Industrial Chemistry	2	1	100	-	100	
Physics	21UPH44SE02A	Weather Physics	2	1	100	-	100	
Physics	21UPH44SE02B	Electrical Wiring	2	1	100	_	100	
Electronics	21UEL44SE02	PC Assembling and Servicing	2	1	100	-	100	

	GENI	ERIC ELECTIVE -1: 5 th Semes	ster							
Ge		ses are designed for the students		er disci	plines.					
	(open t	to the students of other departme	ents)							
	Co	urse Details		-	Sche	Scheme of Exams				
Offering Department	Course Code	Course Title	Hrs	Cr	CIA	SE	Final			
SBS										
Botany	21UBO54EG01	Landscape Designing	4	3	100	100	100			
SCS										
Computer Science	21UCS54EG01	Ethical Hacking	4	3	100	100	100			
Mathematics	21UMA54EG01	Mathematics for Competitive Examinations	4	3	100	100	100			
Statistics	21UST54EG01	Actuarial Statistics	4	3	100	100	100			
Information Technology	21UBC54EG01	Fundamentals Of Data Science	4	3	100	100	100			
SLAC										
English	21UEN54EG01	Film Studies	100	100	100					
History	21UHS54EG01	Tamil Heritage and Culture	4	3	100	100	100			
Tamil	21UTA54EG01	தமிழிலயக்கத்தில் மனித உரிமைகள்	4	3	100	100	100			
SMS										
Commerce	21UCO54EG01A	Computerised Accounting	4	3	100	100	100			
Commerce	21UCO54EG01B	Basics of Excel	4	3	100	100	100			
Commerce	21UCO54EG01C	Personal Investment Planning	4	3	100	100	100			
Economics	21UEC54EG01	Principles of Economics	4	3	100	100	100			
Commerce CA	21UCC54EG01	E-commerce and E Business Management	4	3	100	100	100			
BBA	21UBU54EG01A	Global Supply Chain Management	4	3	100	100	100			
BBA	21UBU54EG01B	Start – Ups and Small Business Management	4	3	100	100	100			
SPS										
Chemistry	21UCH54EG01A	Chemistry for Competitive Examinations	4	3	100	100	100			
Chemistry	21UCH54EG01B	Everyday Chemistry	4	3	100	100	100			
Physics	21UPH54EG01A	Everyday Physics	4	3	100	100	100			
Physics	21UPH54EG01B	Renewable Energy Physics	4	3	100	100	100			
Electronics	21UEL54EG01A	Everyday Electronics	4	3	100	100	100			
Electronics	21UEL54EG01B	Wireless Communication	4	3	100	100	100			

	GENE	RIC ELECTIVE -2: 6 th Seme	ster					
Gen		s are designed for the students		r disc	ciplines	•		
		the students of other departm	ents)		-			
	Cou	ırse Details			Scheme of Exams			
Offering Department	Course Code	Course Title	Hrs	Cr	CIA	SE	Final	
SBS								
Botany	21UBO64EG02	Solid Waste Management	4	3	100	100	100	
SCS								
Computer Science	21UCS64EG02	3D Printing and Design	4	3	100	100	100	
Mathematics	21UMA64EG02	Analytical Skill for Competitive Examinations	4	3	100	100	100	
Statistics	21UST64EG02	Applied Statistics	4	3	100	100	100	
Information Technology	21UBC64EG02						100	
SLAC								
English	21UEN64EG02	English for the Media	100	100	100			
History	21UHS64EG02	Intellectual Revivalism in 4 3 Tamil Nadu				100	100	
Tamil	21UTA64EG02	சித்த மருத்துவம்	4	3	100	100	100	
SMS								
Commerce	21UCO64EG02A	Rural Marketing	4	3	100	100	100	
Commerce	21UCO64EG02B	Entrepreneurship Development	4	3	100	100	100	
Commerce	21UCO64EG02C	Digital Marketing	4	3	100	100	100	
Economics	21UEC64EG02	Economics for Competitive Exams	4	3	100	100	100	
CommerceCA	21UCC64EG02	Total Quality Management	4	3	100	100	100	
BBA	21UBU64EG02A	Personality Development	4	3	100	100	100	
BBA	21UBU64EG02B	NGO Management	4	3	100	100	100	
SPS					ļ		<u> </u>	
Chemistry	21UCH64EG02A	Food And Nutrition	4	3	100	100	100	
Chemistry	21UCH64EG02B	Waste Management	4	3	100	100	100	
Physics	21UPH64EG02A	Laser Technology and its Application	4	3	100	100	100	
Physics	21UPH64EG02B	Physics of Earth	4	3	100	100	100	
Electronics	21UEL64EG02A	CCTV and Smart Security System	4	3	100	100	100	
Electronics	21UEL64EG02B	Entrepreneurial Electronics	4	3	100	100	100	

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21UTA11GL01	General Tamil - I	4	3

CO No.	CO–Statements இப்பாடத்தின் நிறைவில் மாணவர்கள்	Cognitive Levels (K –Levels)
CO-1	இக்கால இலக்கிய வகைகளைக் கண்டறிவர்	K1
CO–2	எழுத்து,சொல் இலக்கணங்களின் அடிப்படைகளைக் கண்டறிவர்	K1
СО–3	அயலகக் கவிதை வடிவங்களை விளங்கிக் கொள்வர்	K2
CO-4	மொழிபெயர்ப்புக் கவிதைகளின் வாயிலாக மொழிபெயர்ப்புத் திறனை வளர்த்தெடுப்பர்	К3
CO–5	புதுக்கவிதை வாயிலாக வெளிப்படும் சமூக, அரசியல் விழுமியங்களை மதிப்பிடுவர்	К4

(12 மணிநேரம்)

அலகு - 1	(12 மணிநேரம்)
பாரதியார் கவிதைகள்	- குயில்பாட்டு (குயில் தன் பூர்வ ஜன்மக் கதை
உரைத்தல்)	
பாரதிதாசன் கவிதைகள்	- சஞ்சீவி பர்வதத்தின் சாரல்
உரைநடை	- முதல் மூன்று கட்டுரைகள்
அலகு - 2	(12 மணிநேரம்)
வெ.இராமலிங்கனார்	- சொல், தமிழன் இதயம்
முடியரசனார்	- உயிர் வெல்லமோ, மனத்தூய்மை
பெருஞ்சித்திரனார்	- அஞ்சாதீர், மொழி இனம் நாடு,
பட்டுக்கோட்டை	
கல்யாணசுந்தரனார்	- வருங்காலம் உண்டு, உழைக்காமல் சேர்க்கும் பணம்.
இலக்கணம்	- எழுத்து
இலக்கிய வரலாறு	- மூன்றாம் பாகம் - தண்டமிழ்த் தொண்டர்கள்
அலகு - <i>3</i>	(12 மணிநேரம்)
சுரதா	- நல்ல தீர்ப்பு
சுரதா கண்ணதாசன்	
-	- நல்ல தீர்ப்பு - ஒரு பானையின் கதை - வீடு
கண்ணதாசன்	- ஒரு பானையின் கதை
கண்ணதாசன் அப்துல் ரகுமான் மேத்தா இலக்கிய வரலாறு	- ஒரு பானையின் கதை - வீடு
கண்ணதாசன் அப்துல் ரகுமான் மேத்தா	- ஒரு பானையின் கதை - வீடு - ஒரே குரல்
கண்ணதாசன் அப்துல் ரகுமான் மேத்தா இலக்கிய வரலாறு	- ஒரு பானையின் கதை - வீடு - ஒரே குரல்
கண்ணதாசன் அப்துல் ரகுமான் மேத்தா இலக்கிய வரலாறு இலக்கியவளர்ச்சி	- ஒரு பானையின் கதை - வீடு - ஒரே குரல் - மூன்றாம் பாகம் - இருபதாம் நூற்றாண்டு - முதல் ஐந்து சிறுகதைகள்
கண்ணதாசன் அப்துல் ரகுமான் மேத்தா இலக்கிய வரலாறு இலக்கியவளர்ச்சி சிறுகதை	- ஒரு பானையின் கதை - வீடு - ஒரே குரல் - மூன்றாம் பாகம் - இருபதாம் நூற்றாண்டு - முதல் ஐந்து சிறுகதைகள் கவிதைகள் (12 மணிநேரம்)

சுகிர்தராணி	- என் கண்மணியே இசைப்பிரியா	
சக்தி ஜோதி	- யுகாந்திர உறக்கம்	
பழநிபாரதி	- வெள்ளைக்காகிதம்	
லிவிங் ஸ்மைல் வித்யா	- நினைவில் பால்யம் அழுத்தம்	
இலக்கணம்	- சொல்	
அலகு - 5 அயலகக்	கவிதைகள்	(12 மணிநேரம்)

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ஒசே ரிசால்	- விடைகொடு என் தாய் மண்ணே	
ஹைபுன் கவிதைகள்	- அறுவடை நாளின் மழை (மூன்று	கவிதைகள்)
சிறுகதை	- ஆறு முதல் பத்து சிறுகதைகள்	

உரைநடை - நான்கு முதல் ஆறு கட்டுரைகள்

பாட நூல்கள்

- 1. **பொதுத்தமிழ்,** செய்யுள் திரட்டு, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021
- 2. **சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு,** தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, பத்தாம் பதிப்பு, 2017
- 3. **நற்றமிழ்க் கோவை** (கட்டுரைத் தொகுப்பு). *தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021*
- 4. **சிறுகதைத் தொகுப்பு -** ஒவ்வொரு கல்வியாண்டிற்கும் ஒவ்வொரு சிறுகதைத்தொகுப்பு
- 5. (2021–2022 கல்வியாண்டுக்கு மட்டும்): **நல்லாசிரியர்**, சிறுகதைத் தொகுப்பு, -தமிழாய்வுத்துறை, நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை, முதற்பதிப்பு, 2021

Relationship matrix for Course outcomes, Programme outcomes / Programme Specific Outcomes

Semester	Course code				Title of the Course			Hours/ week		Credits	
Ι	I 21UTA11GL01 General Tamil - I 4						3				
Course Outcomes Programme Outcomes (POs) Programme Specific Outcomes (itcomes (P	SOs)	Mean Score of		
(COs)	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	Cos
CO-1	2	1	2	2	3	3	3	2	3	2	2.3
СО-2	2	1	2	2	2	3	2	2	2	2	2.0
СО-3	2	1	2	2	3	3	3	2	3	2	2.3
CO-4	1	2	1	2	2	3	2	2	3	2	2.0
CO–5	1	1	2	2	3	3	3	2	3	2	2.2
	Mean overall Score								2.16 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21UFR11GL01	FRENCH – I	4	3

CO No.	CO–Statements On successful completion of this course, students will be able to	Cognitive Levels (K –Levels)
CO-1	recall and spell the alphabets, numbers, colours, days of the week and months in French.	K1
CO–2	compare the definite and indefinite articles and its usages.	К2
СО-3	construct simple phrases by using 'er' verbs in present tense.	K3
CO-4	make use of correct terminology and introduce oneself in French.	К3
CO-5	distinguish between affirmative and negative phrases and take part in role play - conversation.	K4

Unit – I

TITRE:BONJOUR CA VA?

GRAMMAIRE : Les pronoms personnels sujets, les articles définis et indéfinis, Etre et avoir (verbes auxiliaires)

LEXIQUE : Saluer, Entrer en contact, demander et dire comment ça va ?, L'alphabet, les couleurs, les pays et les nationalités, les animaux domestiques.

PRODUCTION ORALE : Epeler son nom et son prénom, Comprendre des personnes qui se saluent.

PRODUCTION ECRITE : Les formules de politesse

Unit – II

TITRE:SALUT ! JE M'APPELLE AGNES

GRAMMAIRE : La conjugaison du 1^{er} groupe, les adjectifs possessifs, la formation du féminin, la formation du pluriel.

LEXIQUE : Se présenter, Présenter quelqu'un, Remercier, Les jours de la semaine, les mois de l'année, les nombres de 0 à 69, la famille

PRODUCTION ORALE : Comprendre des informations essentielles PRODUCTION ECRITE : Présentez –vous

Unit - III

TITRE:QUI EST-CE?

GRAMMAIRE : La phrase interrogative : Qu'est-ce que... ?/Qu'est-ce que c'est ?/Qui estce ?, quelques indicateurs du temps, la formation du féminin, les verbes aller et venir LEXIQUE : Demander et répondre poliment,les professions PRODUCTION ORALE : Parler de ses projets PRODUCTION ECRITE : Ecrire de brefs messages

Unit - IV

TITRE:DANS MON SAC, J'AI? GRAMMAIRE : la phrase négative, c'est/il est, les articles contractes, les pronoms personnels toniques

(12 hours)

(12 hours)

(12 hours)

(12 hours)

LEXIQUE : Demander des informations personnelles, Quelques objets, la fiche d'identité, les nombres à partir de 70 PRODUCTION ORALE : Comprendre un message sur un répondeur téléphonique PRODUCTION ECRITE : Remplir une fiche d'identité

Unit - V

(12 hours)

TITRE: IL EST COMMENT? / ALLO?

GRAMMAIRE : les adverbes interrogatifs, les prépositions de lieu, les verbes du deuxième groupe, le verbe faire

LEXIQUE : Parler au téléphone, décrire quelqu'un, l'aspect physique, le caractère PRODUCTION ORALE : Un jeu de rôle – la conversation téléphonique PRODUCTION ECRITE : Décrivez votre aspect physique et votre caractère en quelques lignes

Book for Study

P. Dauda, L.Giachino and C.Baracco, Generation A1, Didier, Paris 2016.

Books for Reference

- 1. J.Girardet and J.Pecheur, Echo A1, CLE International, 2edition, 2017
- 2. Régine Mérieux and Yves Loiseau, Latitudes A1, Didier, 2012.
- 3. Isabelle Fournier, Talk French, Goyal Publishers, 2011

Web Resources

- 1. https://www.wikihow.com/Pronounce-the-Letters-of-the-French-Alphabet
- 2. https://francais.lingolia.com/en/grammar/tenses/le-present
- 3. https://www.lawlessfrench.com/grammar/articles/
- 4. https://www.frenchpod101.com/french-vocabulary-lists/10-lines-you-need-for-introducing-yourself
- 5. https://www.tolearnfrench.com/exercises/exercise-french-2/exercise-french-3295.php

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code			Title of the Course				Hours		Credits	
Ι	21U	F R11(GL01		F	RENCH – I			4		3
Course	Pr	ogran	nme O	utcon	nes	Prog	ramme	Specif	ic Outo	comes	Mean
Outcomes			(POs)				(PSOs)				Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	3	1	2	3	2	3	2	1	2	3	2.2
CO-2	3	3	3	2	2	2	1	2	2	3	2.3
CO-3	3	1	2	3	2	3	2	1	2	2	2.1
CO-4	2	2	3	2	1	3	2	1	2	3	2.1
CO–5	3	2	3	2	2	3	2	2	3	2	2.4
	Mean overall Score									2.22 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21UHI11GL01	HINDI- I	4	3

	CO–Statements	Cognitive
CO No.	On successful completion of the course, students will be able to	Levels
		(K –Levels)
CO -1	list out the literary works in Hindi during the period of 12th	K1
	century in India.	
CO -2	compare the vocabulary & expressions related to day-to-day	K2
	conversation.	
CO -3	use simple Phrases from English to Hindi.	K3
CO -4	investigate the values of Indian society & summarize the duties of	K4
	a citizen for his/her country.	
CO -5	identify the sentences in Hindi using basic grammar.	K4

Unit - I

Dr. Abdul Kalam Ling Kabir Ke Dohe Baathcheeth - Aspathal mein Adhikal - Namakarn

Unit - II

Vachan Badaliye Thulasi ke Dohe Adhikal - Samajik Paristhithiyam Moun Hee Mantra Hai

Unit - III

Sangya Soordas ke Pad Baathcheeth - Hotel mein Adhikal - Sahithyik Paristhithiyam

Unit - IV

Sarvanam Rahim ke Dohe Bathcheeth - Kaksha mein Adhikal - Salient Features, Main Divisions (12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

Unit - V Anuvad - 1 Visheshan Bihari - Dohe Bathcheeth - Kariyalay mein Adhikal - Visheshathayem

Books for Study

- 1. M.kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020. Unit-I *Chapters 2 and 3*
- Viswanath Tripaty, *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd, New Delhi,2018. Unit-II, III and IV Chapters 4 and 5
- Dr. Sanjeev Kumar Jain, Anuwad: Siddhant Evam Vyavhar, Kailash Pustak Sadan, Madhya Pradesh 2019.
 Unit-V Chapter 1

Books for Reference

- 1. Dr.A.P.J.Abdul Kalam, Mere sapnom ka Bharath, Prabath Prakashan, Noida, 2020,
- 2. Lakshman prasad singh, Kavya ke sopan, Bharathy Bhavan Prakashan, 2017.
- 3. Aravind Kumar, Sampoorna Hindi Vyakaran our Rachana, Lucent publisher, 2019.
- 4. Adhunik Hindi Vyakaran our Rachana, bharati bhawan publishers & distributors, 2018.
- 5. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.

Web Resources

- 1. https://youtu.be/LrdrcP2oiyU
- 2. https://youtu.be/Cib2FNv8KyA
- 3. https://youtu.be/aXARykpYCxA
- 4. https://youtu.be/RUDFis-tdg4
- 5. https://youtu.be/upivTmLTPQA

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code Titl					itle of	le of the Course				Credits
Ι	21UI	21UHI11GL01				HIN	DI - I			4	3
Course	Prog	ramm	e Out	comes	(PO)	Progra	amme Sj	pecific O	outcomes	(PSO)	Mean
Outcomes↓	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Scores of Cos
CO-1	2	3	2	3	1	3	1	3	3	2	2.3
CO-2	2	2	3	3	1	3	2	3	3	2	2.4
CO-3	3	2	2	1	2	3	2	3	2	3	2.3
CO-4	3	2	1	3	2	3	2	3	3	2	2.4
CO-5	2	3	3	2	3	2	3	3	3	1	2.5
			<u>.</u>					Mean (Overall	Score	2.38 (High)

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21USA11GL01	SANSKRIT - I	4	3

	CO–Statements	Cognitive
CO No.	On successful completion of the course, the student will be able to	Levels (K –Levels)
CO-1	remember and Recall words relating to objects.	K1
CO-2	understand classified vocabulary.	K2
CO-3	apply nouns and verbs.	K3
CO-4	analyze different forms of names and verbs.	K4
CO-5	appreciate the good saying of Sanskrit Improve the self-values.	K5

(12 Hours)

Unit - I

Samyakthakshatra pada paricaya	
Unit - II	(12 Hours)
Vartmanakala prayogaha	
Unit - III	(12 Hours)
Samskruta varathamanakalaha	
Unit - IV	(12 Hours)
Shadha priyoghaa aakaarnta ikaraantha ukarantha	
Unit - V	(12 Hours)

Subhashitani manoharani Dasaslokani

Book for Study

Shaptamanjari , K.M.,Saral Snakrit Balabodh , Bharathiya Vidya Bhavan , Munushimarg Mumbai $-4000\ 007\ 2018,\ 2019$

Books for Reference

- 1. Kulapathy , K.M.,Saral Snakrit Balabodh , Bharathiya Vidya Bhavan , Munushimarg Mumbai 4000 007 2018
- 2. R.S.Vadhar & Sons , Book Sellers and publishers , Kalpathi.Palgahat 678003, Kerala South India , Shabdha Manjari 2019
- 3. Balasubramaniam R, Samskrita Akshatra Siksha , Vangals Publications, 14th Main road JP Nagar , Bangalore 78

Relationship matrix for Course outcomes, Pro-	ogramme outcomes /Programme Specific
Outcomes	

Semester	Course Code Titl				tle of the Course				Hou	rs	Credit	
Ι	21US A	A11GL	01		5	SANSI	KRIT-	Ι		4		3
Course Outcomes	Programme Outcomes (PO)				Programme Specific Outcomes (PSO)				2		Mean Scores	
\downarrow	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	C	of COs
CO-1	3	1	1	3	2	3	2	3	2	2		2.2
CO-2	2	2	3	3	1	2	2	3	3	2		2.3
CO-3	3	2	2	2	2	2	2	3	3	2		2.3
CO-4	3	2	2	3	2	3	3	3	2	2		2.3
CO-5	3	2	3	2	3	2	2	3	3	3		2.6
	Mean Overall Score									Score		2.34
									ŀ	Result	#]	High

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21UEN12GE01	GENERAL ENGLISH - I	5	3

CO No.	CO-Statements	Cognitive Levels
	On successful completion of this course, students will be able to	(K- Levels)
CO-1	recall what they observe and experience	K1
CO-2	arrange different parts of a text in a coherent manner	K2
CO-3	examine the underlying meaning in a text	K3
CO-4	analyse and evaluate letters regarding the use of appropriate language and format	K4 & K5
CO-5	use conversational English to communicate with friends	K6

Unit-I

- 01. Personal Details
- 02. Positive Qualities
- 03. Listening to Positive Qualities
- 04. Relating and Grading Qualities
- 05. My Ambition
- 06. Abilities and Skills
- 07. Self-Improvement Word Grid
- 08. What am I Doing?
- 09. What was I Doing?
- 10. Unscramble the Past Actions
- 11. What did I Do Yesterday?

Unit-II

- 12. Body Parts
- 13. Actions and Body Parts
- 14. Value of Life
- 15. Describing Self
- 16. Home Word Grid
- 17. Unscramble Building Types
- 18. Plural Forms of Naming Words
- 19. Irregular Plural Forms
- 20. Plural Naming Words Practice
- 21. Whose Words?

Unit-III

- 22. Plural Forms of Action Words
- 23. Present Positive Actions
- 24. Present Negative Actions
- 25. Un/Countable Naming Words
- 26. Recognition of Vowel Sounds
- 27. Indefinite Articles
- 28. Un/Countable Practice

(15 Hours)

(15 Hours)

(15 Hours)

- 29. Match the Visual 30. Letter Spell-Check 31. Drafting a Letter **Unit-IV** 32. Friendship Word Grid 33. Friends' Details 34. Guess the Favourites 35. Guess Your Friend 36. Friends as Guests 37. Introducing Friends 38. What are We Doing? 39. What is (S)He / are They Doing? 40. Yes / No Question 41. What was S/He Doing? 42. Names and Actions 43. True Friendship 44. Know Your Friends 45. Giving Advice/Suggestions 46. Discussion on Friendship
- 47. My Best Friend

Unit-V

- 48. Kinship Words
- 49. The Odd One Out
- 50. My Family Tree
- 51. Little Boy's Request
- 52. Occasions for Message
- 53. Words Denoting Place
- 54. Words Denoting Movement
- 55. Phrases for Giving Directions
- 56. Find the Destination
- 57. Giving Directions Practice
- 58. SMS Language
- 59. Converting SMS
- 60. Writing Short Messages
- 61. Sending SMS
- 62. The Family Debate
- 63. Family Today

Book for Study

Joy, J.L., and Peter, F.M. Let's Communicate 1. New Delhi, Trinity P, 2014.

Books for Reference

- 1. Ahrens, Sönke. *How to Take Smart Notes: One Simple Technique to Boost Writing, Learning and Thinking.* New York: Create Space, 2017.
- 2. Aspinall, Tricia. Test Your Listening. London: Pearson, 2002.
- 3. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Routledge, 2004.
- 4. Fitikides, T.J. Common Mistakes in English (6th ed.). London: Longman, 2002.

(15 Hours)

(15 Hours)

5. Wainwright, Gordon. *How to Read Faster and Recall More: Learn the Art of Speed Reading with Maximum Recall* (3rd ed.). Oxford: How to Books, 2007.

Web Resources

- 1. https://learnenglish.britishcouncil.org/
- 2. https://oneminuteenglish.org/en/best-websites-learn-english/
- 3. https://www.dailywritingtips.com/best-websites-to-learn-english/

Relationship Matrix for Course Outcomes, Programme Outcomes, and Programmes Specific Outcomes

Semester	Co	urse C	ode		• ·	Title of	the Cou	rse		Hours	Credit
Ι	21U	EN12G	E01		GEI	NERAL ENGLISH – I					3
Course Outcome	utcom	tcomes Programme Specific Outcomes (PSOs)									
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO -1	2	3	2	2	3	2	3	2	3	2	2.4
CO -2	2	2	3	2	3	3	2	3	2	2	2.3
CO -3	2	3	2	3	2	2	3	2	3	2	2.4
CO -4	2	2	3	2	3	3	2	3	2	3	2.5
CO -5	2	2	2	3	2	2	2	3	2	2	2.2
Mean Overall Score										2.36	
											(High)

Semester	Course Code	Course Code Title of the Course				
Ι	21UCH13CC01	CORE 1: GENERAL CHEMISTRY – I	4	4		

	CO – Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Levels (K–Level)
CO-1	acquire the knowledge about periodicity and periodic trends.	K1
СО–2	understand the basics of quantum chemistry.	K2
CO-3	apply VSEPR theory and predict the structure of molecules and ions.	К3
CO-4	comprehend the concepts of ionic equilibrium	K3
CO-5	analyze the bonding in molecules and ions by applying MO theory.	K4

Unit - I Quantum Theory: Introduction and Principles

The failures of classical mechanics – comparison between classical and quantum mechanics – wave–particle duality – de Broglie Equation – photoelectric effect – Compton effect – Heisenberg's uncertainty principle – energy quantization –black–body radiation –heat capacities – atomic and molecular spectra – dynamics of microscopic systems: The Schrödinger equation– constraints on the wave function. The principles of quantum theory: operators – eigen value equations – The construction of operators– Hermitian operators – the postulates of quantum mechanics –particle in a 1D box.

Unit– II Periodicity and Periodic Properties

Arrangement of the elements in the periodic table – groups and periods – sizes of atoms and ions – atomic, ionic, covalent and metallic radii – electronic configurations of elements of various groups The concept of shielding and effective nuclear charge – slater's rules – ionization energies – variation of ionization energy across the period and down the groups – electron affinities – electronegativity – determination of electronegativity using Pauling and Mulliken methods – metallic and non-metallic character – variable valency and oxidation states.

Unit –III Covalent Bond

Lewis theory – octet rule and its exceptions – drawing modern Lewis structures for simple molecules and ions and formal charge – Sidgwick – Powell theory – Valence Shell Electron Pair Repulsion (VSEPR) theory – structures of some simple molecules and ions using VSEPR theory – BeCl₂, BF₃, CH₄, PCl₅, SF₆, IF₇, NH₃, NF₃, H₂O, F₂O, SF₄, ClF₃, I₃⁻, XeF₂, BrF₅, XeF₄, XeF₆, BF₄⁻.

Unit-IV Valence Bond Theory

Hybridization sp, sp², sp³, sp³d – predicting hybridization and geometry of some selected molecules – BeCl₂, BF₃, CH₄, PCl₅, SF₆, IF₇, NH₃, NF₃, H₂O, F₂O, SF₄, ClF₃,I₃⁻, XeF₂, BrF₅, XeF₄, XeF₆, BF₄⁻, CO, CO₂, SO₂, SO₃, SO₄^{2–}, CO₃^{2–}, XeOF₄ – resonance – molecular orbital theory – The LCAO method – different types of combinations of atomic orbitals – MO diagrams of simple homonuclear and heteronuclear diatomic molecules and ions –

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

20

determination of bond order, magnetic property and stability of H₂, He₂, F₂, O₂, N₂, N_{2⁺}, N_{2⁻}, C₂, B₂, NO, O_{2⁻} and O_{2²⁻}.

Unit –V Ionic Equilibrium

(12 Hours)

Ionic equilibrium – electrolytes – degree of ionization – factors affecting the degree of ionization – ionization constant and ionic product of water – ionization of weak acids and bases – pH scale – common ion effect – dissociation constants of mono–, di–, and triprotic acids – salt hydrolysis – calculation of hydrolysis constant, degree of hydrolysis and pH for different salts – Buffer solutions – derivation of Henderson's equation and its applications – buffer capacity – buffer range – buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body.

Books for Study

1. Atkins P W, *Physical Chemistry*, 10th Edition, Oxford University Press, United Kingdom, 2014.

Unit–I Chapters 7 and 9

2. Puri B P and Sharma L R, *Principles of Physical Chemistry*, 47th Edition, Vishal Publication, New Delhi, 2018.

Unit–V Chapter 20

3. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd., Oxford, London, 1996.

Unit–II, III and IVChapters 1 and 4

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.

2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.

3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Willey and Sons. Inc., New York, 1995.

4. Prasad R K, *Quantum Chemistry*, 4th Edition, New Age International (P) Ltd., New Delhi, 2012.

5. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, New Delhi, 2004.

6. Rajam J B and Broglie L D, Atomic *Physics*, 7th Edition, S. Chand and Co. Pvt. Ltd., New Delhi, 1999.

Web Resources



Photoelectric Effect





Hybridization sp, sp², sp³, sp³d

Effective nuclear charge

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse co	ode		Title of the Course						Credits
Ι	I 21UCH13CC01					CORI AL CHI	2	4	4		
Course	Prog	gramm	e Outc	omes ()	POs)	Programme Specific O (PSOs)				mes	Mean Score
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	2	3	2	3	2	1	2	3	1	3	2.2
CO–2	2	3	2	3	2	2	3	2	3	3	2.5
СО–3	1	3	1	1	3	2	2	3	3	1	2
CO–4	1	3	1	3	2	2	3	2	1	2	2
CO–5	2	1	3	3	2	2	3	2	2	3	2.3
								Mea	n overal	l Score	2.2 (High)

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21UCH13CC02	CORE 2: ORGANIC CHEMISTRY – I	3	2

	CO–Statements	Cognitive Levels
CO No.	On successful completion of this course, students will be able to	(K– Level)
CO-1	understand the nomenclature, preparations and reactions of cyclic and acyclic alkanes.	K1
СО-2	identify stereochemistry in addition and elimination reactions of alkenes.	K2
СО-3	comprehend the delocalization in dienes and its chemical consequences.	K3
CO-4	overview the synthetic applications of alkynes.	K4
CO–5	analyze the conformations of cyclic and acyclic hydrocarbons.	K5

Unit-I Alkanes and Cycloalkanes

IUPAC nomenclature of alkanes and cycloalkanes - petroleum source of alkanes - octane number - preparation of alkanes using Grignard and Gilmann reagents - Wurtz synthesis chlorination and bromination of alkanes - mechanism of free radical substitution - factors determining product distribution – reactivity and selectivity principle – radical substitution in benzylic and allylic carbons - stereochemistry of radical substitution reactions - reactions of cyclic compounds.

Unit –II Conformational Isomers

Conformational isomerism in ethane and n-butane - projection formula - Fischer, Newmann and Sawhorse - conformational isomerism in cycloalkanes - Baeyer's strain theory conformational analysis of cyclohexane, mono- and disubstituted cyclohexanes - cis- and trans-decalins.

Unit –III Alkenes –I

Nomenclature – geometrical isomerism – cis/trans - E/Z – methods of preparation of alkenes - dehydrohalogenation of alkyl halides - regioselectivity - dehydration of alcohols -Saytzeff's rule relative stability of alkenes – dehalogenation of vicinal dihalides – elimination mechanisms (E1, E2, E1_cB) – Hoffman elimination and its regioselectivity – reduction of alkynes – *cis/trans* alkene formation.

Unit– IV Alkenes – II

Electrophilic addition – general mechanism – addition of HX – regioselectivity Markovnikov's and Anti-Markovnikov's rules - carbocation stability - bromine and its stereochemistry - halohydrin formation - addition of water (oxymercuration-demercuration, hydroboration-oxidation) - hydroxylation(syn- and anti-dihydroxylation) - addition of hydrogen-relative stability of alkenes - ozonolysis.

Unit –V Dienes

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

(9 Hours)

Types– preparation of conjugated dienes from consecutive E2 elimination reactions– MO of conjugated diene -1,2/1,4– addition of HX to conjugated dienes – Diels–Alder reaction – regio– and stereoselectivity – ozonolysis.

Books for Study

Bruice P Y, Organic Chemistry, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
 Unit – I Chapters 2 and 9 Unit– II Chapter 2 Unit– IV Chapter 5 Unit– V Chapter 8
 Morrison R T and Boyd R T, Organic Chemistry, 7th Edition, Allyn and Bacon Ltd., New York, 2011.
 Unit– I Chapter 3 and 13 Unit– II Chapter 3 and 13 Unit– II Chapter 8 Unit– IV Chapter 8 and 9 Unit– V Chapter 11

Books for References

- 1. Pine S H, Organic Chemistry, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.
- 2. Finar I L, *Organic Chemistry*, Vol: 1and 2, 6th Edition, Addison Wesley Longman Ltd. England, 1996.
- 3 Graham Solomons T W, Organic *Chemistry*, 6th Edition, John Wiley and Sons, New York, 1996.
- 4. Wade L G, *Organic Chemistry*, 5th Edition, Pearson Ltd., University of California, Santa Barbara, 2003.
- 5. Carey F A, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 2000.

Web resources





Alkanes and Cycloalkanes

Nomenclature and conformations

Semester	Co	urse c	ode		Ti	itle of the Course				Hours	Credits
I						CORE 2: NIC CHEMISTRY – I				3	2
Course	Course Programme Outcomes						gramm	e Speci	fic Ou	tcomes	Mean
Outcomes			(POs)					(PSOs	5)		Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	3	1	2	2	3	3	2	1	3	2	2.2
CO-2	3	2	2	3	3	2	3	2	2	3	2.5
CO-3	2	1	2	3	2	3	1	2	3	2	2.1
CO-4	3	3	2	1	2	2	2	3	2	1	2.1
CO–5	2	2	1	3	2	2	1	2	3	2	2.0
	Mean overall Score										

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course	Hours	Credits
т	2111CH12A C01	ALLIED: MATHEMATICS FOR	6	1
1	21UCH13AC01	CHEMISTRY-I	U	4

	CO-Statements	Cognitive
CO No.	On successful completion of this course, students will be able	Levels
	to	(K-levels)
CO-1	acquire knowledge of basics of mathematics like series,	K1
	matrices, trigonometry and differential calculus.	
CO-2	understand the process of finding the sum of the series, eigen	K2
	values and eigen vectors, higher derivatives of a function and	
	trigonometric expansions.	
CO-3	apply the Cayley Hamilton Theorem, trigonometric	K3
	expressions, higher derivatives of functions in working out	
	problems they encounter in chemistry.	
CO-4	analyse the importance of mathematical concepts in giving	K4
	solution to chemistry based real time problems.	
CO-5	evaluate egen values, eigen vectors, summation of series in	K5
	solving problems on chemistry.	
Init I	· · · · · · · · · · · · · · · · · · ·	(19Uoum

Unit-I

(18Hours)

Partial fractions–Binomial series–Summation of series–Finding terms– Coefficient of x^n . Unit-II (18Hours)

Exponential series-Summation-Logarithmic series-Summation.

Unit-III

(18 Hours)

Matrices–Rank of a matrix–Solving simultaneous linear equation in three unknowns using Elementary Operations method – Eigen values and Eigen vectors–Verification of Cayley Hamilton theorem.

Unit-IV

(18Hours)

(18 Hours)

Higher Derivatives – Formation of equations involving derivatives – Applications of Leibnitz's theorem.

Unit-V

Expansion of $\cos q$ and $\sin q$ –Powers of sines and $\cos q$ in terms of functions of multiples of q.

Books for Study

1. S. Narayanan, R. HanumanthaRao, T.K. Manicavachagom Pillay, Kandaswamy, "Ancillary Mathematics Vol.-I", 2009 Edition.

Unit-I-Chapter 1, Sections 1.1 to 1.2 Unit-II-Chapter 1, Sections 1.3 Unit-III-Chapter 3, Sections 3.2 to 3.4 Unit-IV-Chapter 6, Sections 6.1 Unit-V-Chapter 5, Sections 5.1 to 5.4

Books for Reference

1. M.K.Venkatraman, "Engineering Mathematics"

2. S.Narayanan and T.K.Manicavachagam Pillay, "Trigonometry".

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code Title of the Course									Hours	Credits	
I	21UC	H13AC	C01	ALLIED: MATHEMATICS FOR CHEMISTRY-I							6	4
Course Outcomes↓	Pro	gramm	e Outo	comes (PO) Programme Specific Outcomes (PSO)								Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSC	05 0	of Cos
CO-1	3	3	2	3	1	2	3	2	3	1		2.3
CO-2	3	3	1	2	2	3	3	2	2	2		2.3
CO-3	2	3	2	2	2	3	2	2	2	2		2.2
CO-4	2	2	2	2	2	2	2	2	3	2		2.1
CO-5	3	2	2	1	2	3	2	2	3	2		2.2
	Mean Overall Score									ore (2.22 High)	

Semester	Course Code	Title of the Course	Hours	Credits
Ι	21UHE14VE01	ESSENTIALS OF HUMANITY	2	1

CO. No	CO – Statements	Cognitive Levels (K-levels)		
	On completion of this course, the graduates will be able to:			
CO-1	recall the prescribed values and their dimensions	K1		
CO-2	examine themselves by learning the developmental changes happening in the course of their life time	К2		
CO-3	apply the trained values in their day today life	K3		
CO-4	analyze themselves as responsible men and women	K4		
CO-5	create a constructive approach to life	K5 & K6		

Unit-I Principles of Value Education

Introduction to values - Characteristics and Roots of Values - Value Education & Value Clarification - Moral Characters - Kinds of Values - Objectives of Values.

Unit-II The Development of Human Personality

Personality: Introduction, Theories, Integration &Factors influencing the development of personality - SEL Series - Discovering self - Defense Mechanism - Power of positive thinking - Why worry?

Unit-III The Dimensions of Human Development

Areas of Development: Physical, Intellectual, Emotional, Social Development, Moral & Spiritual development

Unit-IV Responsible Parenthood

Human sexuality - Marriage and Family - Sex and Love - Characteristics of Responsible parent - Causes of Marriage disharmony - Art of wise parenting.

Unit-V Gender Equality and Empowerment

Historical perspective - Women in Independence struggle - Women in Independent India -Education & Economic development - Crimes against Women - Women rights - Time-line of Women Achievements in India

Books for Study

Department of Human Excellence. Essentials of Humanity, St. Joseph's College, Tiruchirappali-02, 2021.

Books for Reference

- 1. Alphonse Xavier Dr SJ. You Shall Overcome, (6th Ed.) Chennai: ICRDCE Publication, 2012.
- 2. Alex K. Soft Skills, New Delhi: S. Chand, 2009.
- 3. Kalam Abdul APJ. You Are Unique, Bangalore: Punya Publishing, 2012.

Web Sources

http://livingvalues.net. Accessed 05 Mar. 2021.

https://www.apa.org/topics/personality#. Accessed 05 Mar. 2021.

https://www.peacecorps.gov/educators/resources/global-issues-gender-equality-

and-womens-empowerment/. Accessed 05 Mar. 2021.

(6 Hours)

(6 Hours)

(6 Hours)

(6 Hours)

(6 Hours)

Semester	Course Code	Title of the Course	Hours	Credits
II	21UTA21GL02	General Tamil - II	4	3

CO No.	CO- Statement	Cognitive Level (K- level)			
	இப்பாடத்தின் நிறைவில் மாணவர்கள்				
CO-1	தமிழிலக்கிய வரலாற்றில் சைவ, வைணவ இலக்கியங்கள் பெறும் இடத்தை அறிந்துகொள்வர்	K 1			
CO-2	அகப்பொருள், புறப்பொருள் இலக்கணங்களின் அடிப்படை அறிவைப் பெறுவர்.	K 1			
CO-3	காப்பியச் சுவையை மாணவர்கள் புரிந்துகொள்வர்	K 2			
CO-4	இஸ்லாமிய இலக்கியச் சிந்தனைகளைப் பெறுவர்	K 3			
CO-5	கிறித்தவ மதிப்பீடுகளைச் சிற்றிலக்கிய வகைகளின் வழியாகத் திறனாய்வர்.	K 4			

 அலகு - 1
 (12 மணிநேரம்)

 சிலப்பதிகாரம்
 - கனாத்திறம் உரைத்த காதை

 மணிமேகலை
 - ஆபுத்திரன் திறம் அறிவித்த காதை

 இலக்கிய வரலாறு
 - சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய.

 இலக்கணம்
 - அகப்பொருள் இலக்கணம்

 அலகு - 2
 (12 மணிநேரம்)

 திருவாசகம்
 - திருச்சாழல்

சிவவாக்கியார் பாடல்கள் - 25 பாடல்கள் (04, 14, 16, 22, 27, 33, 34, 35, 36,37, 38, 47, 81, 91, 225, 237, 242, 495, 504, 520,522, 533, 534, 536, 548.)

அலகு - 3

(12 மணிநேரம்)

நாலாயிர திவ்வியப் பிர கம்பராமாயணம் உநைடை	ரபந்தம்- அமலானாதிபிரான் (10 பாடல்கள்) - பெருமாள் திருமொழி (11 பாடல்கள்) - கைகேயி சூழ்வினைப்படலம் - 7 முதல் 9 முடிய உள்ள கட்டுரைகள்
அ லகு - 4	(12 மணிநேரம்)
சீறாப்புராணம் இலக்கணம் இலக்கிய வரலாறு	- உடும்பு பேசிய படலம் - புறப்பொருள் இலக்கணம் - தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள் முடிய
அலகு - 5	(12 மணிநேரம்)
திருக்காவலூர்க் கலம்ப உரைநடை	கம் - சமூக உல்லாசம் - 10 முதல் 12 வரையிலான கட்டுரைகள்

பாடநூல்கள்:

- 1. **பொதுத்தமிழ் செய்யுள் திரட்டு**, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி. திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021
- 2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, பத்தாம் பதிப்பு, 2017
- 3. **நற்றமிழ்க் கோவை** (கட்டுரைத் தொகுப்பு). *தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி,* முதற்பதிப்பு, 2021

Semester	Co	urse C	ode		Т	Hours	Credit				
II	21 U	TA210	GL02		(4	3			
Course	Pr	ogrami	ne Out	comes (I	PO)	Program	mme Sp	ecific O	utcomes	s (PSO)	Mean
Outcomes (Cos)	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	Scores of COs
CO-1	2	2	1	2	3	2	2	2	3	2	2.1
CO-2	2	1	2	2	3	3	2	2	3	2	2.2
CO-3	2	1	2	2	3	3	2	2	3	2	2.2
CO-4	1	1	2	2	3	3	2	2	3	2	2.1
CO-5	1	1	2	2	3	2	2	3	3	2	2.1
	Mean Overall Score									2.14 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UFR21GL02	FRENCH – II	4	3

	CO–Statements	Cognitive
CO No.	On successful completion of this course, students will be able	Levels
	to	(K–Levels)
CO-1	relate pronominal verbs in expressing one's day today activity.	K1
CO-2	compare the different types of articles.	K2
СО-3	construct texts using pronouns – passages and dialogues.	K3
CO-4	discover the food habits of the French culture.	K4
CO–5	appraise the French fashion.	K5

Unit - I

TITRE:LES LOISIRS

GRAMMAIRE : les adjectifs interrogatifs, les nombres ordinaux, les verbes pronominaux LEXIQUE : les différentes activités quotidiennes, les loisirs, les activités quotidiennes, les matières

PRODUCTION ORALE : parler sur votre passe-temps PRODUCTION ECRITE : décrire sa journée

Unit -II

TITRE:LA ROUTINE GRAMMAIRE : les pronoms personnels COD, les verbes du premier groupe en e/er/eler/eter, le verbe prendre LEXIQUE : exprimer ses gouts et ses préférences, le temps, l'heure, la fréquence

PRODUCTION ORALE : savoir comment dire l'heure

PRODUCTION ECRITE : écrire vos préférences en quelques lignes

Unit - III

TITRE: OU FAIRE SES COURSES?

GRAMMAIRE : les articles partitifs, le pronom en (la quantité), très ou beaucoup LEXIQUE : inviter et répondre à une invitation, les commerces et les commerçants, demander et dire le prix, les quantités

PRODUCTION ORALE : faire des courses pour une soirée

PRODUCTION ECRITE : écrire un message en acceptant l'invitation

Unit - IV

TITRE:DECOUVREZ ET DEGUSTEZ GRAMMAIRE : l'impératif, il faut, les verbes devoir, pouvoir, savoir,vouloir LEXIQUE : Commander et commenter sur un plat de la carte,les aliments, les services, les moyens depaiement PRODUCTION ORALE : Jeu de rôle – au restaurant (entre vous et le garçon) PRODUCTION ECRITE : faire une comparaison avec la carte française et indienne

(12 hours)

(12 Hours)

(12 hours)

(12 hours)

(12 hours)

Unit - V

(12 hours)

TITRE:TOUT LE MONDE S'AMUSE/ LES ADOS AU QUOTIDIEN GRAMMAIRE : les adjectifs démonstratifs, le pronom indéfini on, le futur proche, le passé composé, les verbes en –yer, voir et sortir LEXIQUE : connaitre les marques connues sur les vêtements, les sorties, situer dans le temps, les vêtements et les accessoires PRODUCTION ORALE : décrire une tenue

PRODUCTION ECRITE : écrire une lettre amicale, une carte postale

Book for Study

P.Dauda, L.Giachino and C.Baracco, Generation A1, Didier, Paris 2016.

Books for Reference

- 1. J.Girardet and J.Pecheur, Echo A1, CLE International, 2edition, 2017
- 2. Régine Mérieux and Yves Loiseau, Latitudes A1, Didier, 2012.
- 3. Isabelle Fournier, Talk French, Goyal Publishers, 2011

Web Resources

- 1. <u>https://www.frenchtoday.com/blog/french-verb-conjugation/french-reflexive-verbs-list-</u>exercises/
- 2. https://www.fluentu.com/blog/french/french-subject-pronouns/
- 3. https://grammarist.com/french/french-partitive-article/
- 4. https://www.talkinfrench.com/guide-french-food-habits/
- 5. https://www.fluentu.com/blog/french/talking-about-clothes-in-french/

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code			Title of the Course					Ho	ours	Credits
II	21U	FR21(GL02]	FRENC	H – II		4	4	3
Course Outcomes	Programme Outcomes (POs)					Pro	Programme Specific Outcomes (PSOs)				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	3	3	1	3	1	2	2	2	2.2
CO-2	2	1	2	3	2	3	1	2	2	2	2.0
CO-3	3	2	3	2	2	3	3	1	3	2	2.4
CO-4	3	2	2	1	3	3	3	1	1	3	2.2
CO–5	2	1	2	2	3	3	3	2	2	2	2.2
	Mean overall Score									2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UHI21GL02	HINDI - II	4	3

CO No.	CO–Statements On successful completion of the course, students will be able to	Cognitive Levels (K –Levels)
CO -1	Find out the Terms & Expressions related to letter writing	K1
CO -2	Explain the works of Hindi writers	K2
CO -3	Complete the sentences in Hindi using basic grammar	K3
	Analyze the social & political conditions of Devotional period in Hindi Literature	K4
	Justify the human values stressed on the works of the following authors "Premchand, Nirala, etc."	К5

Unit - I Kafan	(12 Hours)
Letter Writing - Chutti Patra	
Bakthikal - Namakarn	
Sarkari kariyalayom ka naam	
Unit - II	(12 Hours)
Baathcheeth - Dookan mein	
kriya	
Letter Writing - Rishthedarom ko patra	
Bakthikal - Samajik Paristhithiyam	
Unit - III	(12 Hours)
Vah Thodthi patthar	
Adverb	
Letter Writing - Naukari keliye Avedan Patra	
Bakthikal - Sahithyik Paristhithiyam	
Unit - IV	(12 Hours)
Mukthi	. ,
Samas	
Letter Writing - Kitab Maangne Keliye Patra	

Bakthikal - Salient Features, Main Divisions

(12 Hours)

Unit - V

Anuvad - 2 Sandhi Letter writing - Nagarpalika ko Patra Bakthikal - Visheshathayem

Books for Study

- 1. Viswanath Tripaty, *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd, New Delhi, 2018. **Unit-I** *Chapter 1*
- 2. M.kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020. Unit-II, III and IV *Chapter 2*
- 3. Dr.Sadananth Bosalae, *kavya sarang*, Rajkamal Prakashan, New Delhi, 2020. **Unit-V** *Chapter 4*

Books for Reference

- 1. Adhunik Hindi Vyakaran our Rachana, bharati bhawan publishers & distributors, 2018.
- 2. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.
- 3. Krishnakumar Gosamy, Anuvad vigyan ki Bhumika, Rajkamal Prakashan, 2016.
- 4. Aravind Kumar, Sampoorna Hindi Vyakaran our Rachana, Lucent publisher, 2019.
- 5. Lakshman prasad singh, Kavya ke sopan, Bharathy Bhavan Prakashan, 2017.

Web Resources

- 1. https://youtu.be/tE2RHQcqlbI
- 2. https://youtu.be/Xxvco3qa284
- 3. https://youtu.be/1z8x95IFGi4
- 4. https://youtu.be/CBMYf8NRLW4
- 5. https://youtu.be/h31tMLeFtHs

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Cou	irse Co	ode		T	Hours	Credits				
II	21UI	HI21G	L02			4	3				
Course	Prog	ramm	e Outo	comes	(PO)	Progra	amme Sp	pecific O	utcomes	(PSO)	Mean
Outcomes↓	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Scores of Cos
CO-1	2	3	3	2	2	3	3	3	2	2	2.5
CO-2	1	3	1	2	2	3	3	3	2	3	2.3
CO-3	3	2	3	2	2	3	2	3	2	2	2.4
CO-4	2	3	3	1	3	2	3	2	1	2	2.2
CO-5	3	2	2	2	3	2	3	2	3	2	2.4
Mean Overall Score									Score	2.36	
											(High)

Semester	Course Code	Title of the Course	Hours	Credits
II	21USA21GL02	SANSKRIT - II	4	3

CO No.	CO–Statements On successful completion of the course, the student will be able to	Cognitive Levels (K –Levels)			
CO-1	-1 remembering names of different objects, remembering different verbal forms and sandhi.				
CO-2	contrast different verbal forms Explain good sayings, Relate good saying to life.	K2			
CO-3	apply and build small sentences.	K3			
CO-4	analyze different forms of Verbs and nouns.	K4			
CO-5	appreciate subhashitas and Sanskrit poetry Expand Sanskrit vocabulary.	K5			

Unit - I

(12 Hours)

Asmath usmath tat kim (MFN)

Unit - II	(12 Hours)
Sandhi Niyamaaha Abuyaasha (Guna, Visarga, Dirgha, Vrddhi)	
Unit - III	(12 Hours)
Lang lakaaraha Kriyapadaani	
Unit - IV	(12 Hours)
Raguvamsaha Pratama sargaha (1-15)	
Unit - V	(12 Hours)

Suvachana Prayogha

Book for Study

SARALASAMKRITHAM SIKSHA, 2020, K.M Saral sankrit Balabodh, Bharathiys Vidya Bhavan, Munshimarg Mumbai – 400007, 2018

Books for Reference

- 1. Paindrapuram Ashram, Srirangam 620006 Gopalavimshanthi 2019
- R.S.Vadhyar & Sons book Kulapthy , K.M Saral sankrit Balabodh , Bharathiys Vidya Bhavan , Munshimarg Mumbai – 400007, 2018

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Cour	rse Cod	le	Title of the Course			Hou	Irs	Credit			
II	21US	A21GL	02	SANSKRIT -II			4	4 2				
Course	Progr	amme	Outcomes (PO)			Programme Specific						Mean
Outcomes↓				Outcomes (PSO)					S	Scores		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	0	of COs
CO-1	2	1	3	2	2	2	3	3	2	1		2.1
CO-2	3	2	3	2	2	3	2	3	3	2		2.5
CO-3	2	2	3	2	2	2	2	3	3	1		2.1
CO-4	3	2	3	3	1	2	3	3	3	1		2.4
CO-5	3	2	2	2	3	2	2	3	3	1		2.3
Mean Overall Score							Score		2.28			
Result						Result	#]	High				

Semester	Course Code	Title of the Course	Hours	Credits
II	21UEN22GE02	GENERAL ENGLISH - II	5	3

CO No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K- Levels)		
CO-1	CO-1 remember the use of suitable punctuation marks in appropriate places			
CO-2	describe their pictures with appropriate expressions	K2		
CO-3	infer meaning from the given context	K3		
CO-4	analyse real-life situations and ask open-ended questions	K4 & K5		
CO-5	use polite expressions in appropriate ways	K6		

Unit-I

- 01. Education Word Grid
- 02. Reading Problems and Solutions
- 03. Syllabification
- 04. Forms for Expressing Quality
- 05. Expressing Comparison
- 06. Monosyllabic Comparison
- 07. Di/polysyllabic Comparison
- 08. The Best Monosyllabic Comparison
- 09. The Best Di/Polysyllabic Comparison
- 10. Practising Quality Words

Unit –II

- 11. Wh Words
- 12. Yes/No Recollection
- 13. Unscramble Wh Questions
- 14. Wh Practice
- 15. Education and the Poor
- 16. Controlled Role Play
- 17. Debate on Education
- 18. Education in the Future
- 19. Entertainment Word Grid
- 20. Classify Entertainment Wordlist
- 21. Guess the Missing Letter
- 22. Proverb-Visual Description
- 23. Supply Wh Words
- 24. Rearrange Questions
- 25. Information Gap Questions

(15 Hours)

(15 Hours)

34. Career Word Grid

- 35. Job-Related Wordlist
- 36. Who's Who?

Unit-III

Unit-IV

26. Asking Questions27. More about Actions

29. Crime Puzzle30. Possessive Ouiz

28. More about Actions and Uses

Humourous News Report
 Debate on Media and Politics
 Best Entertainment Source

- 37. People at Work
- 38. Humour at Workplace
- 39. Profession in Context
- 40. Functions and Expressions
- 41. Transition Fill-in
- 42. Transition Word Selection
- 43. Professional Qualities
- 44. Job Procedures
- 45. Preparing a Resume
- 46. Interview Questions
- 47. Job Cover Letter Format
- 48. Emailing an Application
- 49. Mock Interview

Unit-V

50. Society Word Grid

- 51. Classify Society Wordlist
- 52. Rearrange the Story
- 53. Storytelling
- 54. Story Cluster
- 55. Words Denoting Time
- 56. Expressing Time
- 57. What Can You Buy?
- 58. Noise Pollution
- 59. Positive News Headlines
- 60. Negative News Headlines
- 61. Matching Conditions
- 62. What Would You Do?
- 63. If I were Elected
- 64. My Dream Country

Book for Study

Joy, J.L. & Peter, F.M. Let's Communicate 2, New Delhi: Trinity Press, 2014.

(15 Hours)

(15 Hours)

(15 Hours)

Books for Reference

- 1. Ahrens, Sönke. *How to Take Smart Notes: One Simple Technique to Boost Writing, Learning and Thinking.* New York: CreateSpace, 2017.
- 2. Aspinall, Tricia. *Test Your Listening*. London: Pearson, 2002.
- 3. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Routledge, 2004'
- 4. Fitikides, T.J. *Common Mistakes in English* (6th ed.). London: Longman, 2002
- 5. Wainwright, Gordon. *How to Read Faster and Recall More: Learn the Art of Speed Reading with Maximum Recall* (3rd ed.). Oxford: How to Books, 2007.

Web Resources

- 1. https://learnenglish.britishcouncil.org/
- 2. https://oneminuteenglish.org/en/best-websites-learn-english/
- 3. https://www.dailywritingtips.com/best-websites-to-learn-english/

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Course Code 1				Fitle of the Course				Hours	Credits	
II	21UEN22GE02 GEN				ERAL	ENGLI	SH - II		5	3	
Course Outcomes	Programme Outcomes (PO)				Programme Specific Outcomes (PSO)					Mean Scores	
(COs)	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	of COs
CO-1	2	3	2	2	3	2	3	2	3	2	2.4
CO-2	2	2	3	2	3	3	2	3	2	2	2.3
CO-3	2	3	2	3	2	2	3	2	3	2	2.4
CO-4	2	2	3	2	3	3	2	3	2	3	2.5
CO-5	2	2	2	3	2	2	2	3	2	2	2.2
								Mean (Overall	Score	2.36
											(High)

Semester	Course Code	Title of the Course	Hours	Credits	
т	21UCH23CC0	CORE 3: GENERAL	5	5	
11	3	CHEMISTRY-II	5		

CO. No.	CO – Statements On successful completion of this course, students will be able to	Cognitive Levels (K –Level)
CO-1	acquire knowledge on the structures and properties of ionic crystals.	K1
CO-2	comprehend the orientation and reactivity of mono and disubstituted aromatic compounds towards aromatic electrophilic substitution.	K2
CO-3	apply the Huckel's rule and predict the aromaticity of organic compounds	К3
CO-4	identify the nature of conductivity of different solids.	K4
CO–5	check and solve various problems based on chemical equilibrium and First and Zeroth law of thermodynamics.	K5

Unit –I Ionic Solids

Three-dimensional close packing in solids (*ccp* and *hcp*) – tetrahedral and octahedral voids – radius ratio rule-ionic compounds of the type AX - NaCl, CsCl-ionic compounds of the type AX₂ - CaF₂ and TiO₂ - lattice energy- Born-Haber cycle and Born-Lande equation (derivation not required)-determination of lattice energy of NaCl and CaCl₂ using Born-Haber cycle-polarizing power and polarizability - Fajan's rules.

Unit- II Defects in Solids and Metallic Bond

Stoichiometric defect - Schottky, Frenkel, non-stoichiometric defects - metal excess and metal deficiency defects-theories of bonding in metals - free electron theory, valence bond theory, molecular orbital or band theory-application of band theory to conductors, insulators and semiconductors-superconductivity.

Unit –III Aromatic compounds – I

Criteria for aromaticity - Huckel's rule- aromatic hydrocarbons - cations and anions annulenes - heterocyclic compounds - consequences of aromaticity: pKa, solubility and dipole moment – molecular orbital description of aromaticity and anti–aromaticity.

Electrophilic aromatic substitution- general mechanism - reaction coordinate diagram mechanism of halogenation, nitration, sulphonation - principle of microscopic reversibility-Friedel-Craft's acylation - acylation followed by Clemmensen and Wolff-Kishner reductions - Gatterman- Koch carbonylation and Friedel-Craft's alkylation - Stille and Suzuki reactions.

Unit – IV Aromatic Compounds – II

Nomenclature of substituted benzenes - mono-, di- and polysubstituted reactions orientation and reactivity of aromatic electrophilic substitution reactions of mono - and disubstituted benzenes - activating and deactivating groups - ortho/para and meta directing groups - electrophilic aromatic substitution reactions of phenols and anilines - polynuclear

(15 Hours)

(15 Hours)

39

(15 Hours)

(15 Hours)

aromatic compounds – synthesis of naphthalene, anthracene, phenanthrene from benzene by multistep synthesis – orientation and reactivity.

Unit –V Chemical Equilibrium and Thermodynamics–I (15 Hours)

Gibbs energy– exergonic and endergonic reactions – description of equilibrium – nature of a reaction – relation between equilibrium constants – molecular interpretation of the equilibrium constant– the response to pressure and temperature– The Van't Hoff equation– the value of K at different temperatures.

Internal energy: work, heat, and energy – definitions– molecular interpretation of heat and work – molecular interpretation of internal energy– formulation of the First Law– expansion work – general expression for work – expansion against constant pressure– reversible expansion– isothermal reversible expansion– heat transactions – calorimetry – heat capacity– enthalpy– enthalpy change and heat transfer– variation of enthalpy with temperature – heat capacity at constant pressure and volume.

Quantifying w, q, dU and dH during the reversible and irreversible processes of expansion of ideal and real gases under isothermal and adiabatic conditions – Joule–Thomson effect – relationship between μ_{JT} and other thermodynamic quantities – calculation of Joule–Thomson coefficient for ideal and real gases – inversion temperature– zeroth law of thermodynamics – absolute scale of temperature.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.

Unit–I and II Chapter 3

- 2. Morrison R T and Boyd R N, *Organic Chemistry*, 7th Edition, New York, Allyn and Bacon Ltd., 2011.
 - Unit–III Chapter16 Unit–IV Chapter16
- 3. Atkins P W, *Physical Chemistry*, 10th Edition, Oxford University Press, 2014. **Unit–V** *Chapters 2, 3 and 9*

Books for Reference

- 1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
- 2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
- 3. Cotton F A, Wilkinson G, Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, Johh Willey and Sons. Inc., New York, 1995.
- 4. Bruice P Y, *Organic Chemistry*, 8th Edition University of California, Santa Barbara, Pearson Ltd, 2011
- 5. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, 2004.
- 6. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York , 2014.

Web Resources







Defects in crystals

Basics of Thermodynamics

Thermodynamics

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse c	ode		Titl	e of the	Cours	e	Но	urs	Credits
II	21U0	CH230	CC03	GE	NERA	CORE 3: L CHEMISTRY – II			4	5	5
Course Outcomes	Programme Outcomes (POs)				Prog	Programme Specific Outcomes (PSOs)			omes	Mean Score of	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	1	1	2	3	1	2	3	2	3	3	2.1
CO-2	1	1	3	3	4	2	4	1	2	3	2.4
СО-3	1	2	2	3	2	2	2	2	1	1	1.8
CO-4	2	1	1	3	1	2	1	3	1	3	1.8
CO-5	1	3	1	2	3	2	2	3	3	1	2.1
Mean overall Score								2.04 (Medium)			

Semester	Course code	Title of the course	Hours	Credits
I & II	21UCH23CP01	CHEMISTRY PRACTICAL–I (Inorganic Qualitative Analysis)	3	2

CO No.	CO–Statements	Cognitive level (K –Level)		
On succes				
CO-1	Know the lab safety and identify nature of chemicals	K 1		
CO-2	understand the principles of qualitative analysis for detection of inorganic cations.	K 2		
СО–3	apply the principles of qualitative analysis for detection of inorganic anions.	K 3		
CO-4	illustrate the techniques of semi micro qualitative analysis of inorganic salt mixtures.	K 4		
CO-5	eliminate the interfering acid radicals.	K 4		

Unit– I Lab Safety, Chemicals and Glassware

Philosophy of lab safety - first-aid techniques - general work culture inside the chemistry lab-importance of wearing lab coat, eye glasses.

Personal protection - nature of chemicals - toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals - safe storing and handling of chemicals - disposal of chemical wastes - glassware - handling of glassware - handling of different types of equipment's like Bunsen burner, centifuger, Kipp's apparatus, etc. - ventilation facilities.

Unit -II General Principles of Qualitative Analysis

Principle of flame test - concept of solubility and solubility product - theory of acids and bases - concept of pH and buffer action - common ion effect - redox reactions - theory of testing acid radicals (simple and interfering) - principle of grouping of cations - theory of testing cations.

Unit-III Semi-micro Qualitative Analysis - I

Analysis of simple acid radicals:

- a) Carbonate
- b) Sulphide
- c) Sulphate
- d) Chloride
- e) Bromide
- f) Iodide
- g) Nitrate

Analysis of interfering acid radicals:

- a) Fluoride
- b) Oxalate
- c) Borate
- d) Phosphate
- e) Chromate

(3 Hours)

(3 Hours)

(28 Hours)

42

- f) Arsenite
- **g**)

Unit - IV Semi-micro Qualitative Analysis - II Elimination of interfering acid radicals

- a) Fluoride
- b) Oxalate
- c) Borate
- d) Phosphate
- e) Chromate
- f) Arsenite

Identifying the groups of basic radicals

Group I : Ag ⁺, Hg²⁺, Pb²⁺ Group II : **IIA**–Cu ²⁺, Cd²⁺, Hg²⁺, Pb²⁺, Bi³⁺. **IIB**–Sn²⁺, Sn⁴⁺, Sb³⁺ Sb⁵⁺ As³⁺, As⁵⁺ Group III : Fe^{3+} , $Al^{3+}Cr^{3+}$. Group IV: Co²⁺ ,Ni²⁺, Mn²⁺,Zn²⁺ Group V : Ca^{2+} , Ba^{2+} , Sr^{2+} . Group VI: Mg²⁺, NH₄⁺.

Unit -V Semi-micro Qualitative Analysis - III

Analysis of basic radicals (group-wise): Lead, Copper, Bismuth, Cadmium, Antimony, Iron, Aluminium, Chromium, Zinc, Manganese, Nickel, Calcium, Strontium, Barium, Magnesium, Ammonium.

Analysis of a mixtures containing two cations and two anions (of which one is interfering type - max. 15 Mixtures).

Books for Study

- 1. Svehla G, Vogel's Qualitative Analysis, 7th Edition, Pearson Education, India, 2012.
- 2. Lab manual, Department of Chemistry, St. Joseph's College, Tiruchirappalli.
- 3. Venkateswaran V, Veeraswamy R, Kulandaivelu A R, Basic Principles of Practical Chemistry, 2nd Edition, New Delhi, Sultan Chand and Sons, 1997.

Web Resources



Systematic Qualitative Analysis

Qualitative Analysis of

Inorganic Salts

Handling of Chemicals

(26 Hours)

(30 Hours)

Scheme of Valuation

Chemistry Practical–I

Inorganic Qualitative Analysis

INTERNAL

CIA	
	Cumulative mark of Regular Practical Classes
	Two CIA tests
For E	ach CIA Test 100 marks

	100 mains
Theory/Test	10 Marks
Record	10 Marks
Procedure	20 marks
Results/Analy	sis 60 Marks
	Scheme of valuation

15 marks for each of the four radicals $-4 \times 15=60$ marks

10 marks for Identification of group only of a particular radical

100 Marks 50 Marks 50 Marks

EXTERNAL							
Total	100 Marks						
Theory	10 Marks						
Procedure	10 Marks						
Results/Analysis	80 Marks						
	Scheme of valuation						
	20 marks for each of the four radicals $-4 \times 20 = 80$ marks						
	15 marks for Identification of group only of a particular radical						

marks for Identification of group only of a particular radica

Semester	Course code	Title of the course	Hours	Credits
I &II	21UCH23CP02	CHEMISTRY PRACTICAL-II	3	2

CO No.	CO–Statements On successful completion of the course, students will be able to	Cognitive levels (K–Level)
CO -1	understand methods of preparation of solutions with different concentration	K1
CO –2	understand the principles of acid base titrations.	K2
CO – 3	comprehens advanced titerimetric technics	K2
CO -4	applying techniques of tritrimetric analyses.	K3
CO –5	analysis to solve the enviroinmental probeloms	K4 & K6

Unit – I Principles of Quantitative Analysis

Introduction – types of quantitative analyses – theory of significant figures– error analysis – apparatus used in titrimetric analysis – handling of digital balances and other apparatus – concept of molecular weight, formula weight, equivalent weight - concentrations of solutions - molarity, formality, normality, weight percentage.

Unit – II Principles of Titrimetry

Principle of titrimetry – primary and secondary standards – preparing standard solutions – standardizing the secondary standard solutions -types of titrimetric analyses - principal reactions - concepts of acids, bases, oxidants, reductants - theory of indicators - calculations for strengths of solutions and the amount of substances in solution.

Unit –III Preparation of Solutions and Types of Titrimetric Methods (28 Hours)

- 1. Preparation of a standard solution.
- 2. Preparing a standard solution and doing a titration.
- 3. Making up a given solution and doing a titration.
- 4. Estimation of strength of a solution.
- 5. Types of titrimetric methods and indicators used.

Unit – IV Acid–Base and Redox titrations

- 1. Estimation of HCl by NaOH using a standard oxalic acid solution.
- 2. Estimation of oxalic acid by NaOH using a standard oxalic acid solution.
- 3. Estimation of Na₂CO₃ by HCl using a standard Na₂CO₃ solution.
- 4. Estimation of Oxalic acid by KMnO₄ using a standard oxalic acid solution.
- 5. Estimation of K₂Cr₂O₇ by Thio solution.
- 6. Estimation of Iron (II) by KMnO₄ using a standard Mohr's salt solution.
- 7. Estimation of KMnO₄ by thio using a standard potassium dichromate solution.
- 8. Estimation of Iron (II) by K₂Cr₂O₇ using a standard Mohr's salt solution.
- 9. Estimation of Copper (II) sulphate by K₂Cr₂O₇ solution.
- 10. Estimation of Copper by standard CuSO₄ solution.

Unit – V Complexometric and applied titrations

1. Estimation of magnesium(II) by EDTA.

45

(28 Hours)

(28 Hours)

(3 Hours)

(3 Hours)

- 2. Estimation of calcium(II) by EDTA.
- 3. Estimation of zinc(II) by EDTA.
- 4. Estimation of total hardness of water.
- 5. Estimation of antacid.
- 6. Estimation of bleaching powder.

Books for Study

- 1. Anna Coulling, A Complete guide to Volumetric Analysis, 1st Edition, Create Space Independent Publishing Platform, 2013.
 - **Unit–II** Chapter 3 **Unit– I** *Chapter*1
- 2. Schimpt Henry W, Essential of Volumetric Analysis, 1st Edition, Wentworth Press, 2019. **Unit– III** Chapter 6
- 3. Peter McPherson, Volumetric Analysis, 1st Edition, Royal Society of Chemistry, 2014. **Unit–I** Chapter 9 **Unit–** I *Chapter*12

Books for Reference

- 1. Venkateswaran V, Veeraswamy R., Kulandaivelu A R., Basic Principles of Practical Chemistry, New Delhi, 2nd Edition, Sultan Chand and sons, 1997.
- 2. Bassett J, Vogel's Textbook of Quantitative Inorganic Analysis,4th Edition, ELBS Longman, 1985.
- 3. Peter McPherson, *Volumetric Analysis*, 1st Edition, Royal Society of Chemistry, 2014.

Web Resources







Preparation of Oxalic acid

Fundamentals of Volumetric Analysis **Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes**

Semester	Course code Title				le of the	of the Course			lours	Credits	
I & II	21U	CH230	CP02	CH	EMIS	TRY P	RACTI	CAL-I	I	3	2
Course Outcomes	Programme Outcomes (POs)				Prog	Programme Specific Outcomes (PSOs)				Mean Score of	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	2	4	1	3	2	2	3	2	2	1	2.2
CO-2	1	2	2	1	2	2	3	2	4	3	2.2
СО-3	1	3	2	1	3	1	2	4	3	1	2.1
CO-4	2	3	1	3	1	1	2	3	2	3	2.1
CO-5	3	1	3	2	1	2	2	4	2	3	2.3
	Mean overall Score								2.18 (Medium)		

INTERNAL

CIA			100 Marks	
Cumulative	Cumulative mark of Regular Practical Classes			
Two CIA tes	ts		50 Marks	
For Each CIA Test	100 marks			
Theory/Test	10 Marks			
Record	10 Marks			
Results	80 Marks			
	Scheme of valuation			
	<1% Error	80 Marks		
	2%	70 Marks		
	3%	60 Marks		
	4%	50 Marks		
	>4%	30 Marks		
	EX	KTERNAL		

Total Short Procedure Test Results/Analysis

10 Marks 80 Marks

100 Marks

10 Marks

Scheme of vo	aluation
<1% Error	80 Marks
2%	70 Marks
3%	60 Marks
4%	50 Marks
>4%	30 Marks

Semester	Course Code	Title of the Course	Hours	Credits
Π	21UCH23AC02	ALLIED: MATHEMATICS FOR	6	4
		CHEMISTRY-II		

	CO- Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Levels (K-levels)
CO-1	acquire knowledge in integration, differential equations and Laplace transform.	K1
CO-2	understand the various methods of integration, differential equations and the concepts of Laplace transform.	K2
CO-3	solve problems in integration, differential equations and Laplace transform	K3
CO-4	identify the suitable methods to solve problems related to integration, differential equations and Laplace transform.	K4
CO-5	evaluate integrals, first and second order differential equations with constant coefficients, problems involving Laplace transforms and ordinary differential equations using Laplace transform.	К5

UNIT-I

Integration – Integrals of functions containing linear functions of x – Integrals of functions involving $a^2 + x^2$ – Integrals of rational algebraic functions – Integration of irrational functions.

UNIT-II

Properties of definite integrals - Simple applications - Integration by parts- Bernoulli's formula – Evaluation of double integrals (omit problems involving changing the order of Integration and applications).

UNIT-III

Differential equations of first order - variable separable - Homogeneous equations - Nonhomogeneous equations – Linear equation – Bernoulli's equation.

UNIT-IV

(18 Hours)

Second order linear equations with constant coefficients – Particular Integrals for e^{kx} , $\sin kx$, $\cos kx$, x^n and $e^{kx}X$.

UNIT-V

Laplace transforms - Definition - Some general theorems - Inverse transform - Solving ordinary differential equations using Laplace transformation.

Books for Study

1. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay, P. Kandaswamy, "Ancillary Mathematics, Volume II", 2009 Edition, S. Viswanathan Pvt. Ltd. **Unit I:** Chapter 1: Sec 6.1, 6.2, 7 (omit 7.4), 8 case (i) to (iv) only,

48

(18 Hours)

(18 Hours)

(18 Hours)

(18 Hours)

pages: 7–13, 23–31, 39–4. Unit II: Chapter 1: Sec. 11, 12, 15, pages: 61 – 72, 93 and 94; Chapter 3: Sec. 2.2, pages: 163-170. Unit III: Chapter 4: Sec. 1- 5, pages 205 – 218. Unit V: Chapter 7: Sec. 7.1 – 7.7, pages 289 – 315.

2. S. Narayanan, T. K .Manicavachagom Pillay, "Ancillary Mathematics Book II", 2002 Edition, S. Viswanathan Pvt. Ltd.
Unit IV: Chapter 3: Sec. 1-4, pages: 42 – 60.

Books for Reference

- 1. M. K. Venkatraman, "Engineering Mathematics" National Publishing Company, 1996
- S. Narayanan, T.K. Manicavachagom Pillay, "Differential Equations and its applications" S. Viswanathan Pvt. Ltd, 2009.
- 3. S. Narayanan, T.K. Manicavachagom Pillay "Calculus Volume I & II" S.Viswanathan Pvt. Ltd, 2009.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Cou	Course Code Title of the Course					Hours	Credits			
II	21U0	CH23A	C02	A	LLIE	D: MAT			OR	6	4
						CHEM	ISTRY	·II			
Course	Prog	Programme Outco		comes ((PO)	Pr	ogramn	ne Speci	fic	Mear	n Scores
Outcomes↓				Outcomes (PSO)			of	COs			
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	3	3	2	2	1	2.2
CO-2	3	3	2	1	2	3	3	2	1	2	2.2
CO-3	2	3	2	2	2	2	3	2	2	2	2.2
CO-4	3	3	2	2	1	3	3	2	2	1	2.2
CO-5	3	3	1	3	1	3	3	1	3	1	2.2
Mean Overall Score								2.2 Iigh)			

Semester	Course Code	Title of the Course	Hours	Credits
II	21UHE24AE02	Environmental Studies	2	2

CO No.	CO - Statements	Cognitive Levels (K-levels)
	On Completion of this course, the graduates will be able to	
CO-1	identify the concepts related to the environmental global scenario	K1
CO-2	comprehend the natural resources and environmental organizations	K2
CO-3	apply the acquired knowledge to sensitize individuals and public about the environmental crisis	К3
CO-4	analyze the causes and changes in the structure of biodiversity	K4
CO-5	enhance their skills in the society by solving the environmental problems and preserving nature by the acquired knowledge	K5

Unit I Introduction to Environmental Studies

Introduction - Scope and Importance - Subsystems of Earth - Various recycling Methods -Environmental Movements in India - Eco- Feminism - Public awareness - Suggestions to conserve environment.

Unit II Natural Resources

Food Resources - Land Resources - Forest resources - Mineral Resources - Water Resources – Energy Resources

Unit III Ecosystems, Biodiversity and Conservation

General structure of ecosystem - Functions of Ecosystem - Energy flow and Ecological pyramids - Levels of Biodiversity - Hot spots of Biodiversity - Endangered and Endemic Species - Value of Biodiversity - Threats to Biodiversity - Conservation of Biodiversity

Unit IV Environmental Pollution

Air Pollution - Water Pollution - Oil Pollution - Soil Pollution - Marine Pollution - Noise Pollution - Thermal Pollution - Radiation Pollution

Unit VEnvironmental Organizations and Treatise

United Nations Environment Program (UNEP) - International treaties on Environmental protection - Ministry of Environment, Forest and Climate Change - Important National Environmental Acts and rules- Environmental Impact Assessment.

Books for Study

Department of Human Excellence, Environmental Studies, St. Joseph's College, Tiruchirappali-02, 2021.

(6 Hours)

(6 Hours)

(6 Hours)

(6 Hours)

(6 Hours)

Books for Reference:

- 1. Rathor, V.S. and Rathor B. S. *Management of Natural Resources for Sustainable Development*. New Delhi: Daya Publishing House, 2013.
- 2. Sharma P.D, Ecology and Environment, 8 ed., Meerut: Rastogi Publications, 2010.
- 3. Agrawal, A and C.C. Gibson. Introduction: The Role of Community in Natural Resource
- 4. Conservation. NJ: Rutgers University Press, 2001.

Web Sources:

https://www.unep.org/. Accessed 05 Mar. 2021.

http://moef.gov.in/en/ Accessed 05 Mar. 2021.

https://www.ipcc.ch/reports/. Accessed 05 Mar.2021.

Semester	Course Code	Title of the Course	Hours	Credits
п	21UHE14VE02	TECHNIQUES OF SOCIAL ANALYSIS: FUNDAMENTALS OF HUMAN RIGHTS	2	1

CO No.	CO - Statements	Cognitive Levels (K-levels)
	On completion of this course, the graduates will be able to:	
CO-1	identify the importance and the values of human rights	K1
CO-2	understand the historical background and the development of Human Rights and the related organizations	K2
CO-3	apply the provisions of National and International human rights to themselves and the society	K3
CO-4	analyse the violations of human rights to the marginalized section in the society	K4
CO-5	animate the people to involve in the struggles and activities of the human rights organizations	K5

Unit-I Human Rights - An Introduction

Introduction- Classification of Human Rights- Scope of Human Rights-Characteristics of Human Rights-NHRC-SHRC- Challenges for Human Rights in the 21stCentury.

Unit-II Historical Development of Human Rights

Human Rights in Pre-World War Era- Human Rights in Post-World War Era- Evolution of International Human Rights Law - the General Assembly Proclamation- Institution Building, Implementation and the Post- Cold War Period. The ICC.

Unit-III India and Human Rights

Introduction-Classification of Fundamental Rights-Salient Features of Fundamental Rightsand Fundamental Duties.

Unit-IV Human Rights of Women and Children

Women's Human Rights- Issues related to women's rights - and Rights of Women's and Children

Unit-V Human Rights Violations and Organizations

Human Rights Violations - Human Rights Violations in India - the Human Rights Watch Report, January 2012- Human Rights Organizations.

Books for Study

The Department of Human Excellence, *Techniques of Social Analysis: Fundamentals of Human Rights*, St. Joseph's college, Tiruchirappalli -02, 2021.

Books for Reference

1. Venkatachalem. Dr. The Constitution of India, Salem: Giri Law House, 2005.

(6-Hours)

(6-Hours)

(6-Hours)

(6-Hours)

(6-Hours)

- 2. NaikVarunand Mukesh Shany. *Human rights education and training*, New Delhi: crescent Publishing Corporation, 2011.
- 3. BhathokeNeera. *Human Rights content and extent*, New Delhi: swastika publications, 2011.

Web Sources:

https://www.un.org/en/universal-declaration-human-rights/_Accessed 05 Mar. 2021. https://www.ilo.org/global/lang--en/index.htm_Accessed 05 Mar. 2021. https://www.amnesty.org/en/_Accessed 05 Mar. 2021.

Semester	Course Code	Title of the Course	Hours	Credits
III	21UTA31GL03	General Tamil - III	4	3

CO No.	CO- Statement	Cognitive Level (K- level)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
CO-1	சங்க இலக்கிய வகைகளை நினைவுகூருவர்	K 1
CO-2	இலக்கியத்தினை நுட்பமாக அறிதலின் வழியாக ஆற்றுப்படுத்தும் திறன் பெறுவர்	K 2
CO-3	இலக்கிய அறநெறிகளைத் தற்கால வாழ்வியலில் பயன்படுத்தும் திறன் பெறுவர்	К 3
CO-4	அகம் மற்றும் புற இலக்கியத் திணை, துறைகளைப் பகுத்தாராய்வர்	K 4
CO-5	யாப்பு, அணி இலக்கண நுட்பங்களை இலக்கியங்களில் மதிப்பிடுவர்	K 5

அலகு - 1		(12 மணிநேரம்)
பொருநராற்றுப்படை	_ (முழுமையும்)	
அலகு - 2		(12 மணிநேரம்)
நற்றிணை ஐங்குறுநூறு யாப்பிலக்கணம்	- 5 பாடல்கள் - (1, 19, 21, 70, 148) - அன்னாய் வாழிப்பத்து. - வெண்பா, ஆசிரியப்பா	
அலகு - <i>3</i>	- வையைபா, ஆசாயப்பா	(12 மணிநேரம்)
கலித்தொகை	- (குறிஞ்சிக்கலி- 62, பாலைக்கலி -22, மருதக்க -149, முல்லைக்கலி - 116)	නි- 87,
	- முதற்பாகம் ('தமிழ் மொழியின் தொன்மையும் 'சங்க தொகை நூல்கள்' முடிய), - குடும்ப அட்டை (2022-2023)	சிறப்பும்' முதல்
ച് <u>ച</u> ാംബ്ല அலகு - 4		(12 மணிநேரம்)
பதிற்றுப்பத்து புறநானூறு அணியிலக்கணம்	- 3 பாடல்கள் (14, 32, 61) - 5 பாடல்கள் (95, 121, 130, 204, 279)	
அலகு - 5 திருக்குறள்	- புறங்கூறாமை, பழமை, புலவி நுணுக்கம் ஆ	(12 ம ணிநேரம்) கிய அதிகாரங்கள்

திரிகடுகம் - 5 பாடல்கள் (2, 6, 12, 15, 42)

இலக்கிய வரலாறு - சங்க இலக்கியங்களின் தனித்தன்மைகள் முதல் இரட்டைக் காப்பியங்கள் முடிய

பாடநூல்கள் :

- 1. **பொதுத்தமிழ்** செய்யுள் திரட்டு, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2, முதற்பதிப்பு, 2021
- 2. **சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு,** தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, பத்தாம் பதிப்பு, 2017

3. **புதினம்** (ஒவ்வொரு கல்வியாண்டிற்கும் ஒவ்வொரு புதினம்)

2022 – 2023 கல்வியாண்டுக்கு மட்டும் : வீ.செந்தில் குமார், **குடும்ப அட்டை,** தாமரை பப்ளிகேஷன்ஸ் பிரைவேட் லிமிடெட், சென்னை, முதற்பதிப்பு, 2009

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Cou	rse Code	e	Title of the Course Hour							Credit
III	21UT	A31GL()3	General Tamil - III 4							3
Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
(COs)	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	of COs
CO-1	3	2	2	3	2	3	2	3	3	2	2.5
CO-2	2	2	2	3	3	2	2	3	3	2	2.4
CO-3	3	3	2	3	3	2	2	3	3	3	2.7
CO-4	3	2	2	3	2	3	2	3	2	3	2.5
CO-5	2	3	2	3	2	3	2	3	2	3	2.5
	Mean Overall Score									2.52 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UFR31GL03	FRENCH – III	4	3

CO No.	CO–Statements On successful completion of this course, students will be able to	Cognitive Levels (K –Levels)
CO-1	relate colours, materials and shapes to the french clothing.	K1
CO-2	select appropriate prepositions in giving directions.	K2
CO–3	construct a text in present tense using different verbs.	K3
CO-4	examine the travel manners and celebrations of the French.	K4
CO–5	justify the usage of past tense in a biography.	K5

Unit – I

TITRE: VIVRE LAVILLE

GRAMMAIRE : la comparaison, les prépositions avec les noms géographiques, les pronoms personnels COI, le pronom y (le lieu)

LEXIQUE : se repérer sur un plan de ville, la ville, les lieux de la ville

PRODUCTION ORALE : demander et indiquer une direction dans un dialogue

PRODUCTION ECRITE : décrire votre ville natale, créez les affiches en appréciant votre ville

Unit - II

TITRE: VISITER UNE VILLE

GRAMMAIRE : la position des pronoms compléments, les verbes du premier groupe en – ger et – cer, les verbes ouvrir et accueillir

LEXIQUE : dire les informations sur une ville de votre choix, les transports, les points cardinaux, les prépositions de lieu

PRODUCTION ORALE : Indiquer le chemin

PRODUCTION ECRITE : Demander des renseignements touristiques

Unit - III

TITRE: ON VEND OU ON GARDE

GRAMMAIRE : la formation du pluriel, les adjectifs de couleurs, l'adjectif beau, nouveau, vieux

LEXIQUE : savoir comment s'habiller des grandes occasions, les couleurs, les formes, les matériaux

PRODUCTION ORALE : comprendre une présentation de catalogues vestimentaires en France

PRODUCTION ECRITE : adresser des souhaits à quelqu'un

Unit - IV

TITRE: VENTES D'AUTREFOIS, VENTES D'AUJOURD'HUI

GRAMMAIRE : les pronoms relatifs qui et que, l'imparfait, les verbes connaitre, écrire, mettre et vendre, la question avec inversion

(12 hours)

(12 hours)

(12 hours)

(12 hours)

LEXIQUE : comprendre la description de personnes dans un extrait de roman, les mesures, l'informatique

PRODUCTION ORALE : imaginez un dialogue avec un personnage célèbre. Utilisez l'inversion.

PRODUCTION ECRITE : écrire une biographie en utilisant les pronoms relatifs

Unit- V

(12 hours)

TITRE: FELICITATIONS ! / ON VOYAGE!

GRAMMAIRE : les pronoms démonstratifs, les articles : particularités, les pronoms interrogatifs variables : lequel, les adverbes de manières, les verbes recevoir et conduire LEXIQUE : les moyens de transports, les voyages, les fêtes, l'aéroport et l'avion, la gare et le train, l'hôtel PRODUCTION ORALE : Présenter ses vœux PRODUCTION ECRITE : Faire une réservation

Book for Study

P.Dauda,L.Giachino and C.Baracco, Generation A2, Didier, Paris 2016.

Books for Reference

1. J.Girardet and J.Pecheur, EchoA2, CLE International, 2edition, 2017

2. Régine Mérieux and Yves Loiseau, *Latitudes A2*, Didier, 2012.

3. Isabelle Fournier, Talk French, Goyal Publishers, 2011

Web Resources

- 1. https://francais.lingolia.com/en/grammar/prepositions
- 2. https://www.lawlessfrench.com/grammar/present-tense/
- 3. https://www.thoughtco.com/textures-french-adjectives-and-expressions-1368980
- 4. https://study.com/academy/lesson/past-tense-in-french.html
- 5. https://absolutely-french.eu/french-celebrations/?lang=en

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Co	ourse c	ode		Tit	tle of the Course				ours	Credits
III	21 U	FR31(GL03		F	RENC			4	3	
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	2	1	2	2	3	2	3	1	2	3	2.1
CO-2	3	2	3	3	1	2	1	2	2	3	2.2
CO-3	2	1	3	2	2	3	1	3	2	2	2.1
CO-4	3	1	3	2	3	3	3	1	2	3	2.4
CO–5	3	2	3	2	2 2 3 3 2 2 1						2.3
	Mean overall Score									2.22 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UHI31GL03	HINDI - III	4	3

	CO–Statements	Cognitive
CO No.	On successful completion of the course, students will be able to	Levels (K –Levels)
CO-1	find out the dialects of Hindi language.	K1
СО-2	compare the poems of Sumithra Nandanpanth, Prasad & Bachan in Context with their experience of life.	K2
СО-3	illustrate the importance given to family ethics by the youth in the modern period according to "Bahoo Ki vidha" One Act play.	K3
CO-4	categorize the poetics in some selective poems.	K4
CO-5	justify the social & political conditions of Devotional period in Hindi Literature.	К5

Unit - I

Tera sneh na khooon Samband Bodak Reethikal - Namakarn Tense

Unit - II

Himadri Thung Sring Se Paribakshik shabdavali Samuchaya Bodak Reethikal - Samajik Paristhithiyam

Unit - III

Insan our Kuthae Vismayadi Bodak Reethikal - Sahithyik Paristhithiyam Reethikal - Salient Features

Unit - IV

Shokgeeth Avikary shabdh Reethikal - Main Divisions Social media and modern world

Unit - V

Reethikal - Visheshathayem Anuvad – 3 Bahoo ki vidha (one act play)

(12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

Books for Study

- Dr. Sanjeev Kumar Jain, Anuwad: Siddhant Evam Vyavhar, Kailash Pustak Sadan, Madhya Pradesh, 2019.
 Unit-I Chapter 1
- 2. M. Kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020. Unit-II, III and IV Chapter 2
- 3. Dr. Sadananth Bosalae, *kavya sarang*, Rajkamal Prakashan, New Delhi, 2020. Unit-V Chapter 4

Books for Reference

- 1. Ramdev, Vyakaran Pradeep, Hindi Bhavan, 2016.
- 2. Lakshman prasad singh, Kavya ke sopan, Bharathy Bhavan Prakashan, 2017.
- 3. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.
- 4. Hindi Niband Sangrah, V&S Publishers, 2015.
- 5. Krishnakumar Gosamy, Anuvad vigyan ki Bhumika, Rajkamal Prakashan, 2016.

Web Resources

- 1. https://youtu.be/Xxvco3qa284
- 2. https://youtu.be/e9wK-pYfVPc
- 3. https://youtu.be/75tHr53f5_o
- 4. https://youtu.be/eFNM6y_cpjY
- 5. https://youtu.be/jHWXWLMxJtw

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	C	ourse	Code		Ti	itle of the Course				Hour	s Credits		
III	21UHI31GL03					HINI	DI - III			4	3		
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcon (PSO)				mes	Mean Scores		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos		
CO-1	3	2	3	3	2	3	2	1	3	2	2.4		
CO-2	3	2	3	2	2	3	2	3	2	3	2.5		
CO-3	3	2	2	3	1	3	2	3	2	3	2.4		
CO-4	2	3	3	2	3	2	3	3	2	1	2.4		
CO-5	3	2	2	3	3	2	1	3	2	3	2.4		
Mean Overall Score									2.42 (High)				

Semester	Course Code	Title of the Course	Hours	Credits
III	21USA31GL03	SANSKRIT - III	4	3

CO No.	CO–Statements On successful completion of the course, the student will be able to	Cognitive Levels (K –Levels)
CO-1	remember Characters and events of Ramayana.	K1
CO-2	understand social ethics and moral duties.	K2
CO-3	apply the values learnt , in day to day life.	К3
CO-4	analyzing the Vedic Philosophy.	K4
CO-5	evaluate and create new words with upasargas.	K5

Unit - I	(12 Hours)
Romodantam, Balakandam (1-15)	
Unit - II	(12 Hours)
Romodantam, Balakandam (15-30)	
Unit - III	(12 Hours)
Vedas – Vedangas vivaranam	
Unit - IV	(12 Hours)
Puranas .Upanishands	
Unit - V	(12 Hours)
Upasargas , Bhayishyat Kaalah	

Upasargas, Bhavishyat Kaalah

Book for Study

VEDIC LITERATURE, 2019

Books for Reference

- 1. Parameshwara, Ramodantam, LIFCO Chennai 2018
- R.S.Vadhyar & Sons , Book sellers and publishers , Kalpathu ,Palghat 678003 , Kerala , south India , History of Sanskrit Literature 2019
- 3. Kulapathy , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007 2018

Outcomes						
Semester	Course Code	,	Title of the Course	Hou	irs	Credit
III	21USA31GL03		SANSKRIT-III	4		3
Course	Programme Outco	mes (PO)	Programme Specific		N	Iean

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Course	Programme Outcomes (PO)					Programme Specific					Mean
Outcomes ↓						Outcomes (PSO)					Scores
	PO1 PO2 PO3 PO4 PO5					PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	1	2	2	3	3	3	3	3	2	1	2.3
CO-2	3	3	2	3	3	2	2	3	3	3	2.7
CO-3	3	3	1	3	3	1	1	3	3	3	2.4
CO-4	2	2	1	2	3	2	2	3	2	1	2.0
CO-5	3	3	2	3	2	2	3	3	3	2	2.6
Mean Overall Score									2.4		
											# High

Semester	Course Code	Title of the Course	Hours	Credits
III	21UEN32GE03	GENERAL ENGLISH - III	5	3

CO.No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K-Levels)
CO -1	recall the meaning of familiar words in different contexts	K1
CO-2	comprehend the complex written texts by guessing meaning of unfamiliar words using contextual clues	K2
CO-3	use tenses and punctuations appropriately in sentences	K3
CO-4	analyse formal and informal letters to rewrite them meaningfully	K4
CO-5	compare different genres of writing and construct paragraphs	K5 & K6

 Unit-I 1. Suggestions to Develop Your Reading Habit 2. General Writing Skill: Letter Writing – Informal 3. Grammar: Simple Present Tense 	(15 Hours)
 Unit-II 4. The Secret of Success: An Anecdote 5. General Writing Skill: Letter Writing – Formal 6. Grammar: Present Continuous Tense 	(15 Hours)
 Unit-III 7. The Impact of Liquor Consumption on the Society 8. General Writing Skill: Letter to Newspaper 9. Grammar: Simple Past Tense 	(15 Hours)
Unit-IV10. Dr. A.P.J. Abdul Kalam: A Short Biography11. General Writing Skill: Job Application Letter12. Grammar: Past Continuous Tense	(15 Hours)
 Unit-V 13. Golden Rule: A Poem 14. General Writing Skill: Circular-Writing 15. Grammar: Simple Future Tense and Future Continuous Tense 	(15 Hours)

Book for Study

Jayraj, S. Joseph Arul et al. *Trend-Setter: An Interactive General English Textbook for Undergraduate Students.* Trinity, 2016.

Books for Reference

- 1. Malkani, Neelam. *A comprehensive Guide on General English for Competitive Exams*. Agra: Oswal Publications, 2020.
- 2. Jain, B. B. Compendium General English. Agra: Upkar Prakashan, 2010.
- 3. Aggarwal, R.S. Quick Learning Objective General English. India: S Chand, 2006.
- 4. T. Ferrari, Bernard. *Power Listening: Mastering the Most Critical Business Skill of All.* USA: Penguin Publishers, 2012.
- 5. Barry, Marian. Steps to Academic Writing. USA: Cambridge University Press, 2011.

Web Resources

- 1. https://www.nypl.org/events/classes/english
- 2. <u>https://www.waywordradio.org/listen/podcast-</u> itunes/?gclid=EAIaIQobChMIrbeRtbP12AIVCYZpCh0-XwnvEAAYAiAAEgLcjvD_BwE
- 3. <u>https://eltlearningjourneys.com/2015/05/19/websites-for-learning-english/</u>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Cou	arse C	ode			Fitle of the Course				Hours	Credits
III	21U	EN320	E03		GEN	ERAL]	ENGLI	SH - III		5	3
Course Outcomes	(POs)				Programme Specific Outcomes (PSOs)					Mean Scores	
(COs)	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	of COs
CO-1	2	3	2	2	3	2	3	2	3	2	2.4
CO-2	2	2	3	2	3	3	2	3	2	2	2.3
CO-3	2	3	2	3	2	2	3	2	3	2	2.4
CO-4	2	2	3	2	3	3	2	3	2	3	2.5
CO-5	2	2	2	3	2	2	2	3	2	2	2.2
Mean Overall Score									2.36		
											(High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH33CC04	CORE–4: GENERAL CHEMISTRY – III	4	3

CO No.	CO–Statements	Cognitive Levels
	On successful completion of course, students will be able to	(K–Level)
CO-1	revise the basic introduction of hydrogen and the hydrides.	K1
CO-2	compare the different concepts of acids and bases.	K2
CO-3	examine the various systems and their coexistence in phase equilibrium.	K2
CO-4	apply the concepts of thermodynamics to natural and industrial processes	К3
CO–5	Analyze and determine the isolation aspects of metallurgy.	K4 & K5

Unit - I Redox Reactions and Metallurgical Processes

Oxidation-reduction reactions- use of reduction potentials – the Latimer diagrams-the occurrence and isolation of the elements-mechanical separation-thermal decomposition methods – high temperature chemical reduction methods – reduction by carbon, reduction by another metal, self-reduction and reduction of oxides with hydrogen-electrolytic reduction – in aqueous solution, in other solvents and in fused melts-factors influencing the choice of extraction process – thermodynamics of reduction process – the Ellingham diagram.

Unit – II Hydrogen, Hydride and Acids and Bases

Electronic structure-abundance-preparation and properties of molecular hydrogen-isotopes of hydrogen-*ortho* and *para* hydrogen.

Hydrides – ionic, covalent, metallic and intermediate hydrides-types of hydrogen bonding and its consequences.

Concepts of acids and bases – Arrhenius theory, Bronsted–Lowry theory – Lewis theory – the solvent system concept, Lux–Flood definition and Usanovich definition–hard soft acids and bases.

Unit – III Chemistry of Group 1 and Group 2 Elements Group 1 Elements

Differences between lithium and other group 1 elements–general characteristics –sizes of atoms and ions, density, ionization energy, electronegativity and bond type, hardness, melting and boiling points, flame colors and spectra– chemical properties – reaction with water, air and dinitrogen– oxides, hydroxides, peroxides and superoxides– solutions of metals in liquid ammonia – complexes, crowns, crypts and their biological importance.

Group 2 Elements

Differences between beryllium and other group 2 elements–general characteristics – sizes of atoms and ions– ionization energy– electronegativity–hydration energies–anomolous behaviour of beryllium–solubility and lattice energy–solutions of metals in liquid ammonia– chemical properties–hardness of water–structures and importances of compounds of group 2

(12 Hours)

(12 Hours)

elements – oxides, peroxides, sulphates, nitrates, hydrides, halides, nitrides and carbides, basic beryllium acetate–biological role of Ca^{2+} and Mg^{2+} .

Unit – IV Thermodynamics–II

The second law of thermodynamics – direction of spontaneous change – dispersal of energy – entropy – thermodynamic definition of entropy – entropy as a state function – carnot cycle – thermodynamic temperature – Clausius inequality – entropy changes accompanying specific processes: expansion, phase transitions, heating, measurement of entropy – third law – Nernst heat theorem – third law entropies – Helmholtz and Gibbs energies – criteria of spontaneity – some remarks on the Helmholtz energy – maximum work – some remarks on Gibbs energy – maximum non–expansion work – standard Gibbs energies of reaction – standard Gibbs energies of formation – Born equation – combing first and second laws –Fundamental equation – properties of internal energy – Maxwell relations – variation of internal energy with volume – properties of the Gibbs energy – variation of the Gibbs energy with temperature and pressure.

Unit – V Phase Equilibria

Concept of phases, components and degrees of freedom, derivation of Gibbs phase rule for nonreactive and reactive systems – stabilities of phases – phase, phase transition, transition temperature, meta stable phases – phase boundaries – vapour pressure, sublimation vapour pressure, boiling temperature, normal boiling point, standard boiling point, critical temperature, critical pressure, freezing temperature, normal freezing point, standard freezing point, triple point Clausius–Clapeyron derivation and its applications to solid–liquid, liquid–vapour and solid–vapour equilibria, phase diagram for one component systems, with applications– carbon dioxide, water, helium – phase stability and phase transition – thermodynamic criterion of equilibrium – dependence of stability on the conditions – temperature dependence of phase stability, response of melting to applied pressure, effect of applied pressure on vapour pressure – Ehrenfest classification of phase transitions – first order and second order phase transitions.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.

Unit–I *Chapter* 6 **Unit–II** *Chapter* 8

2. Atkins P W and Paula J D, *Atkins' Physical Chemistry*, 8th Edition, Oxford University Press, Oxford, 2006.

Unit–IV Chapter 3 Unit–V Chapter 4

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.

2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.

3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Willey and Sons. Inc, New York, 1995.

4. Castellan, G W, *Physical Chemistry*, 4th Edition, Narosa, 2004.

5. Mc Quarrie D A and Simon J D, *Molecular Thermodynamics*, University Science Books, California, 2004.

6. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York, 2014.

(12 Hours)

(12 Hours)

Unit–III Chapter 9 and 11

Web Resources



Sulphur system–Phase Rule





Acid and Base Concept

Ortho vs Para Hydrogen

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	ester Course code Title of the Course			Ho	urs	Credits					
III	21U0	СН330	CC04	GEN	CORE-4: GENERAL CHEMISTRY – III 4						3
Course Outcomes	Pr	ogran	nme O (POs)		ies	Prog	ramme	Specifi (PSOs)	c Outco	omes	Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	1	2	2	3	2	1	2	2	3	2	2.0
СО-2	2	2	3	2	2	2	2	3	2	2	2.2
СО–3	1	2	2	3	2	1	2	2	3	2	2.0
CO-4	2	2	2	2	3	2	2	2	2	3	2.2
CO–5	3	2	2	2	2	3	2	2	2	2	2.2
Mean overall Score									2.12 (Medium)		

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH33CC05	CORE-5: ORGANIC CHEMISTRY – II	4	3

CO No.	CO–Statements On successful completion of this course, students will be able to	Cognitive Levels (K – level)
CO-1	enumerate the structure, properties and relative reactivity of carboxylic acids and their derivatives.	K1
CO-2	understand the stereochemistry of nucleophilic addition reactions of carbonyl compounds.	K2
СО-3	predict the products of reduction reactions of carbonyl compounds using selective reducing agents.	К3
CO-4	deduce selective naming reactions of carbonyl compounds with mechanism.	K4
CO–5	compare the synthetic applications of different organometallic reagents.	К5

Unit-I Carbonyl Compounds I

Nomenclature of carboxylic acids, acyl halides, acid anhydrides, esters, lactones, amides, and lactams – structure of carboxylic acid and derivatives – preparation of carboxylic acid derivatives – physical properties – naturally occurring carboxylic acid and derivatives – acid strength of carboxylic acids and derivatives – nucleophilic substitution reactions – reaction coordinate diagram – relative reactivity of carbonyl compounds – mechanism of nucleophilic acyl substitution reactions – reactions acid halides – reactions of acid anhydrides – reactions of esters – acid catalyzed hydrolysis – transesterification – hydroxide ion promoted ester hydrolysis.

Unit – II Carbonyl Compounds II

Reactions of carboxylic acids – reactions of amides – acid catalyzed hydrolysis of amides – hydrolysis of imides – Gabriel synthesis – hydrolysis of nitriles – dicarboxylic acids and their derivatives – decarboxylation of β -keto acids – soaps detergents and micelles – reduction of carbonyl compounds – selectivity of LAH, NaBH₄ and its analogues, aluminium hydride and its analogues, sodium cyanoborohydride.

Unit-III Carbonyl Compounds III

Nomenclature of aldehydes and ketones –summary of IUPAC functional groups nomenclature –relative reactivities of carbonyl compounds – nucleophilic addition reactions – reactions of carbonyl compounds with carbon nucleophiles: Grignard reagents, acetylide ions, HCN – reaction with hydride ion – reactions with nitrogen nucleophiles: primary and secondary amines – formation of imine derivatives: oxime, hydrazine and semicarbazone – Wolff–Kishner reduction – addition of oxygen nucleophiles: water, alcohol – Protecting groups – addition sulphur nucleophiles – Witting reaction – stereochemistry of nucleophilic addition reactions: Re and Si faces.

Unit-IV Carbonyl Compounds IV

Reactions at α –carbonyl carbons – acidity of α –hydrogens – pKa values of carbon acids – keto–enoltautomerism–acid–catalyzed α –substitution reactions – base–catalyzed β – substitution reaction – acid catalyzed and base promoted – Halogenation of α –carbon – haloform reaction – Hell–Volhard–Zelinski reaction – halogenated carbonyl compounds in

(12 Hours)

(12 Hours)

(12 Hours)

synthesis – formation of enolates using LDA –alkylation of the α –carbon of carbonyl compounds – alkylation by enamine intermediates –alkylation of the β –carbon: the Michael reaction – the aldol addition – dehydration of aldol products – mixed aldol condensation – Claisen condensation – mixed Claisen condensation – Dieckmann condensation – intramolecular aldol condensation – Robinson annulations.

Unit–V Organometallic reagents

Grignard reagent – preparation and synthetic applications – organolithium preparation and its applications – organocopper preparation and synthetic applications –Pd mediated coupling and cross coupling reactions – organosilicon compounds in organic synthesis.

Books for Study

- 1. Morrison R T and Boyd R T, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.
- Unit–I Chapter 19 Unit–II Chapter 20 Unit–III Chapter 18
 2. Bruice P Y, Organic Chemistry, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
 Unit–IV Chapter 19 Unit–V Chapter 12

Books for Reference

- 1. Pine S H, Organic Chemistry, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.
- 2. Finar I L, Organic Chemistry, 6th Edition Addison Wesley Longman Ltd., England, 1996.
- 3. Graham Solomons T W, *Organic Chemistry*, 6th Edition, John Wiley and Sons, New York, 1996.
- 4. Wade L G, *Organic Chemistry*, 5th Edition, Pearson Ltd., University of California, Santa Barbara, 2003.

5. Carey F A, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 2000.

Web Resources



Chemistry of Carbonyl Compounds

Carbonyl derivatives

Aldehydes and Ketones

abudas and Kat



Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	ourse co	do				Course		Цо	1180	Credits
Semester			Jue								Creans
III	21U	СН33С	C05	0	CORE 5 ORGANIC CHEMISTRY – II 4						3
Course Outcomes (COs)	Programme Outcomes (POs)				Progra	Mean Score of COs					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	2	3	2	2	3	2	1	3	2	2.2
CO–2	2	3	2	2	3	2	3	1	2	3	2.3
СО–3	3	2	1	3	2	2	1	2	3	3	2.2
CO-4	3	2	1	3	2	2	2	2	3	2	2.2
CO–5	3	2	2	2	3	2	2	2	2	3	2.3
Mean overall Score									2.24 (High)		

Semester	Course Code	Title of the Course	Hours	Credit
III	21UCH33AO03A	ALLIED OPTIONAL: PHYSICS – I	4	4

~~~~	CO- Statements	Cognitive
CO No.	On the successful completion of the course, student will be able to;	Levels (K-Levels)
CO-1	Acquire knowledge of physics fundamentals involved in waves, and oscillation, properties of materials, Thermal physics, electricity and magnetism, ray optics.	K1
СО-2	Understand the different properties of a physical matter and apply the longitudinal and transverse laws of vibration in strings and sonometer.	K2 & K3
СО-3	Describe the theories explaining thermal properties of gases, electric and magnetic induced effects, dispersive power of a prism.	K2
СО-4	Apply the concepts of ray optics and electricity and magnetism, wave oscillations in real life problems like defects in images, aberration in lenses, electrical circuits and acoustics of buildings.	К3
CO-5	Examine the physics knowledge learned from class room with real life problems.	K4

#### **UNIT - I: WAVES AND OSCILLATIONS**

Simple harmonic motion and circular motion - composition of two simple harmonic motions at right angles (periods in the ratio 1:1) - Lissajou's figures - uses - Laws of transverse vibrations of strings - verification of Melde's string - transverse and longitudinal modes - determination of a.c. frequency using sonometer (steel and brass wires) - Ultrasonics - production - application and uses - Acoustics of buildings - reverberation - Absorption coefficient - Requirements for a good auditorium.

#### **UNIT - II: PROPERTIES OF MATTER**

**Elasticity:** Elastic constants - energy stored in a stretched wire - bending of beams - expression for bending moment - Young's modulus by non-uniform bending - torsion in a wire - determination of rigidity modulus by torsional pendulum.

**Viscosity:** Streamline flow and turbulent flow- Coefficient of viscosity - Poissuelle's formula - Comparison of Viscosities - burette method - Stoke's law - terminal velocity - viscosity of highly viscous liquids.

**Surface tension:** Molecular theory of surface tension - excess pressure inside a drop and bubble - variation of surface tension with temperature.

#### **UNIT - III: THERMAL PHYSICS**

Postulates of kinetic theory of gases - Joule-Kelvin effect - Porous plug experiment - theory of Porous plug Experiment - Liquefaction of gases - Linde's process - adiabatic demagnetization -Helium I and II - Thermodynamic equilibrium - laws of thermodynamics - entropy - change of entropy in reversible and irreversible processes.

### (12 Hours)

(12 Hours)

#### **UNIT - IV: ELECTRICITY AND MAGNETISM**

Capacitor - energy of charged capacitors - loss of energy due to sharing of charges – Biot -Savart's law - magnetic induction at a point on the axis of a circular coil carrying current -EMF induced in a coil rotating in a magnetic filed - Mean value of alternating current - RMS values of a ac current and voltage - Electric circuit - switch and its types - fuses - circuit breaker – Relays - P.O. Box: measurement of resistance - Potentiometer: calibration of ammeter.

#### **UNIT - V: GEOMETRICAL OPTICS**

#### (12 Hours)

Refraction - Normal refraction - Refractive index by microscopy - air cell method - refraction through a prism and thin prism - Spectrometer - determination of refractive index - combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion - direct vision spectroscope - defects of images - coma, Distortion - Aberrations - spherical aberration in lenses - methods of minimizing spherical aberration - Chromatic aberration in lenses - Expression for longitudinal chromatic aberrations.

#### **Book for Study**

1. R. Murugesan, "Allied Physics", S Chand and Co. Publications, New Delhi, Reprint, 2015.

UNIT	BOOK	CHAPTER	SECTION
Ι	1	1	1.1, 1.3, 1.4, 1.7,1.8, 1.9, 1.10, 1.11, 1.12,1.13, 1.14, 1.15, 1.16, 1.17
II	1	2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.12, 2.13, 2.14, 2.15, 2.17, 2.19, 2.20, 2.21, 2.22, 2.24, 2.25, 2.27, 2.28, 2.30
III	1	3	3.1, 3.4, 3.5, 3.6, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.15, 3.16, 3.17, 3.18, 3.20, 3.21, 3.22
IV	1	4	4.1, 4.2, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, 4.12, 4.16, 4.17, 4.18, 4.19, 4.20
v	1	5	5.1, 5.2, 5.3, 5.5, 5.6, 5.10, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.22, 5.23, 5.24

#### **Books for Reference**

- 1. D. Halliday, R. Resnick, J. Walker, "Fundamental of Physics", 9th Edition, John Wiley & Sons, 2010.
- 2. M.E. Schaltz, "Grob's Basic Electronics", 11th Edition, McGraw Hill, 2011.
- 3. D.S. Mathur, "Elements of Properties of Matter", S.Chand and Co. publications, New Delhi, Reprint 2016.
- 4. S. G. Garg, R.M. Bansal and C.K. Gosh, "Thermal Physics", Tata-McGraw Hill Publications, 2012.

Semester	Course code			Title of the Course					Hours	Credit	
III	21UCH33AO03A			ALLIED OPTIONAL: PHYSICS- I						4	4
Course	Programme Out			come (l	<b>?O</b> )	Programme specific outcome(				(PSO)	Mean
outcomes COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Scores of CO
CO1	3	3	3	2	1	3	2	2	1	1	2.1
CO2	3	2	3	3	2	2	3	2	2	1	2.3
CO3	3	2	3	2	2	3	2	2	2	2	2.3
CO4	3	3	2	3	2	3	3	3	2	2	2.6
CO5	3	3	3	3	2	3	3	3	2	2	2.7
	Mean Over all marks						2.4 (High)				

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH33AO03B	Allied-II	4	3
		PRINCIPLES OF ELECTRONICS		

CO No.	CO statements	Cognitive Levels (K- levels)
	On completion of this course, students would be able to	
CO-1	Classify and interpret the semiconductor devices	K2
CO-2	Demonstrate and analyze the functionalities of various Electronic circuits	К3
CO-3	Distinguish and evaluate various sensors	K4
<b>CO-4</b>	Compare and estimate the operations of integrated sensors	K5
CO-5	Design and develop Electronic circuits for different applications	K6

#### **UNIT I: SEMICONDUCTOR DEVICES**

Introduction to semiconductor devices-diode-Bipolar Junction Transistor- Field effect Transistor-Applications-Metal oxide Semiconductor - Enhancement mode- Depletion mode-MOSFET -Silicon controlled Rectifier- Laser diode- Photo diode-Optocoupler-Applications. (12 Hours)

#### **UNIT II: ELECTRONIC CIRCUITS**

Introduction to Linear Power supply- Voltage regulators-Relays-types-switching applications using relay-solid state relay - Opto-SCR and Opto-triac based switching for high power applications-Switch mode power supply-Block diagram-Applications- UPS - Capacitive power supply.

#### **UNIT III: SENSORS**

Sensors and Transducers - Transducers-Resistive transducers-capacitive transducers-Inductive transducers- LVDT principle and applications. Measurement of non electrical quantity: humidity-flow rate-pH –pressure-thermal conductivity.

#### **UNIT IV: INTEGRATED SENSORS**

Basic sensor signal conditioning networks for interfacing with PC- Integrated sensors overview- temperature module based on LM35-Hall effect sensor module-TSOP17 photo module-MOC 3042 opto-isolator module-kmz51 magnetic field module- ICM105A VGA CMOS sensor-MPXV5004G pressure sensor- 3 axis accelerometer module: MPU 6050 IMU sensor-wearable sensors.

**UNIT V: PSPICE SIMULATION FOR ANALOG CIRCUITS** Introduction to PSPICE-small circuit simulation-circuit examples for worst case design-DC sweep -plotting output-Sources and polynomially controlled sources- Transfer function analysis (one example).

#### **Book for study**

- 1. Albert Malvino, David Bates and Patrick Hoppe, "Electronic Principles" 9th edition .2015
- 2. N. Mathivanan, "PC-BASED INSTRUMENTATION: CONCEPTS AND PRACTICE" 2007
- 3. Paul W. Tuinenga"SPICE- A guide to circuit simulation and Analysis using PSPICE" 2015.
- 4. Material Prepared by the Department.

## (12 Hours)

(12 Hours)

(12 Hours)

#### **Book(s) for Reference**

- 1. Allen Mottershead, "Electronic Devices and Circuits: An Introduction" 1979.
- 2. Ian Sinclair, "Sensors and Transducers"2000.
- 3. Rahid, "Introduction to Pspice Using Orcad for Circuits and Electronics",2005

Unit	Book	Chapter	Sections
Ι	1	3,5,6,12	3.1,6.1,6.2,6.3,12.1,12.3,12.4,13.2,5.9
II	1,4	22	22.1,22.7
III	2	3	3.1.3,3.2.2,3.3,3.4,3.5
IV	2,4	3,4	3.1.4, Material prepared by the department
V	3,4	1,2,3,5,6	1.1,1.2.2.1-2.4,3.3,5.1,5.6,5.7

# Relationship matrix for Course outcomes, Programme outcomes/ Programmes Specific outcomes

Semester	Course Code				Title	of the C	Course		Ho	urs	Credits
III	21UCH	[ <b>33AO</b> 0	3B		1	Allied-I	Ι		4	L I	3
			]	PRINC	IPLES	OF EI	LECTR	ONICS	5		
Course	Pro	gramm	e Out	comes (	PO)	Prog	ramme	Specifi	ic Outc	omes	Mean
<b>Outcomes</b>								(PSO)			Scores
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	of COs
CO 1	2	2	1	2	2	2	3	3	2	2	2.1
CO 2	3	3	2	3	2	3	3	3	2	2	2.6
CO 3	2	3	2	2	2	3	2	3	2	3	2.4
<b>CO 4</b>	3	3	2	3	2	3	3	2	2	3	2.6
CO 5	3	3	2	3	2	3	3	2	2	3	2.6
								Mean (	Overall	Score	2.5
										Result	High

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH34SE01A	SEC-1 (WD): CHEMICAL INSTRUMENTATION – I	2	1

CO No.	CO – Statements	Cognitive Levels
00110	On successful completion of this course, students will be able to	(K–Level)
CO-1	recall the principles of UV-Visible and IR spectroscopy.	K1
СО-2	discuss the instrumentation of UV-Visible and IR spectroscopy.	K2
СО-3	use the principles of GC, TLC and HPLC.	К3
CO-4	demonstrate the separation and purification of organic compounds.	K4
CO-5	analyse the electroanalytical techniques.	K4

#### **Unit– I Absorption Spectroscopy–I**

Principle of UV– Visible absorption spectroscopy - Beer-Lambert law - electronic transitions - instrumentation of UV - Visible spectrophotometer - calculation of lambda max ( $\lambda_{max}$ ) and concentration.

#### **Unit-II Absorption Spectroscopy-II**

Absorption Spectroscopy - principles of IR spectroscopy - instrumentation of IR spectrophotometer – spectral analysis and interpretation of organic compounds – hydrogen bonding.

#### **Unit-III Electroanalytical Techniques**

Electroanalytical methods - polarography - principles and instrumentation - principles of cyclic voltammetry – instrumentation of cyclic voltammetry – applications.

#### **Unit– IV Separation and Purification**

Separation and purification of organic compounds – instrumental separation– solvent extraction-ion-exchange separation - fractional distillation, crystallization and precipitation.

#### **Unit–V** Chromatographic Techniques

Chromatography - principle of chromatography - retardation factor- classification of chromatographic techniquesprinciples of TLC – preparation of TLC plates – development of chromatogram- principles and instrumentation of GC and HPLC.

#### **Books for Study**

1. Vogel A I, Text book of Quantitative Chemical Analysis, 6th Edition, Pearson Education Limited, London, 2008.

Unit–III Chapter 10 and 13

Unit–IV *Chapter6* 

2. Sharma Y R, Elementary Organic Spectroscopy, Revised Edition, S .Chand Pvt, Ltd., New Delhi, 2010.

# (6 Hours)

#### 75

(6 Hours)

(6 Hours)

(6 Hours)

### (6 Hours)

Unit–I Chapter 2Unit–IIChapter 32. Skoog, Holler, Crouch, Instrumental Analysis, Cengage Learning, 2007.Unit–IIIChapter 25Unit–VChapter 26, 28

#### **Books for References**

- 1. Gopalan R, Subramanian P S, Rengarajan K, *Elements of Analytical Chemistry*, 3rd Edition, Sultan Chand and sons, New Delhi, 2003.
- 2. Gary A Christian, Analytical Chemistry, 6th Edition, John Wiley and sons Ltd. 2003.
- 3. Willard and others, Instrumental methods of analysis, 3rd Edition, East west press, 1977.

#### Web Resources









Polarography

Chromatography

IR and UV-Visible

Instrumentation

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Outcomes											
Semester	Semester Course code					le of the	Ho	urs	Credits		
III	21UC	CH34S	E01A	SEC-1 (WD): CHEMICAL INSTRUMENTATION – I						2	1
Course Outcomes	Prog	ramm	e Outc	omes (	POs)	Pro	gramme	e Specifi (PSOs)	c Outco	omes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	3	3	1	3	3	3	3	1	2.6
СО-2	3	3	3	3	1	3	3	3	3	1	2.6
CO-3	3	3	3	2	2	3	3	3	2	2	2.6
CO-4	3	3	2	3	2	3	3	2	3	2	2.6
CO–5	3	3	2	3	2	3	3	2	3	3	2.7
	Mean overall Score										2.62 (High)

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
III	21UCH34SE01B	SEC-1 (WD): CHEMICAL INSTRUMENTATION – II	2	1

CO No.	<b>CO – Statements</b> On successful completion of this course, students will be able to	Cognitive Levels (K–Level)
CO-1	recall the principles of UV– Visible and IR Spectroscopy.	K1
CO-2	discuss the instrumentation of UV– Visible and IR spectroscopy.	K2
CO-3	use the principles of paper and column chromatography.	K3
CO-4	demonstrate the separation and purification of organic compounds.	K4
CO–5	analyse the electroanalytical techniques.	K4

#### **Unit-I UV-Vis Spectrophotometer**

Principle of UV– Visible absorption spectroscopy – Beer–Lambert law – electronic transitions – instrumentation of UV – Visible spectrophotometer – calculation of lambda max ( $\lambda_{max}$ ) and concentration.

#### Unit-II FT-IR Spectrophotometer

Absorption Spectroscopy – principles of IR spectroscopy – instrumentation of IR spectrophotometer – spectral analysis and interpretation of organic compounds – hydrogen bonding.

#### **Unit – III Electroanalytical Techniques**

Electroanalytical methods – principles of cyclic voltammetry – instrumentation of cyclic voltammetry – applications – principles of amperometry – electrogravimetry.

#### **Unit – IV Separation and Purification**

Separation and purification of organic compounds – solvent extraction– ion–exchange separation – fractional distillation, crystallization and precipitation.

#### **Unit – V Chromatographic Techniques**

Principle of chromatography – retardation factor– classification of chromatographic techniques– paper chromatography – principles – development of chromatogram – column chromatography – column packing – separation of mixture.

#### **Books for Study**

1. Vogel A I, *Text book of Quantitative Chemical Analysis*, 6th Edition, Pearson education Limited, London, 2008.

Unit–III Chapter 10 and 13
Unit–IV Chapter 6
2. Sharma Y R, Elementary Organic Spectroscopy, Revised Edition, S .Chand Pvt, Ltd, New Delhi, 2010.
Unit–I Chapter 2
Unit–II Chapter 3
3. Skoog, Holler, Crouch, Instrumental Analysis, Cengage Learning, 2007.
Unit–V Chapter 26 and 28

#### 77

#### (6 Hours)

## (6 Hours)

## (6 Hours)

### (6 Hours)

## (6 Hours)

#### **Books for Reference**

- 1. Gopalan R, Subramanian P S, Rengarajan K, *Elements of Analytical Chemistry*, 3rd Edition, Sultan Chand and sons, New Delhi, 2003.
- 2. Gary A Christian, *Analytical Chemistry*, 6th Edition, John Wiley and sons Ltd. 2003.
- 3. Willard, *Instrumental methods of Analysis*, 3rd Edition, East west press, 1977.

#### Web Resources









Spectroscopy

Separation Techniques

IR and UV-Visible Instrumentation

### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

Semester Course code					Tit	le of the	Ho	urs	Credits		
III 21UCH34SE01B				SEC-1 (WD): CHEMICAL INSTRUMENTATION – II						2	1
Course Outcomes	Prog	ramm	e Outc	omes (	POs)	Pro	gramme	e Specifi (PSOs)	c Outco	omes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	3	3	1	3	3	3	3	1	2.6
СО–2	3	3	3	3	1	3	3	3	3	1	2.6
СО-3	3	3	3	2	2	3	3	3	2	2	2.6
CO-4	3	3	2	3	2	3	3	2	3	2	2.6
CO–5	3	3	2	3	2	3	3	2	3	3	2.7
	Mean overall Score										2.62 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UHE24VE03 A	PROFESSIONAL ETHICS–I: SOCIAL ETHICS - I	2	1

CO No.	Co- Statements	Cognitive Levels (K–Level)
	On completion of this course the graduates will be able to:	
CO-1	know the responsibility of the educated youth.	K1
CO-2	understand the values prescribed under social ethics.	K2
CO-3	apply their minds critically to the various types of cyber crime.	К3
<b>CO-4</b>	analyse the various kinds of political systems.	K4
CO-5	analyse the behaviour of the elected representatives.	K4

#### **Unit-I** Introduction to Social Ethics

Introduction to social ethics and social responsibility, important role of Social ethics on the various areas, religion influences social changes - secularism. Social ethics and corporate dynamics, forms of social ethics.

#### Unit-II The Economic and Political System of Today

Planned economy and communism – market economy and capitalism- socialism - mixed economy -the emerging market economy - political system- totalitarian system- oligarchic system.

#### Unit-III Integrity in Public Life National Integration

What is Integrity, Public Life, Integrity and Public Life, Integrity in a Democratic State, India as Democratic State, Behavior of a elected representative of India, Noticeable degradation acts of elected Representatives, Suggestions to stem this rot, Types of integrity, Transparency can be a guarantee for integrity.

#### Unit-IV Cyber Crime

Business Ethics, Business ethics permeates the whole organization, Measuring business ethics, The Vital factors highlighting the importance of business ethics, Cyber crime, Strategies in committing Cyber Crimes, Factors aiding Cyber Crime, computer Hacking, Cyber Bullying, Telecommunications piracy, Counter Measures to Cyber Crime, Ethical Hacking.

#### **Unit-V** Social Integration

Global challenges, The future is with the Educational Youth, Cost of the Sacrifice, Crusaders against corruption, Responsibility of the Educated Youth, Positive Global Scenario, Right to Education, Eradicating gender inequality, Sustainable Human Development, Social Integration, Elimination Crime, Integration with Global Market

#### **Books for Study**

Department of Human Excellence, Formation of Youth, St Joseph's College(Autonomous), Tiruchirappali -02, 2021

## (6-Hours)

(6-Hours)

(6-Hours)

### (6-Hours)

#### (6-Hours)

#### **Books for Reference**

- 1. Ramesh K. Arora, *Ethics, Integrity and Values* by Public Service Paperback ,- 1 January 2014
- 2. Cunningham, D. There's something happening here: The new left, the Klan, and FBI counterintelligence. Berkeley: University of California Press, 2004.
- 3. Adv. Prashant Mali, *Cyber law & Cyber Crimes simplified* by Cyber Info media Paperback 1 January 2017.
- 4. Matthew Richardson, *Cyber Crime: Law and Practice Hardcover Import*, Wildy publications, 29 November 2019

#### Web Sources

https://cybercrime.gov.in/ https://open.lib.umn.edu/sociology/chapter/14-2-types-of-political-systems/ https://www.esv.org/resources/esv-global-study-bible/social-ethics/

https://en.wikipedia.org/wiki/Political_system

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
TTT		<b>PROFESSIONAL ETHICS I:</b>	•	1
III	21UHE34VE03B	<b>RELIGIOUS DOCTRINE- I</b>	2	1

CO.No.	Co – Statements	Cognitive Levels (K–Level)
	On completion of this course, the graduates will be able to:	
CO-1	understand the history of the Catholic Church	K1
CO-2	examine and grasp the Sacraments of the Catholic Church	K2
CO-3	apply the Christian Prayer to their everyday life	K3
CO-4	analyze themselves in the light of Sacraments & Christian Prayer	K4
CO-5	create a harmonious society learning values from all religions	K5 & K6

Unit-I	God of salvation	(6 Hours)
Unit-II	Life & Mission of Jesus Christ	(6 Hours)
Unit-III	The Holy Spirit	(6 Hours)
Unit-IV	Biblical Values	(6 Hours)
Unit-V	Mother Mary	(6 Hours)

#### **Book for Study**

Department of Human Excellence, *Life in the Lord: Religious Doctrine*. St. Joseph's College, Trichirappalli-02, 2021.

#### **Books for Reference**

- Compendium: Catechism of the Catholic Church. Bengaluru: Theological Publications in India, 1994.
- 2. Holy Bible (NRSV).

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UTA41GL04B	Scientific Tamil (SBS, SPS,SCS)	4	3

CO No.	CO- Statement	Cognitive Level (K- level)							
	இப்பாடத்தின் நிறைவில் மாணவர்கள்								
CO-1	பண்டைத் தமிழர்களின் அறிவியலறிவை அறிந்துகொள்வர்.	K 1							
CO-2	பண்டைத் தமிழிலக்கியங்களுள் காணலாகும் அறிவியல் சிந்தனைகளைப் புரிந்துகொள்வர்.	K 2							
CO-3	தமிழரின் அறிவியல் மருத்துவத்தையும், நீர் மேலாண்மை அறிவையும் அறிந்துகொள்வர்.	К 3							
CO-4	இக்கால இலக்கியங்களுள் அறிவியல்துறை பெற்றுள்ள செல்வாக்கை அறிந்துகொள்வர்.	K 4							
CO-5	அறிவியல் கலைச்சொற்களைத் தமிழில் கற்றுக் கொண்டு அறிவியல் தமிழ் வளரத் துணைபுரிவர்.	K 5							

#### அலகு – 1

(12 மணிநேரம்)

### தொல்காப்பியம் :

நிலம் தீ நீர் வளி விசும்போடு (தொல்.பொருள் 635)

ஒன்றறிவதுவே (தொல்.பொருள் 571)

### புறநானூறு

மண் திணிந்த நிலனும் (புறம்.2)

செஞ்ஞா யிற்றுச் செலவும் (புறம். 30)

### அகநானூறு

அம்ம வாழி, தோழி (அகம்.141)

### பதிற்றுப்பத்து

நிலம் நீர் வளி விசும்பு என்ற நான்கின் (பதிற்று.14)

நெடுவயின் ஒளிறு மின்னுப் பரந்தாங்கு (பதிற்று.24)

**உரைநடைக்கட்டுரை** : வியக்க வைக்கும் தமிழரின் அறிவியல்

அலகு- 2

(12 மணிநேரம்)

**சித்தர் பாடல்கள்** ப**தார்த்த குண சிந்தாமணி** குளத்து சலந்தானே கொடிதான (27) ஏரிசலம் வாதமிகு மதுவே (31)

அருவிநீர் மேக மகற்றுங் (39) மேவிய சீவன் வடிவது சொல்லிடில் (திருமூலர்) அணுவில் அணுவினை ஆதிபிரானை (திருமூலர்) நட்டகல்லைத் தெய்வமென்று (சிவவாக்கியர்) **உரைநடைக்கட்டுரை**: தமிழர்களின் மருத்துவ அறிவியல் (12 மணிநேரம்) அலகு - 3 **திருக்குறள்** (2 அதிகாரங்கள்) வான் சிறப்பு, மருந்து வலைப்பூக்கள் உருவாக்கல், பராமரித்தல் புதிய அறிவியல் கலைச்சொல்லாக்கங்களை உருவாக்குதல் **உரைநடைக்கட்டுரை**: தமிழ் இலக்கியங்களில் நீர் மேலாண்மையியல் (12 மணிநேரம்) அலகு- 4 புதினம்: சொர்க்கத்தீவு – சுஜாதா நால் - கிறனாய்வு அறிவியல் புனைவு ஆவணப்படம், திரைப்படம் - திறனாய்வு **உரைநடைக்கட்டுரை:** தமிழில் அறிவியல் புனைவுகள் அலகு - 5 (12 மணிநேரம்) அறிவியல் கலைச்சொற்கள் அன்றாட வாழ்வில் அறிவியல் பழமொழிகளைத் தொகுத்தல் மூலிகைகள், கீரைகள் ஆகியவற்றின் முக்கியத்துவத்தைக் காட்சிப்படுத்துதல். தமிழர் அறிவியல் கண்காட்சி நடத்துதல் **உரைநடைக்கட்டுரை**: அறிவியல் தமிழின் வளர்ச்சி நிலைகள் பாட <u>ந</u>ால்கள் 1. அறிவியல் தமிழ், தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2022 2. சுஜாதா, **சொர்க்கத்தீவு,** விசா பப்ளிகேஷன்ஸ், சென்னை-17, ஒன்பதாம் பதிப்பு, 2009 3. மூர்த்தி அ.கி., அறிவியல் அகராதி, மணிவாசகர் பதிப்பகம், சென்னை, 2001 பார்வை நூல்கள் 1. குழந்தைசாமி.வா.செ., **அறிவியல்தமிழ்,** பாரதி பதிப்பகம், சென்னை-17, 6ஆம்பதிப்பு, 2001 நெடுஞ்செழியன், **இன்னும் மீதமிருக்கிறது நம்பிக்கை,** பூவுலகின் நண்பர்கள் 2. வெளியீடு, சென்னை, முதற்பதிப்பு, 2017

- 3. பரிமேலழகர்(உரை.), **திருக்குறள்,** பாரதி பதிப்பகம், சென்னை-17, ஏழாவது பதிப்பு, 2000.
- 4. வையாபுரிப்பிள்ளை, **பாட்டும் தொகையும்,** பாரி நிலையம், சென்னை, இரண்டாம் பதிப்பு, 1967.

Semester	Cou	irse Cod	rse Code Title of the Course						Hours	Credit	
IV	21UT.	A41GL0	<b>4B</b>	S	Scientifi	c Tamil (	SBS, SP	S,SCS)		4	3
Course Outcomes	Programme Outcomes (PO)							omes	Mean Scores		
(COs)	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	of COs
CO-1	1	2	3	2	2	3	3	2	2	2	2.2
CO-2	2	2	3	2	2	2	3	2	3	2	2.3
CO-3	1	2	2	3	2	2	2	3	3	3	2.3
CO-4	2	2	3	2	2	3	2	3	3	2	2.4
CO-5	3	1	2	2	2	2	3	2	3	3	2.3
	Mean Overall Score									2.3 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UFR41GL04	FRENCH – IV	4	3

CO No.	CO–Statements On successful completion of this course, students will be able to	Cognitive Levels ( K –Levels)
CO-1	recall the vocabulary pertaining to dwelling place.	K1
CO-2	outline crisis management in France.	K2
CO-3	develop a travel diary of your own.	K3
CO-4	simplify the French education system.	K4
CO–5	interpret past tenses in a text.	K5

#### Unit-I

**TITRE: ON FAIT LE MELANGE!** 

GRAMMAIRE : le présent progressif, les pronoms possessifs, la phrase négative LEXIQUE : décrire les étapes d'une action, la maison, les taches ménagères PRODUCTION ORALE : comprendre le récit d'un voyage **PRODUCTION ECRITE** : raconter ses actions quotidiennes

#### Unit – II

TITRE: A PROPOS DE LOGEMENT

GRAMMAIRE : quelques adjectifs et pronoms indéfinis, les verbes lire, rompre et se plaindre LEXIQUE : la localisation et le logement, les pièces, meubles et équipement

PRODUCTION ORALE : jeu de rôle -votre ami et vous s'installe dans un nouveau meuble **PRODUCTION ECRITE : décrire votre maison/appartement** 

#### Unit-III

**TITRE: TOUS EN FORME!** 

GRAMMAIRE : le passé composé et l'imparfait, le passé récent, l'expression de la durée LEXIQUE : un souvenir et les évènements du passées, le corps humain : extérieur, le corps humain : intérieur

**PRODUCTION ORALE** : échanger sur ses projets de vacances **PRODUCTION ECRITE** : raconter un souvenir

#### Unit – IV

TITRE: ACCIDENTS ET CATASTROPHES

GRAMMAIRE : les adjectifs et les pronoms indéfinis : rien/ personne/aucun, les verbes dire, courir et mourir

LEXIQUE : savoir les mots et les expressions des catastrophes naturelles, les maladies et les remédies, les accidents, les catastrophes naturelles

PRODUCTION ORALE : comprendre des personnes qui expriment leur accord ou leur désaccord selon un thème donné

PRODUCTION ECRITE : écrivez sur une catastrophe naturelle en articulant la cause et la conséquence

#### Unit –V

TITRE: FAIRE SES ETUDES A L'ETRANGER/ BON VOYAGE/ LA METEO

#### (12 hours)

## (12 hours)

# (12 hours)

## (12 hours)

(12 hours)

GRAMMAIRE : les pronoms démonstratifs neutres, le futur simple, situer dans le temps, moi aussi/non-plus – moi non/si, les verbes impersonnels, les verbes croire, suivre et pleuvoir LEXIQUE : savoir vivre en France, le système scolaire, les formalités pour partir à l'étranger. PRODUCTION ORALE : exprimer son opinion sur la météo/parler del'avenir PRODUCTION ECRITE: comparer le système scolaire français et indien

#### **Book for Study**

P.Dauda, L.Giachino and C.Baracco, Generation A2, Didier, Paris 2016.

#### **Books for Reference**

- 1. J.Girardet and J.Pecheur, Echo A2, CLE International, 2eedition, 2013
- 2. Régine Mérieux and Yves Loiseau, Latitudes A2, Didier, 2012.
- 3. Isabelle Fournier, Talk French, Goyal Publishers, 2011

#### Web Resources

- 1. https://www.frenchcourses-paris.com/french-travel-journal/
- 2. http://www.saberfrances.com.ar/vocabulary/house.html
- 3. https://www.thoughtco.com/different-past-tenses-in-french-1368902
- 4. https://www.youtube.com/watch?v=JZdwJM7sEY8
- 5. https://www.scholaro.com/pro/Countries/France/Education-System

# Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code Titl					le of the Course			Но	urs	Credits	
IV	<b>21U</b>	FR410	GL04		F	RENCI	H - IV		4	4	3	
Course Outcomes	Prog	Programme Outcomes (POs)					me Outcomes (POs) Programme Specific Outcomes (PSOs)					
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos	
CO-1	3	1	3	2	2	3	2	1	2	2	2.1	
CO-2	3	1	2	3	3	3	2	1	3	1	2.2	
СО-3	3	2	3	2	2	3	2	1	3	2	2.3	
CO-4	3	1	2	2	3	3	3	1	3	3	2.4	
CO–5	2	2	3	3	1	3	1	2	3	2	2.2	
	Mean overall Score									2.24 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UHI41GL04	HINDI - IV	4	3

CO No.	CO–Statements On successful completion of the course, students will be able to	Cognitive Levels (K –Levels)
CO-1	list out the social conditions prevailed in Modern Period which are depicted in Hindi Literature.	K1
CO-2	discuss the dialects of Hindi language.	K2
CO-3	illustrate the works of some eminent Hindi Writers related to society.	К3
CO-4	analyze the human values expressed in life and literature of Hindi Novelist "Mamatha Kaliyah".	K4
CO-5	evaluate the film & Literary works in Hindi.	K5

(12 Hours)

### Unit - I

Computer ka yug Prathyay Adhunik Kal - Namakarn Namakaran

Unit - II Vigyan hani/labh Paryayvachy Shabdh Adhunik Kal - Samajik Paristhithiyam Samanarthy Shabdh	(12 Hours)
Unit - III Nari shiksha Upasarg Adhunik Kal – Sahithyik Paristhithiyam Adhunik kal – Salient Features	(12 Hours)
<b>Unit - IV</b> Review- Book/Film Paryavaran Pradookshan Adhunik Kal - Main Divisions	(12 Hours)

Adhunik Kal - Visheshathayem

#### Unit - V

Sapnom Kee Home Delivery (Novel) Anuvad - 4

#### **Books for Study**

- 1. Dr. Sadananth Bosalae, *kavya sarang*, Rajkamal Prakashan, New Delhi, 2020. Unit-I Chapters 4
- 2. M. Kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020. Unit-II, III and IV *Chapter 2*
- 3. Dr. Sanjeev Kumar Jain, *Anuwad: Siddhant Evam Vyavhar*, Kailash Pustak Sadan, MadhyaPradesh,2019 **Unit-V** *Chapter 2*

#### **Books for Reference**

- 1. Hindi Niband Sangrah, V&S Publishers, 2015.
- 2. Rajeswar Prasad Chaturvedi, Hindi vyakarana, Upakar prakashan, 2015.
- 3. Ramdev, Vyakaran Pradeep, Hindi Bhavan, 2016.
- 4. Krishnakumar Gosamy, Anuvad vigyan ki Bhumika, Rajkamal Prakashan, 2016.
- 5. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.

#### Web Resources

- 1. https://youtu.be/xmr-DaQ3LhA
- 2. https://youtu.be/xIm-VEmgEg0
- 3. https://youtu.be/ZHuqxWbMtas
- 4. https://youtu.be/HGS63OJuHto
- 5. https://youtu.be/r-i3autqPug

# Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Co	urse Co	ode		Title of the Course Ho					Hours	Credits
IV	<b>21U</b>	HI41G	L04			HINI	DI - IV			4	3
Course	Prog	gramm	e Outc	omes (	PO)	Progr	amme Sj	pecific O	utcomes	(PSO)	Mean
<b>Outcomes</b> ↓	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Scores of Cos
CO-1	2	3	2	3	3	2	3	2	3	1	2.4
CO-2	3	2	3	3	2	3	2	3	1	2	2.4
CO-3	3	2	2	3	2	2	1	3	2	3	2.3
CO-4	3	2	3	1	3	3	2	3	3	2	2.5
CO-5	3	2	2	3	3	2	3	2	3	3	2.6
Mean Overall Score								Score	2.44		
											(High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21USA41GL04	SANSKRIT - IV	4	3

CO No.	O No. On successful completion of the course, the student will be able to							
CO-1	remember and identifying Mahabharatha characters and events.	K1						
CO-2	understand human behaviors by studying dramas.	K2						
CO-3	apply the morals learnt in day to day life.	К3						
CO-4	create new conversational sentences and to Improve self- character (Personality Development ).	K4						
CO-5	appreciate ancient Sanskrit dramas.	К5						

Unit - I Samskrita Vyavahara sahasri vakiya Prayogaha	(12 Hours)
<b>Unit - II</b> Lot Lakaarah , Prqayaogh Kartari Vaakyaani	(12 Hours)
<b>Unit - III</b> Naatakasya Itihaasah Vivaranam, Thuva and Tum Prathiyaha	(12 Hours)
<b>Unit - IV</b> Karnabhaaram , Naatakasya Visistyam	(12 Hours)
Unit - V Samskrita Rachanani priyogaha	12 Hours)

#### **Book for Study**

Karnabhavam & Literature Language, 2019 , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007

#### **Books for Reference**

- R.S.Vadhyar & Sons , Book sellers and publishers , Kalpathu ,Palghat 678003 , Kerala , south India , History of Sanskrit Literature 2019
- Kulapathy , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai 400 007 2018
- Samskrita Bharathi , Aksharam 8 th cross , 2nd phase Giri nagar Bangalore Vadatu sanskritam Samaskara Binduhu 2019

Semester	Cour	rse Cod	e		Ti	tle of t	he Cou	rse		Hou	rs	Credit
IV	21US	A41GL	04		5	SANSK	V	4		3		
Course	Prog	ramme	Outc	omes (	PO)	Prog	ramme	Specif	ic Outc	omes		Mean
Outcomes↓	_					_		(PSO)			5	Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	(	of COs
CO-1	2	2	2	3	2	3	2	3	3	2		2.5
CO-2	2	2	3	2	3	3	3	3	3	2		2.4
CO-3	3	3	2	3	2	1	1	3	3	3		2.4
CO-4	2	3	3	3	2	1	3	3	3	2		2.5
CO-5	2	2	3	2	3	3	3	3	2	3		2.6
Mean Overall Score												2.48
Result										# I	High	

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UEN42GE04	GENERAL ENGLISH - IV	5	3

CO. No.	CO-Statements	Cognitive Levels		
CO. 110.	On successful completion of this course, students will be able to	(K-Levels)		
CO-1	identify different local and global issues in given passages	K1		
CO-2	understand explicit and implicit information given in written texts	K2		
CO-3	use appropriate words and punctuations in writing	К3		
CO-4	analyse written texts and modify them for better clarity	K4		
CO-5	assess the coherence and cohesion of written texts and rewrite them	K5 & K6		

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

(15 Hours)

#### Unit-I

- 1. Women through the Eyes of Media
- 2. General Writing Skill: Writing Minutes of a Meeting
- 3. Grammar: Present Perfect Tense

#### Unit-II

- 4. Effects of Tobacco Smoking
- 5. General Writing Skill: Note-Taking
- 6. Grammar: Present Perfect Continuous Tense

#### Unit-III

- 7. Short Message Service (SMS)
- 8. General Writing Skill: Note-Making
- 9. Grammar: Past Perfect Tense

#### **Unit-IV**

- 10. An Engineer Kills Self as Crow Sat on his Head: A Newspaper Report
- 11. General Writing Skill: Précis Writing
- 12. Grammar: Past Perfect Continuous Tense

#### Unit-V

- 13. Traffic Rules
- 14. General Writing Skill: Paragraph Writing
- 15. Grammar: Future Perfect Tense and Future Perfect Continuous Tense

#### **Book for Study**

Jayraj, S. Joseph Arul et al. *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*. Trinity, 2016.

#### **Books for Reference**

1. Clark Peter, Roy. *Writing Tools: 50 Essential Strategies for Every writer*. USA: Little, Brown Spark Publishers, 2008.

- 2. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*. India: Fingerprint Publishers, 2018.
- 3. Vaughn, Steck. Reading Comprehension. USA: Steck-Vaughn Co, 2014.
- 4. Birkett, Julian. Word Power: A Guide to Creative writing. India: Bloomsburry Acdemic, 2016.
- 5. Knight, Dudley. *Speaking with Skill: An Introduction to Knight-Thompson Speechwork*. USA: Methuen Drama, 2016.

#### Web Resources

- 1. <u>https://blog.lingoda.com/en/10-news-sites-to-practice-your-english-reading-skills/</u>
- 2. <u>https://www.espressoenglish.net/how-to-learn-english-for-free-50-websites-for-free-english-lessons/</u>
- 3. https://www.ef.com/wwen/english-resources/

#### Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Co	urse C	ode			<b>Citle of</b>	the Cou	rse		Hours	Credits		
IV	IV 21UEN42GE04 GH							ENERAL ENGLISH - IV					
Course	P	rogran	nme O	utcom	es	Pro	gramm	e Specif	ic Outc	omes	Mean		
Outcome			(POs)					(PSOs)	)		Scores of		
(COs)	(COs) <b>PO1 PO2 PO3</b>					PSO1	PSO2	PSO3	PSO4	PSO5	COs		
CO-1	2	3	2	2	3	2	3	2	3	2	2.4		
CO-2	2	2	3	2	3	3	2	3	2	2	2.3		
CO-3	2	3	2	3	2	2	3	2	3	2	2.4		
CO-4	2	2	3	2	3	3	2	3	2	3	2.5		
CO-5	2	2	2	3	2	2	2	3	2	2	2.2		
	Mean Overall Score												

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UCH43CC06	CORE-6: GENERAL CHEMISTRY – IV	4	3

CO No.	CO – Statements	Cognitive Levels
	On successful completion of this course, students will be able to	(K–Level)
CO-1	identify the different crystal structures and colloids.	K1
CO-2	discuss the different types of colloids and their properties.	K2
CO-3	apply the concepts of colligative properties of dilute solutions in the determination of molecular weights.	К3
CO-4	understand the nucleophilic substitution reaction mechanisms and applications of colloids.	K4
CO–5	analyze the methods of X-ray diffraction and preparation of organo nitrogen compounds.	K4

#### **Unit – I Solid State and polarization**

Forms of solids –isotropic and anisotropic solids – interfacial angle – symmetry elements in crystal systems – Bravais lattices – unit cell – law of rational indices (Weiss indices), Miller indices – unit cell dimension – density – number of atoms per unit cell – X–ray diffraction by crystals – derivation of Bragg's equation – experimental methods of X–ray study– rotating crystal method – X–ray pattern by powder method – determination of Avogadro number – vitreous state. Polarization of molecules in an electric field – polarizability and dipole moment – induced and orientation polarization – Clausius Mosotti equation – applications of dipole moment measurement of molar polarization.

#### **Unit – II Solutions**

Kinds of solutions – definition of the ideal solution – analytical form of the chemical potential in ideal liquid solutions – changes in state with increase in temperature – fractional distillation – azeotropes –ideal dilute solution – chemical potentials in the ideal dilute solution – Henry's law and the solubility of gases – distribution of a solute between two solvents – chemical equilibrium in the ideal and non–ideal solutions – application of the Gibbs–Duhem equation – colligative properties – freezing–point depression – solubility – elevation of the boiling point – osmotic pressure – abnormal molecular mass – Van't Hoff factor – degree of dissociation and degree of association of solutes.

#### **Unit – III Colloidal State**

Colloids – types of colloidal solutions – classification – preparation – purification – properties – electrical and electro kinetic properties – determination of size of particles – hydrophile–lipophile balance – surfactants – micelle formation – factors affecting critical micelle concentration in aqueous media – micellar catalysis – emulsification by surfactants – macro emulsions – gels and their applications – application of colloids .

#### **Unit- IV Nucleophilic Substitutions**

Nucleophilic substitution mechanisms –  $S_N2$ –Factors affecting  $S_N2$  reactions: leaving group – nucleophilicity – basicity and nucleophilicity, effects of solvents and steric effect on nucleophilicity – reversibility of  $S_N2$  reactions –mechanism of  $S_N1$  reaction –factors affecting  $S_N1$  reactions–leaving group – nucleophile – carbocation rearrangement – stereochemistry of  $S_N2$  and  $S_N1$  reactions – Walden inversion – racemization in  $S_N1$  reactions – reactions of benzylic, allylic, vinylic and aryl halides – competition between  $S_N2$  and  $S_N1$  reactions –role of the solvent in  $S_N2$ 

#### (12 Hours)

(12 Hours)

#### (12 Hours)

### (12 Hours)

and  $S_{\rm N}1$  reactions - competition between substitution and elimination–  $S_{\rm N}2/E2$  conditions –  $S_{\rm N}1/E1$  conditions – substitution and elimination reactions in synthesis –  $S_{\rm N}i$  reaction – example and mechanism.

#### Unit –V Organo Nitrogen Compounds

#### (12 Hours)

Amines – nomenclature – preparation and structure of amines – basicity – reactions of amines – alkylation – Hoffmann elimination – conversion of amines to substituted amides and electrophilic substitution reactions – analysis of amines – Hinsberg test –diazonium salts – preparations – reactions and synthetic applications – aromatic nitro compounds – preparation and reductions in various medium – electrochemical reduction – Hoffmann, Curtius, Lossen, Schmidt and Beckmann rearrangements.

#### **Books for Study**

1. Puri B P and Sharma L R, *Principles of Physical Chemistry*, 47th Edition, Vishal Publication, 2018.

Unit–I Chapter 31 Unit–III Chapter 32

2. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, 2004.

Unit–II Chapter 13 and 14

3.Paula Yurkanis Bruice, *Organic Chemistry*, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.

Unit–IV Chapter 10–12 Unit–V Chapter 21

#### **Books for Reference**

1. Atkins P W, *Physical Chemistry*, 10th Edition, Oxford University Press, 2014.

2. Robert T Morrison and Robert T Boyd, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.

#### Web Resources



Organonitrogen Compounds



Solid State

Semester	Co	ourse co	ode		Tit	le of the	Но	urs	Credits		
IV	21U	СН43С	CC06	G	CORE-6: GENERAL CHEMISTRY – IV 4						
Course Outcomes	Programme (Dufcomes (POs)									nes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	2	3	3	2	3	2	3	2	1	2.4
СО–2	2	2	3	3	1	2	2	3	3	2	2.3
СО–3	3	3	3	2	1	3	3	3	3	2	2.6
CO-4	2	3	3	3	1	3	2	3	3	1	2.4
CO–5	3	2	3	3	2	3	2	3	3	2	2.6
Mean overall Score										2.46 (High)	

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
IV	21UCH43CC07	CORE–7: GENERAL CHEMISTRY – V	4	3

CO No.	CO–Statements On successful completion of this course, students will be able to	Cognitive Levels (K – level)
CO-1	recite the fundamentals of nuclear chemistry.	K1
СО-2	understand the nature and periodic properties of <i>p</i> -block elements.	K2
СО-3	identify the important compounds formed by the <i>p</i> -block elements.	K2
CO-4	examine various reactions of alcohol, ethers and epoxides.	K3
CO–5	analyze the structures of non-metallic compounds.	K4

#### Unit – I Chemistry of Group–13 and Group–14 Elements

Inert-pair effect-general characteristics - melting and boiling points, sizes of atoms and ions, electropositive character, ionization energy-structure, properties and importance of compounds of group 13 elements - alums, boron sesquioxide, boric acid, structures of borates, borax, alumina, aluminates, halides, complexes, diborane and other higher boron hydrides, boron nitride and borazine.

Differences between carbon, silicon and the remaining elements-general characteristics - covalent radii, ionization energy, melting points, metallic and non-metallic character, allotropy of carbon, oxidation states-structure, properties and importance of compounds of group-14 elements carbides, oxides of carbon and silicon, silicates, silicones and halides (stannous chloride).

#### Unit – II Chemistry of Group–15 and Group–16 Elements

General characteristics-a comparative study on hydrides, halides and oxides of nitrogen group elements. structure and basic character of ammonia -oxyacids of nitrogen (HNO₂, HNO₃) and phosphorous (H₃PO₃, H₃PO₄ and H₄P₂O₇) – preparation, properties and structure of hydrazine – nitrogen and phosphorous fertilizers.

General characteristics - oxidation states, allotropy-oxides - different types of oxides based on chemical behaviour and oxidation state-oxy acids of sulphur - sulfurous acid, sulphuric acid, Caro's acid and Marshall's acid.

#### **Unit – III Chemistry of Group–17 and Group–18 Elements** (12 hours) **Group–17 Elements**

Bonding energy in X₂ molecules-oxidizing power-reaction with water-hydrogen halides (HF, HCl, HBr and HI)-Ionic halides-molecular halides and bridging halides-halogen oxides (OF₂, O₂F₂, Cl₂O, ClO₂, Cl₂O₆, Cl₂O₇) and oxoacids (HOX, HXO₂, HXO₃ and HXO₄)-preparation, and hydrolysis of inter-halogen compounds (AX, AX₃, AX₅ and AX₇)-polyhalide ions-basic properties of halogens-pseudohalogens and pseudohalide ions.

#### **Group–18 Elements**

Electronic structure-occurrence and recovery of the element-physical and chemical properties-Clathrates– chemistry of xenon–structure and bonding in xenon fluorides (XeF₂, XeF₄ and XeF₆) -Uses of noble gases.

#### **Unit – IV Nuclear Chemistry**

The atomic nucleus - structure of the nucleus -liquid drop and shell models-forces in the nucleus-stability and the ratio of neutrons to protons-modes of decay  $-\beta$  emission, neutron

96

## (12 hours)

(12 hours)

### (12 Hours)

emission, positron emission, orbital or K-electron capture, proton emission, gamma radiation – half-life period-binding energy and nuclear stability-  $\alpha$  decay-Soddy-Fajan's law of radioactive displacement-radioactive decay series-nuclear fission, fusion, atom bomb and hydrogen bomb.

#### Unit – V Alcohols, Ethers, Epoxides and Sulphur Compounds (12 hours)

Alcohols as acids and bases – reactions of alcohols – substitution reactions of alcohols – conversion into sulphonate esters – tests for alcohols – Williamson synthesis – reactions of ethers – cleavage by acids – substitution reactions in ethers – analysis of ethers – reactions of epoxides – arene oxides – crown ethers – reactions of thiols, sulphides, and sulphonium salts – Pinacol– Pinacolone and Dienone–Phenol rearrangements.

#### **Books for Study**

- 1. Lee J D, Concise Inorganic Chemistry, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.
- Unit–I Chapter 12 and 13 Unit–II Chapter 14 and 15

Unit–III Chapter 16 and 17 Unit–IV Chapter 31

2. Bruice P Y, *Organic Chemistry*, 8th Edition., Pearson Ltd., University of California, Santa Barbara, 2011.

**Unit– V** *Chapter 6 and 12* 

#### **Books for Reference**

- 1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
- 2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
- 3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Willey and Sons. Inc., New York, 1995.
- 4. Morrison R T and Boyd R N, *Organic Chemistry*, 7th edition, New York, Allyn and Bacon Ltd., 2011.

#### Web Resources



Group 13 elements

Nuclear Chemistry

Semester	Co	urse co	ode		<u>Outcon</u> Tit		Course		Но	urs	Credits
IV	21U	СН43С	CC07	CORE–7: GENERAL CHEMISTRY – V						4	3
Course Outcomes	Prog	gramm	e Outc	omes (I	POs)	Pro	gramme	e Specific (PSOs)	e Outco	mes	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	2	1	2	3	2	3	1	2	3	2	2.1
CO–2	3	1	2	2	3	3	2	1	3	2	2.2
CO-3	2	2	1	3	2	2	1	2	3	2	2.0
CO-4	3	3	2	1	2	2	2	3	2	2	2.2
CO–5	3	2	2	3	3	2	3	2	2	3	2.5
	Mean overall Score										

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

•			

99

- Unit-V Cycle 2 B 6. Potentiometric Redox Titration.
- 7. Determination of solubility product of a sparingly soluble substance by potentiometric titration.

#### Unit -I Theory of the Practical's Theory of the practical's - critical solution temperature - transition temperature - heat of neutralization - kinetics of ester hydrolysis and persulfate oxidation - viscosity - phase diagram (simple eutectic) – polarimetry of inversion of sugar – potentiometry – conductometry – partition coefficient and equilibrium constant - calculation of parameters with units - drawing graphs handling of various equipment used in physical chemistry practical.

**Title of the Course** 

(PHYSICAL CHEMISTRY)

**CO–Statements** 

acquire practical skill to estimate the strength of acid and base by

design, carry out, record and analyze the results of chemical

On successful completion of this course, students will be able to;

describe the theoretical concepts while performing experiments.

acknowledge experimental errors and their possible sources.

#### Unit – II Cvcle 1 A

Semester

IV

CO No.

**CO-1** 

**CO-2** 

**CO-3** 

**CO**-4

CO-5

- 1. Effect of impurities on critical solution temperature.
- 2. Heat of Neutralization.
- 3. Transition temperature of a salt hydrate.
- 4. Kinetics of acid catalyzed hydrolysis of an ester.
- 5. Conductometric Acid–Base Titration.

### Unit – III Cycle 1 B

- 6. Determination of cell constant.
- 7. Determination of strength of a strong acid by potentiometric titration (HCl vs NaOH).
- 8. Determination of strength of a weak acid by potentiometric titration (CH₃COOH vs NaOH).
- 9. Determination of limiting molar conductance of a strong electrolyte (KCl) by conductometry.
- 10. Determination of single electrode potential.
- 11. Estimation of FAS by potentiometric titration

### Unit – IV Cycle 2 A

- 1. Determination of molecular weight Rast's method.
- 2. Phase diagram of a simple eutectic system and determination of unknown composition.
- 3. Critical Solution Temperature
- 4. Kinetics of persulphate iodide reaction.
- 5. Conductometric Precipitation titration

## (20 Hours)

(20 Hours)

(20 Hours)

(20 Hours)

## (10 Hours)

Hours

3

Credits

2

Cognitive

Levels

(K – level)

**K1** 

**K2** 

**K3** 

K4

**K4** 

**CHEMISTRY PRACTICAL – III** 21UCH43CP03

learn the effective usage of chemicals.

**Course Code** 

conductometric method

experiments

8. Determination of cell constant, specific conductance and equivalent conductance of strong electrolyte.

9. Verification of Onsager equation.

10. A study of weak electrolytes – Ostwald's dilution law.

#### **Books for Study**

1. Veeraswamy R, Venkateswaran V and Kulandaivelu A R, *Basic Principles of Practical Chemistry*, Sultan Chand and Sons,  $2^{nd}$  Edition, 2015.

2. Daniels et al., *Experimental Physical Chemistry*, 7th Edition, McGraw Hill, 1970.

3. Findlay, A., Practical Physical Chemistry, 7th Edition, Longman, 1989.

#### Web Resources





Conductometric (CST) of phenol-water system.

**Precipitation Titration** 

#### Scheme for valuation **CORE 10: Chemistry Practical–III** (PHYSICAL CHEMISTRY) **INTERNAL**

CIA		100 Marks
Cumulative mark of Regular	Practical Classes	50 Marks
Two CIA tests		50 Marks
For Each CIA Test		100 marks
Theory/Test	10 Marks	
Record	10 Marks	
Principle & short procedure	10 marks	
Calculation & Tabulation	10 marks	
Graph	10	
Results	50 Marks	

#### Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

#### **EXTERNAL**

Total Theory/Test 10 Marks Record 10 Marks Principle & short procedure 10 marks

**100 Marks** 

Calculation & Tabulation	10 marks
Graph	10
Results	50 Marks

## Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

Semester	Co	urse co	de	Title of the Course					Но	urs	Credits
IV	<b>21</b> U	CH43C	CP03		CHEMISTRY PRACTICAL – III (PHYSICAL CHEMISTRY)					3	2
Course Outcomes	Programme Outcomes (POs				Programme Outcomes (POs) Programme Specific Outc			itcomes	(PSOs)	Mean Score	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	1	1	2	3	4	2	3	2	3	3	2.4
СО–2	2	3	4	3	4	2	1	3	4	3	2.9
CO-3	1	3	1	4	3	2	2	3	3	1	2.3
CO-4	2	3	2	3	2	2	3	2	1	4	2.4
CO–5	3	4	3	3	2	2	3	1	2	3	2.6
Mean overall Score								2.52 (High)			

Semester	<b>Course Code</b>	Title of the Course	Hours	Credit
IV	21UCH43AO04A	ALLIED OPTIONAL: PHYSICS – II	4	4

CO No.	CO- Statements	Cognitive Levels
	On the successful completion of the course, student will be able to	(K-Levels)
CO 1	Able to acquire knowledge about the fundamentals of physics discipline such as optics, atomic and nuclear physics, elements of relativity, quantum mechanics and electronics	K1
CO 2	Understand the concepts of interference, diffraction, polarization, structure of atom, nucleus and its properties.	K2
CO 3	Understand the significance of relativistic phenomena, quantum wavefunction and electrical circuits.	K2
CO 4	Apply the optical, electrical, atomic and nuclear concepts learned in the classroom for problem solving	К3
CO 5	Analyze the physics knowledge learned from class room with real life problems	K4

#### **UNIT - I: PHYSICAL OPTICS**

Velocity of light - Michelson's method - Interference: colours of thin films - Air wedge - Determination of diameter of a thin wire by air wedge - test for Optical flatness. Diffraction - Fresnel's explanation of rectilinear propagation of light - theory of diffraction and specific rotating power of transmission grating - Normal incidence - polarization - Brewster's law -double Refraction - optical activity - polarimeter.

#### **UNIT - II: ATOMIC PHYSICS**

Atom model - vector Atom model - quantum numbers associated with vector atom model - coupling schemes - Pauli's exclusive principle - magnetic dipole moment of electron due to orbital and spin motion - Bohr magneton - spatial quantization - Stern Gerlach experiment.

#### **UNIT - III: NUCLEAR PHYSICS**

Nuclear model - liquid drop model - magic numbers, shell model - nuclear Energy - mass defect - binding energy - Radiation detectors - ionization chambers - GM counter - nuclear fission - Bohr and wheeler theory - chain Reaction - atom bombs - nuclear fusion - calculation of energy released in a fusion - nuclear reactor - Source of solar energy: proton -proton cycle - Carbon-nitrogen cycle.

#### UNIT - IV: ELEMENTS OF RELATIVITY AND QUANTUM MECHANICS(12 Hours)

Frame of reference - Galilean transformation - Postulates of theory of relativity - Lorentz transformation equations - derivation - length contraction - time dilation - uncertainty principle - postulates of wave mechanics - wave nature of matter - types of operators - Schrodinger's time dependent and time independent equation - Eigen functions and Eigen values - The particle in a box (infinite Square well potential).

#### **UNIT - V: ELECTRONICS**

**Basic Electronics:** Semiconductors, *pn* junction diode - Zener diode and characteristics - voltage regulator - LED - Common emitter transistor amplifier (principle) - Transistor RC coupled amplifier

**Digital electronics:** Logic gates - NAND and NOR gates - Universal building blocks - Boolean algebra – De Morgan's theorem - verification.

## (12 Hours)

#### (12 Hours)

(12 Hours)

#### (12 Hours)

#### **Book for Study**

UNIT	BOOK	CHAPTER	SECTION
Ι	1	6	6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.8, 6.9, 6.10, 6.11, 6.12, 6.13, 6.14, 6.17, 6.19, 6.20
II	1	7	7.1, 7.2, 7.3, 7.4, 7.7.6, 7.7, 7.8
III	1	8	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.10, 8.11, 8.12, 8.13, 8.14, 8.16, 8.17, 8.18
IV	1	9	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.10, 9.12, 9.13, 9.14, 9.15, 9.18, 9.19
V	1	10	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.11, 10.12, 10.13, 10.14, 10.15, 10.16, 10.17, 10.18, 10.19, 10.21

1. R. Murugesan, "Allied Physics", S Chand and Co. Publications, New Delhi, Reprint, 2015.

#### **Books for References**

1. D. Halliday, R. Resnick, J. Walker, "Fundamental of Physics", 9th Edition, John Wiley & Sons, 2010.

2. M.E. Schaltz, "Grob's Basic Electronics", 11th Edition, McGraw Hill, 2011.

3. Arthur Beiser, "Concepts of Modern Physics", Special Indian Edition, Tata McGraw Hill, 2009.

4. R.Murugeshan and Kiruthiga Sivaprasath, "Modern Physics", 14th Edition, S Chand and Co, 2009.

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code			Title of the Course					Hours	Credit	
IV	21UC	CH43A	004A	A	ALLIEI	D OPTIC	DNAL: P	HYSICS	II	4	4
	Pr	ogramn	ne Outo	come (P	<b>PO</b> )	Prog	ramme S	pecific O	utcome	(PSO)	Mean
Course outcome	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Scores of CO
CO1	3	2	2	1	2	3	2	1	2	2	2.0
CO2	3	3	2	2	2	3	2	2	2	2	2.3
CO3	3	3	2	3	2	3	3	3	2	2	2.6
CO4	3	3	3	3	2	3	3	3	2	2	2.7
CO5	3	3	3	2	2	3	3	3	2	2	2.6
Mean overall Score									2.44 (High)		

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UCH43AP01A	ALLIED: PHYSICS PRACTICAL	4	4

#### Any 16 of the following

- 1. Young's modulus Non uniform bending cantilever
- 2. Young's modulus cantilever
- 3. S. T. Method of drops
- 4. S. T. Capillary rise
- 5. Viscosity variable pressure head
- 6. Concave lens f, R,  $\mu$
- 7. Air wedge Thickness of wire
- 8. Newton's Rings R
- 9. Spectrometer solid prism
- 10.Spectrometer Grating (Normal Incidence)
- 11.M1/M2 Tan A and Tan B simultaneous method
- 12. Absolute determination of M and H
- 13.P.O. Box Temp. Coefficient
- 14. Potentiometer Ammeter calibration
- 15.Potentiometer R and  $\rho$
- 16. Field along the axis of the coil
- 17.Sonometer Frequency of tuning fork
- 18. Junction diode characteristics
- 19. Zener diode characteristics
- 20.Logic gates ICs
- 21. Jolly's bulb

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
		Allied-II		
IV	21UCH43AO04B	COMMUNICATION	4	2
		ELECTRONICS		

CO No.	CO statements	Cognitive Levels (K- levels)
	On completion of this course, students would be able to	
CO-1	Understand serial and parallel Communication	K2
CO-2	Infer and Elaborate Optical Communication	K2
CO-3	Experiment and Perceive various optical sources and detectors	K2,K3
<b>CO-4</b>	Appraise various Wireless Networks	K4
CO-5	Apply and Analyze wireless networking using ESP 8266	K6

#### **UNIT I: SERIAL AND PARALLEL PORT COMMUNICATION**

Basics of digital communication- Parallel port interfacing for simple I/O operations-Serial communication-UART-USART-Data transfer using serial port- USB port specifications-HID device –USB for data transfer applications-Communication protocols-SPI-IIC-Applications.

#### **UNIT II: OPTICAL COMMUNICATION**

Basics of optical communication-Block diagram of Optical fibre communication-advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, single mode fiber, cutoff wave length, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

UNIT III: OPTICAL COMMUNICATION SOURCES AND DETECTORS (12 Hours) Introduction, LEDs, Phototransistor characteristics- Photo detector noise, Response time, double hetero junction structure, comparison of photo detectors -LM393 light sensor module TCS3200 color sensor module.

#### **UNIT IV: WIRELESS COMMUNICATION**

Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication-Third generation Cellular Networks- Fourth Generation, fifth generation wireless networks- Wireless Local Loop (WLL)-Wireless Local Area network(WLAN)- Bluetooth and Personal Area Networks.

#### **UNIT V BASIC NETWORKING WITH ESP8266**

Introduction to ESP8266 Wi-Fi Module- Wi-Fi library-Web server- installation- configuration-Posting sensor(s) data to web server-ThingSpeak API and MQTT.

#### **Book(s)** for Study

- 1. N. Mathivanan, "PC-BASED INSTRUMENTATION: CONCEPTS AND PRACTICE" 2007
- 2. Optical Fiber Communications John M. Senior, PHI, 2nd Edition, 2002
- 3. Manoj R. Thakur,"NodeMCU ESP8266 Communication Methods and Protocols : Programming with Arduino IDE"
- 4. Material prepared by the Department.

#### **Book(s) for Reference**

1. John Axelson, "USB Complete: The Developer's Guide", 4th Edition, 2012

#### (12 Hours)

### (12 Hours)

### (12 Hours)

### (12 Hours)

2. Anita Gehlot, Rajesh singh, Praveen Kumar Malik, Lovi Raj Gupta, Bhupendra Singh, "Internet of things with 8051 and ESP8266", 2020

Unit	Book	Chapter	Sections
Ι	1	6	6.1,6.2,9.2,9.3,9.4,9.5
Π	2	1,2,3,5	1.2,1.3,2.1,2.2,3.6,5.3
III	2	7,8	7.2,8.1.8.3,8.5,8.6,8.8
IV	4		Material prepared by the department.
V	3	4,5,21	4.1,4.2,4.3,5.2,21.1-21.3

# Relationship matrix for Course outcomes, Programme outcomes/ Programmes Specific outcomes

Semester	Cour	se Cod	e		Title	of the C	Course		Ho	urs	Credits
IV	21UCH43AO04B			1	Allied-II				L I	3	
	COMM				MUNICATION						
					ELE	CTRO	NICS				
Course	Programme Outcomes (PO)					Programme Specific Outcomes					Mean
Outcomes						(PSO)	)				Scores
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	of COs
CO-1	2	2	3	2	1	2	3	3	2	2	2.2
CO-2	3	3	2	2	2	3	3	2	2	3	2.5
CO-3	3	3	2	3	2	2	3	3	2	2	2.5
<b>CO-4</b>	3	3	3	3	2	2	3	3	3	2	2.7
CO-5	3	3	3	3	2	3	3	3	3	3	2.9
								Mean (	Overall	Score	2.6
										Result	High

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits

IV 21U

### CH43AP01B

#### Allied-II ELECTRONICS PRACTICAL

2

2

### ALLIED ELECTRONICS PRACTICALS (ANY 16 EXPERIMENTS)

- 1. Study of Opto-coupler characteristics and application.
- 2. Study of Photodiode and phototransistor characteristics
- 3. Study of Transducers for temperature measurements.
- 4. Study of MOSFET characteristics.
- 5. Study on Integrated sensors
- 6. Construction and study of Linear power supply
- 7. Construction of voltage regulators.
- 8. Pspice simulation of basic circuits with resistors and node voltage and branch current calculation.
- 9. Study on magnetic and solid state relay.
- 10. Study of SCR characteristics
- 11. DC to DC switching circuits using MOSFET
- 12. Pspice simulation of active devices.
- 13. Configuring ESP8266 based Web-server for data acquisition applications.
- 14. Digitizing temperature sensor data and uploading in thingspeak API.
- 15. Study of USB communication (HID device).
- 16. Study of software serial communication in ESP8266.
- 17. Study of fibre optic communication.
- 18. Hall effect sensor for current measurement
- 19. ESP 8266 I/O operations
- 20. Interfacing RFID module using Arduino.
- 21. Interfacing IIC memory module using Arduino.
- 22. Interfacing HC-05 bluetooth module with arduino
- 23. Study of Parallel port for I/O operations
- 24. Study of Serial port data transfer to hyper-terminal.
- 25. Study of Colour sensing using TCS3200.

SemesterCourse CodeTitle of the CourseHoursCredits
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CO No.	CO – Statements On successful completion of this course, students will be able to	Cognitive Levels (K–Level)
CO-1	identify the roles played by proteins, vitamins, enzymes and hormones.	K1
CO-2	discuss the significance of nutritional supplements and drugs.	K2
СО–3	predict the causes for various diseases.	K2
CO-4	apply the knowledge of nutrition and drugs in curing diseases.	К3
CO–5	analyse the classifications of carbohydrates, proteins and vitamins.	K4

#### **Unit–I Nutrition**

Nutrition – definition – food pyramid – health – hygiene – nutritional foods– sources – significance of nutritional supplements- malnutrition- under nutrition and over nutrition - causes and remedies.

#### **Unit-II Carbohydrates, Proteins and Vitamins**

Carbohydrates - definition- classification- examples - simple qualitative analysis of carbohydrates - biological functions- proteins -definition- classification- examples - simple qualitative analysis of proteins - biological functions- vitamins- definition- classificationexamples-biological functions.

#### **Unit–III Enzymes and Hormones in Digestion**

Enzymes and hormones - types of enzymes - enzyme action - hormones - types of hormonesaction of hormones - examples of essential hormones- digestion in mouth, stomach, intestine and pancreas.

#### **Unit-IV Common Diseases**

Diseases - malaria, typhoid, dysentery, vomiting, jaundice, asthma, epilepsy, ulcer, anemia, diabetes and their causes.

#### **Unit-V Drugs**

Drugs – classification of drugs – definition and examples of antipyretics, antibiotics, antiseptics, analgesics, anti-convulsant agents, anaesthetics and cardiovascular drugs.

#### **Books for Study**

1. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, 2nd Edition, S.Chand and Co. Ltd, New Delhi, 2006.

Unit-IV Chapter 1

**Unit–** V Chapter 1

2. Alex V Ramani, Food Chemistry, MJP Publishers, Chennai, 2009.

Unit–II Chapters 2,3 and 5 Unit–III Chapter 1 **Unit–I** Chapter 1

**Books for Reference** 

#### (6 Hours)

#### (6 Hours)

### (6 Hours)

# (6 Hours)

(6 Hours)

- AshutoshKar, *Medicinal Chemistry*, Wiley Easterns limited New Delhi, 1993.
   Bahl and Arun Bahl, *A text book of Organic Chemistry*, 22nd Edition, S. Chand Publishers, New Delhi, 2019.

#### Web Resources





Overview of Nutrition

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse co	ode		Title of the Course     Hours     C						
IV	21U0	CH44SI	44SE02A SEC-2 (BS): HEALTH CHEMISTRY 2							2	1
Course Outcomes	Prog	gramm	e Outc	omes (]	nes (POs) Programme Specific Outcomes (PSOs)						
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO	4 PSO5	of COs
CO-1	3	2	3	2	1	3	2	3	2	1	2.2
CO–2	3	2	3	2	2	3	2	2	3	1	2.3
СО-3	3	2	3	3	2	3	2	3	2	2	2.5
CO-4	3	3	3	3	2	3	2	3	3	1	2.6
CO–5	3	3	3	3	2	3	3	3	2	1	2.6
Mean overall Score										2.44 (High)	

Semester Course Code	Title of the Course	Hours Ci	edits
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IV	21UCH44SE02B	<b>SEC-2</b> ( <b>BS</b> ):	2	1
		INDUSTRIAL CHEMISTRY		
	•			

	CO – Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Levels (K–Level)
CO-1	identify the types and composition of glasses, paints and cements.	K1
CO-2	compare the different methods of polymerisation.	K2
CO-3	utilize the manufacturing methods of cement, glass and paint.	K3
CO-4	apply the knowledge of drugs in treating diseases.	K3
CO–5	analyze the industrial applications of paint, glass and cement.	K4

#### **Unit–I** Glass

Glasses – composition of glass – types of glasses – manufacturing methods – formation processes - melting, blowing, pressing, annealing and finishing - industrial applications of glasses.

### **Unit –II Cement**

Cement – composition of cement – raw materials – cement factories in india– types of cement – portland cement – composition, types – manufacturing methods– dry and wet processes –setting of cement-applications.

### **Unit–III Paints and Pigments**

Paints - composition of paint - types of paints, manufacturing methods- applications - pigments - classification of pigments and dyes - examples - industrial applications.

### **Unit**-IV Drugs

Drugs – classification of drugs – definition and examples of antipyretics, antibiotics, antiseptics, analgesics, anti-convulsant agents, anaesthetics and cardiovascular drugs.

### **Unit-V** Polymers

Monomers and polymers - definition of polymerisation- types- addition polymerisation and condensation polymerization- examples - uses - moulding types- injection and blow moulding - industrially important polymers.

### **Books for Study**

1. Sharma B K, Industrial Chemistry, 15th Edition, Goel publishing house, Meerut, 2006. Unit–I Chapter 20 Unit–II Chapter 23 Unit–III Chapter 43 Unit–V Chapters 29 and 30

2. Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S.Chand and Co. Ltd, 2006. **Unit–IV** Chapter 1

### **Books for Reference**

1. Charkarabathy B N, Industrial Chemistry, Oxford and IBH Prb. Co., New Delhi, 1981.

2. AshutoshKar, Medicinal Chemistry, Wiley Eastern limited, New Delhi, 1993.

3. Gowariker V R, Viswanathan N V and Sreedhar J, Polymer Science, New Age International, New Delhi, 2011.

### Web Resources

#### (6 Hours)

(6 Hours)

## (6 Hours)

(6 Hours)

### (6 Hours)



Polymerization



#### Polymer Additives

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

	1			1		tcomes					
Semester	SemesterCourse codeIV21UCH44SE02B			Title of the Course					Hours	Credits	
IV				SEC-2 (BS): INDUSTRIAL CHEMISTRY					2	1	
Course Outcomes	Pro	gramm	e Outco	omes (P	omes (POs) Programme Specific Outcomes (I					es (PSOs)	Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO	4 PSO5	of COs
CO-1	3	2	2	3	1	3	3	2	2	2	2.3
СО–2	3	2	3	3	2	3	3	2	2	1	2.4
СО–3	3	3	2	3	2	3	3	2	3	1	2.5
CO-4	3	3	2	3	2	3	3	1	3	2	2.5
CO–5	2	3	2	2	3	2	2	2	3	2	2.3
Mean overall Score							2.4 (High)				

Semester Course Code	Title of the Course	Hours	Credits
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117	21UHE44VE04A	PROFESSIONAL ETHICS-II:	ſ	1
IV		SOCIAL ETHICS - II	Z	1

Co. No.	<b>CO – Statements</b> On completion of this course the graduates will be able to	Cognitive Levels (K–Level)
CO-1	know the value of natural recourses and to live in a harmony with nature.	K1
CO-2	comprehend the importance of a healthy life.	K2
CO-3	apply the plans of disaster management in the society.	К3
CO-4	analyse the importance and differences of science and religion.	K3
CO-5	apply counseling skills and solve their problems.	K4

#### **Unit-I** Harmony with Nature

What is environment, Why should we think of harmony, Principles to conserve environmental resources, Causes of disharmony, The fruits of harmony with nature, Natural Resources, Fruits of disharmony, Economic values and growth, Environmental Ethics, Guidelines to live in harmony with nature, Towards life-centered system for better quality of life. Harmony with animal kingdom.

#### Unit-II Issues Dealing with Science and Religion

What is Science, Science and Religion, Social Relevance of Science and Technology, Science and technology for social justice, Difference caused by Science and Technology, Need for indigenous technology, Science and Technology Innovation Policy of India.

#### Unit-III Public Health

Health related issues, Health Care in India vs Developed Countries, Health and Heredity, Public Health - Objectives of public health in India, Public Health System in India, Failure on the public health front, Role of the central government, Hospitals Services in India, Health and Abortion, Drug Addiction and Drug abuse

#### **Unit-IV** Disaster Management

Disaster Management, Types of disaster, Plans of disaster management, Technology to manage natural disasters and catastrophes, Rehabilitation and Reconstruction, Human-induced disaster, First Aid, The importance of First-aid.

#### Unit-V Counselling for Adolescents

High Risk Behaviours, Developmental Changes in Adolescents, Key Issues of the Adolescents, Need for Counselling, Nature of Counselling, Counselling Goals, Does helping help? The Good and the Bad news.Importance of Career Guidance Counselling.

#### **Books for Study**

Department of Human Excellence, *Formation of Youth*, St Joseph's College (Autonomous), Tiruchirappali 02, 2021.

#### **Books for Reference**

- 1. Albert, D. and Steinberg, L, *Judgment and decision making in adolescence*: Journal of Research on Adolescence, page no: 211-224. 2011
- 2. Larry R. Collins, Disaster Management and Preparedness, Lewis Publications, 22 November

#### (6-Hours)

(6-Hours)

(6-Hours)

# (6-Hours)

#### (6-Hours)

2000.

- 3. Elizabeth B. Hurlock, *Developmental Psychology: A: Life-Span Approach*, New Delhi: Tata McGraw-Hill, 1981, 5th Edition, August 18, 2001.
- 4. Sangha, Kamaljit. *Ways to Live in Harmony with Nature: Living Sustainably and Working with Passion*. Australia, Woodslane Pty Limited, 2015.

#### Web Sources:

https://en.wikipedia.org/wiki/Disaster_management_in_India https://ndma.gov.in/ https://talkitover.in/services/child-adolescent-counselling/ https://www.nipccd.nic.in/schemes/adolescent-guidance-centre-19#gsc.tab=0

Semester Course Code	Title of the Course	Hours	Credits
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IV/	21UHE44VE04B	PROFESSIONAL ETHICS II:	2	1
11	210HE44VE04B	<b>RELIGIOUS DOCTRINE - II</b>	2	

CO.No.	CO-Statements	Cognitive levels (K–Level)
	On completion of this course, the graduates will be able to	
CO-1	Understand the history of the Catholic Church	K1
CO-2	Examine and grasp the Sacraments of the Catholic Church	K2
CO-3	Apply the Christian Prayer to their everyday life	K3
CO-4	Analyze themselves in the light of Sacraments & Christian Prayer	K4
CO-5	Create a harmonious society learning values from all religions	K5 & K6

Unit-I	The Catholic Church	(6 Hours)
Unit-II	Sacraments of Initiation	(6 Hours)
Unit-III	Sacraments of Healing & at the Service of Community	(6 Hours)
Unit-IV	Christian Prayer	(6 Hours)
Unit-V	Harmony of Religions	(6 Hours)

### **Books for Study**

Department of Human Excellence, *Life in the Lord: Religious Doctrine*. St. Joseph's College, Trichirappalli 02, 2021.

#### **Books for Reference**

- 1. *Compendium: Catechism of the Catholic Church*. Bengaluru: Theological Publications in India, 1994.
- 2. Holy Bible (NRSV).

Semester	Course code	Title of the course	Hours	Credits

N/	21UCH53CC08	CORE-8:	6	5
v		<b>INORGANIC CHEMISTRY – I</b>	0	5

CO No.	CO–Statements On successful completion of the course, students will be able to	Cognitive levels (K–Level)
CO-1	describe the properties of inner transition elements.	K 1
СО-2	outline the basics of coordination chemistry.	K 2
СО-3	predict the structure and stability of a complex.	К 3
CO-4	infer about the nature of transition elements.	К 3
CO-5	correlate the electronic transition and structure of complexes.	K 4

#### **Unit–I Chemistry of Transition Elements**

Electronic configurations-variation of atomic and ionic radii of transition elements across the period and down the group-variable oxidation state-magnetic properties-color-complexing tendency-alloy formation-catalytic properties.

#### Unit–IIChemistry of Inner–transition Elements The Lanthanide Series

Abundance, extraction and uses-separation of the lanthanide elements – precipitation, thermal reaction, fractional crystallization, complex formation, solvent extraction, valency change, ion-exchange-electronic structure-oxidation states-solubility- color and spectra-magnetic properties- lanthanide contraction and complexes.

#### **The Actinide Series**

Electronic structure and position in the periodic table-actinide contraction-oxidation statesoccurrence and preparation of the elements.

#### Unit-III Coordination Chemistry-I

Coordination compounds – coordinate bond, coordination number, coordination sphere, oxidation state of the metal ion, coordination number and geometries– ligands –types of ligands– nomenclature of coordination compounds–Isomerism in coordination compounds – polymerization, ionization, hydrate, linkage, coordination, coordination position and stereo isomerism (geometrical and optical)–chelate complexes and chelate effect–EAN rule–Werner's theory–Valence bond theory (VBT).

#### Unit-IV Coordination Chemistry-II

Crystal field theory–splitting of *d*–orbitals in  $O_h$ ,  $T_d$  and square planar environments–calculation of CFSE–effects of crystal field splitting – lattice energy, enthalpies of hydration–tetragonal – distortion in octahedral complexes (Jahn–Teller effect)–MO theory of complexes with and without *pi* bonding –*pi* acceptor ligands–*pi* donor ligands.

#### **Unit-V Electronic Spectra of Complexes**

Energy levels in atoms – coupling of orbital momenta – coupling of spin momenta – spin–orbit coupling – terms and term symbols – determining the ground state terms– Hund's rules – hole formulation – terms arising from p and d configurations (derivations of terms not required) – calculation of number of microstates.

Electronic spectra of transition metal complexes – selection rues and intensity – interpretation of electronic spectra of high–spin  $d^1$ – $d^9$  systems with the help of Orgel diagrams.

#### (18 Hours)

#### (18 Hours)

#### (18 Hours)

#### (18 Hours)

# (18 Hours)

#### **Books for Study**

1. Lee J D, Concise Inorganic Chemistry, 5th Edition, Blackwell Science Ltd., Oxford, London.1996. Unit–I Chapter 18 Unit-III Chapter 29,30 **Unit–III** Chapter 7 **Unit–IV** Chapter 7 **Unit–V** Chapter 32 2.Weller M, Overton T, Rourke J and Armstrong F, Inorganic Chemistry, 7th Edition, Oxford University Press, Oxford, UK, 2018. **Unit–I** Chapter 19 **Unit–III** Chapter 23 **Unit–III** Chapter 7,20 **Unit–IV** Chapter 20 Unit-V Chapter-20 **Books for Reference** 1. Miessler G L, Fischer P J and Tarr D A, Inorganic Chemistry, 5th Edition, Pearson Education, New York , 2014. 2. Housecroft C E and Sharpe A G, Inorganic Chemistry, 4th Edition, Pearson Education, New York, 2012. 3. Cotton F A, Wilkinson G and Gauss P L, Basic Inorganic Chemistry, 3rdEdition, Johh Willey and Sons. Inc., New York, 1995.

#### Web Resources



Group 17 Elements



**Coordination Compounds** 



Inner transition Elements

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	ourse co	ode		Ti	tle of tl	ne Cou	rse		Hours	Credits
V	<b>21</b> U	СН53С	C08	IN	ORGA		RE-8: CHEMI	STRY -	6	5	
Course OutcomesProgramme Outcomes (POs)Programme Specific Outcomes (PSOs)									tcomes	Mean Score of COs	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO	4 PSO5	
CO-1	3	3	2	1	1	3	3	3	2	1	2.2
CO-2	3	3	3	2	1	3	2	2	2	1	2.2
CO–3	3	2	2	1	1	3	2	2	2	1	1.9
CO-4	3	2	3	2	1	3	2	2	1	2	2.1
CO–5	3	2	1	2	1	3	1	2	2	2	1.9
Mean overall Score										2.06 (Medium)	

Semester	Course code	Title of the course	Hours	Credits
V	21UCH53ES01A	DSE -1: ORGANIC SPECTROSCOPY	5	3

СО	CO–Statements	Cognitive
No.	On successful completion of the course, students will be able to	Levels (K–Level)
CO-1	describe the principle, instrumentation and applications of UV-Vis	K1
	spectroscopy	
CO–2	outline the concepts of pericyclic and photochemical reactions	K2
CO-3	predict the stereochemistry of organic reactions	K2
CO-4	apply the principles of NMR in structural elucidation	K3
CO–5	identify the structure of the molecules using MS	K4

#### Unit – I UV–Visible and IR Spectroscopy

#### (15 Hours)

Electromagnetic spectrum– UV –Visible spectroscopy: Beer–Lambert law – electronic transitions – principle – instrumentation (only block diagram)– chromophores– auxochrome– factors influencing absorptions – conjugation – solvent effect – shifts in absorptions – Woodward–Fieser rules for the calculation of  $\lambda_{max}$  of dienes and enones.

**IR spectroscopy:** Hooke's Law– modes of vibrations in organic molecules– instrumentation (only block diagram)– –factors influencing stretching frequency – hybridization, tautomerism, H– bonding, electronic and steric and ring size effects –IR spectra of functional groups – hydrocarbon: methyl, methylene, methine C–H stretching in alkanes and cycloalkanes – alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amides and amines – NH stretching in primary and secondary amines.

Applications of UV–Visble and IR spectra in the structural analysis of simple organic molecules.

#### **Unit – II NMR Spectroscopy**

¹H NMR: Principle, instrumentation, number of signals, shielding and deshielding – chemical shift: calculation, factors influencing chemical shifts – hybridization and electronic effects – exchangeable protons – chemical shift values for different protons – integration and proton counting, spin – spin coupling and coupling constants – types of coupling constants – deuterated solvents – interpreting the NMR spectra of some organic molecules.

¹³C NMR spectroscopy – types of carbon, splitting and chemical shift values for various types of carbons.

#### **Unit – III Mass Spectrometry**

**Mass spectrometry:** principle – instrumentation – ionization techniques – CI and EI – desorption techniques – m/z values – molecular ion peak – isotopic peaks – [M+1] and [M+2] and their importance – metastable ions –benzylic and allylic cleavages – nitrogen rule, McLafferty rearrangement – interpretation of the mass spectra of some organic molecules. Combined approach to identify the structure of organic molecules.

#### **Unit – IV Pericyclic and Photochemical Reactions**

**Pericyclic reactions:** Characteristics and types – FMO of enes, dienes and polyenes – electrocyclic reactions – Woodward–Hoffman rules for thermal and photochemical reactions – cycloaddition reactions–[4+2] and [2+2] – stereo– and regiochemistry – inverse electron demand

#### (15 Hours)

#### (15 Hours)

and retro Diels–Alder reactions – sigmatropic rearrangements – types and examples – Alder–ene reactions and cheletropic reactions.

**Photochemical reactions:** Types of photochemical reactions– Norrish type I and II – Paterno – Buchi reaction – mechanism and stereochemistry.

#### **Unit –V Selectivity in Organic Synthesis**

#### (15 Hours)

Chemoselectivity, regioselectivity, and stereoselectivity – reactivity of carbonyl groups towards nucleophiles – selectivity of hydrides in reduction – selectivity in oxidations – protecting groups – hydroxyl, amino, carbonyl and carboxylic acid protecting groups.

#### **Books for Study**

- Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, *Introduction to Spectroscopy*, 5th Edition, Cengage Learning, New Delhi, 2015. Unit–I Chapter 2 & 7 Unit–II Chapter 3
- Silverstein R M and Bassler G C, Spectrometric Identification of Organic Compounds, 4th Edition, John–Wiley and Sons, New York, 1993. Unit–III Chapter 2
- Clayden J, Greeves N and Warren S, Organic Chemistry, 1st Edition, Oxford University Press, New York, 2001.
   Unit–IV Chapter 35 Unit–V Chapter 24

#### **Books for Reference**

- 1. Kemp W, Organic Spectroscopy, 3rd Edition, ELBS, London, 1987.
- 2. Fleming I, Spectroscopic Methods in Organic Chemistry, 4th Edition, Tata-McGraw Hill Publishing Company, New Delhi, 1988.
- 3. Sharma Y R, *Elementary Organic Spectroscopy*, 5th Edition, S. Chand & Company Pvt. Ltd, 2013.
- 4. Carey F A and Sundberg R J, Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th Edition, Springer Pvt. Ltd., New Delhi, 2007.
- 5. Carey F A and Sundberg R J, Advanced Organic Chemistry, Part B: Structure and Mechanisms, 5th Edition, Springer Pvt. Ltd., New Delhi, 2007.

#### Web Resources





Fundamentals of Spectroscopy

Semester	Co	urse co	de		Titl	e of the Course Hou					Credits
V	V 21UCH53ES01A DSE- 1: OR							ROSCO	<b>P</b> Y	5	3
Course OutcomesProgramme Outcomes (POs)							Programme Specific Outcomes (PSOs)				
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	3	2	3	2	1	2	3	3	3	1	2.3
CO–2	3	3	3	2	1	3	3	3	2	1	2.4
CO-3	1	1	1	3	2	2	3	1	1	1	1.6
CO-4	3	2	3	3	2	1	3	2	3	1	2.3
CO–5	2	1	2	1	2	3	1	2	2	2	1.8
	Mean overall Score										2.08 (Medium)

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

CO No.	CO–Statements	<b>Cognitive levels</b>
	On successful completion of the course, students will be able to	(K-Level)
CO-1	understand the principle, instrumentation and applications of	K1
	UV–Vis and IR.	

Title of the course

**DSE-1: ORGANIC SYNTHESIS AND** 

**CHARACTERIZATION** 

	UV–Vis and IR.	
CO–2	comprehend the importance of NMR and ESR in structural	K1
	elucidation	
СО–3	understand and carry out the stereoselective organic synthesis.	K2
CO–4	identify the structure of compounds from spectral data	K4
CO–5	analyze and design chemoselective organic synthesis	K4

#### **Unit – I Pericyclic and Photochemical Reactions**

**Course code** 

21UCH53ES01B

Semester

V

Pericyclic reactions: Characteristics and types - FMO of enes, dienes and polyenes electrocyclic reactions - Woodward-Hoffman rules for thermal and photochemical reactions cycloaddition reactions-[4+2] and [2+2] - stereo- and regiochemistry - inverse electron demand and retro Diels-Alder reactions - sigmatropic rearrangements - types and examples - Alder-ene reactions and cheletropic reactions.

Photochemical reactions: Types of photochemical reactions- Norrish type I and II - Paterno -Buchi reaction - mechanism and stereochemistry.

#### **Unit- II Stereoselective Organic Synthesis**

Regioselectivity: Regioselectivity in electrophilic and nucleophilic aromatic substitution, regioselectivity in elimination reactions- electrophilic attack on alkenes- regioselectivity in radical reactions-nucleophilic attack on allylic compounds- electrophilic attack on conjugated dienes and conjugate addition.

Diastereoselectivity: Prochirality, Cram's rule and chelation effect- diastereoselectivity in aldol reaction and diastereoselective epoxidation.

#### Unit-III UV-Visible and IR Spectroscopy

UV-Visible spectroscopy: electronic transitions - principle - instrumentation - chromophores, auxochromes - factors influencing absorptions - conjugation - solvent effect - shifts in absorptions - absorption bands in carbonyl compounds - Woodward-Fieser rules for the calculation of  $\lambda_{max}$  of dienes and enones.

IR spectroscopy: Hooke's Law - sample handling - modes of vibrations in organic molecules factors influencing stretching frequency - hybridization, tautomerism, H-bonding, electronic and steric and ring size effects - IR spectra of functional groups - hydrocarbons: methyl, methylene, methine C-H stretching in alkanes and cycloalkanes - alcohols, ethers, halogen, aldehydes, ketones, amines, esters - comparison of stretching frequency in carbonyl compounds - NH stretching in primary and secondary amines

#### **Unit-IV NMR Spectroscopy**

¹H NMR: principle, instrumentation, number of signals, shielding and deshielding - chemical shift: calculation, factors influencing chemical shifts - hybridization, electronic and steric effects peak – shielding and deshielding – exchangeable protons – integration and proton counting, spin-

#### (15 Hours)

(15 Hours)

Hours

5

Credits

3

#### (15 Hours)

### (15 Hours)

#### 120

spin coupling and coupling constants – deuteriated solvents – interpreting the NMR spectra of some organic molecules

¹³C NMR spectroscopy – types of carbon, splitting and chemical shift values for various types carbons

#### Unit- V Mass Spectrometry and Combined Problems

#### (15 Hours)

**Mass spectrometry:** principle – instrumentation – ionization techniques – CI and EI – desorption techniques – m/z values – molecular ion peak – isotopic peaks – [M+1] and [M+2] and their importance – metastable ions – factors affecting the fragmentation: branching, cyclic and acyclic compounds, benzylic and allylic cleavages – nitrogen rule, McLafferty rearrangement – interpretation of the mass spectra of some organic molecules.

Combined approach to identify the structure of organic molecules – minimum 10 problems from Bruice book.

#### **Books for Study**

- 1. Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, *Introduction to Spectroscopy*, 5th Edition, Cengage Learning, Delhi, 2015.
- Unit–III Chapter 7 Unit–IV Chapter 33
  2. Silverstein R M and Bassler G C, Spectrometric Identification of Organic Compounds, 4th Edition, John–Wiley and Sons, New York, 1993. Unit–III Chapter 2
- Clayden J, Greeves N and Warren S, Organic Chemistry, 1st Edition, Oxford University Press, New York, 2001.

Unit–IV Chapter 35 Unit–V Chapter 24

#### **Books for Reference**

- 1. Kemp W, Organic Spectroscopy, 3rd Edition, ELBS, London, 1987.
- 2. Fleming I, Spectroscopic Methods in Organic Chemistry, 4th Edition, Tata-McGraw Hill Publishing Company, New Delhi, 1988.
- 3. Sharma Y R, *Elementary Organic Spectroscopy*, 5th Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2013.
- 4. Carey F A and Sundberg R J, Advanced Organic Chemistry, Part A: Structure and mechanisms, 5th Edition, Springer Pvt. Ltd, New Delhi, 2007.
- 5. Carey F A and Sundberg R J, Advanced Organic Chemistry, Part B: Structure and Mechanisms, 5th Edition, Springer India Pvt Ltd, New Delhi, 2007.
- 6. Morrison R T and Boyd R T, *Organic Chemistry*, 7th Edition, Allyn & Bacon Ltd., New York, 2011.
- 7. Bruice P Y, Organic Chemistry, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
- 8. Carey F A, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 2000.
- 9. Pine S H, Organic Chemistry, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.

Web Resources



Pericyclic Reactions



Fundamentals of Spectroscopy

## Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	ourse co	ode		Tit	le of the	Course	!	Ho	urs	Credits		
V	21U(	СН53Е	S01B	DSE -1: ORGANIC SYNTHESIS AND CHARACTERIZATION						5	3		
Course Outcomes	Prog	gramm	e Outc	omes (]	mes (POs) Programme Specific Ou (PSOs)						Mean Score		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs		
CO-1	3	3	1	1	2	3	3	2	2	2	2.2		
CO-2	2	1	2	1	2	2	2	1	3	1	1.7		
CO-3	3	3	2	2	1	3	3	1	3	1	2.2		
CO-4	3	3	3	2	1	3	3	1	3	2	2.4		
CO–5	3	3	3	3	1	3	2	1	3	1	2.3		
								Mea	n overal	ll Score	2.40 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH53ES02A	DSE- 2: PHYSICAL CHEMISTRY I	5	3

	CO–Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Levels (K – level)
CO-1	describe the principles of electronic spectroscopic techniques.	K1
CO-2	understand the basics of electrolytic processes.	K2
CO-3	apply the concepts of EMF in electrochemical reactions.	K3
CO-4	construct electrodes, galvanic cells and batteries.	K3
CO-5	analyze IR spectra based on knowledge of characteristic functional	K4
	group frequencies.	

#### Unit– I Spectroscopy I

The absorption and emission of radiation– selection rules and transition moments–Beer–Lambert law– spectral line widths– Doppler broadening– experimental techniques– molecular rotation– moments of inertia– rotational energy levels– microwave spectroscopy– selection rules– appearance of microwave spectra .

UV–Visible spectroscopy– electronic spectra –types of electronic transitions – Frank–Condon principle – spectra of diatomic and polyatomic molecules– predissociation – dissociation energy– applications.

#### **Unit – II Spectroscopy II**

Infrared spectroscopy –vibrational motion– anharmonicity– vibration–rotation spectra– selection rules–vibrational spectroscopy of diatomic and polyatomic molecules– normal modes– Infrared absorption spectra– vibrational Raman spectra–, symmetry aspects of molecular.

Vibrations- rotational Raman spectroscopy- nuclear statistics and rotational states-Infrared activity of normal modes- Raman activity of normal modes- Applications of IR and Raman spectroscopy.

#### **Unit – III Electrochemistry**

Ohm's law – conductance in metals and electrolytic solution – specific conductance – equivalent conductance – measurement of equivalent conductance – Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and its limitations – weak and strong electrolytes according to Arrhenius theory – Ostwald's dilution law, its uses and its limitations – elementary treatment of Debye–Huckel theory of strong electrolytes–transportnumber–determination of transportnumber– Hittorf's method and moving boundary method.

#### Unit –IV Conduction Measurement and Electromotive Force

Applications of conductance measurements– determination of degree of dissociation – determination of K_a of acid – determination of solubility of sparingly solublesalt–common ion effect–conductometric titrations (acid–base and precipitation)–electrochemical cells–electrolytic cell–reversible and irreversible cells–conventional representation of electrochemical cells–EMF and its measurements – Weston– Cadmium standard cell – computation of cell EMF–relation between free energy and EMF–Gibbs Helmholtz equation and  $\Delta$ H,  $\Delta$ G,  $\Delta$ E – calculations of thermodynamic quantities of cell reaction (S and K).

### (15 Hours)

#### (15 Hours)

(15 Hours)

#### Unit –V Nernst Equation and EMF Measurements

Nernst equation – types of reversible electrodes – gas/metal ion – metal/metal ion – metal/insoluble/anion – redox electrodes –electrode reaction – Nernst equation of electrode reaction – derivation of cell EMF – single electrode potential –reference electrodes – standard hydrogen electrode –standard electrode potential – sign conventions – electrochemical series and its significance – concentration cells with and without transference–liquid junction potential–application of EMF measurements– valency of ions, solubility product, activity coefficient– potentiometric titration – determination of pH using hydrogen, quinhydrone and glass electrodes – determination of pKa of acids by potentiometry– energy conversion – dry cell, lead acid storage battery,  $H_2$ – $O_2$  fuel cell.

#### **Books for Study**

- Atkins P and Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press Great Britain, 2014.
   Unit–I and II Chapter 12
   Unit–IV and V Chapter 6
- Glasstone S, An Introduction to Electrochemistry, Affiliated East–West Press Pvt. Ltd., New Delhi, 2008.
   Unit III, IV and VChapter 2,3,4,6 and 7

#### **Books for Reference**

- 1. Castellan G W, *Physical Chemistry*, 3rd Edition, Addison–Wesley Publishing Company, Sydney, 1983.
- 2. Puri B R , Pathania M S, Sharma L R, *Principles of Physical Chemistry* ,48th Edition, Vishal Publishing Co., India, 2020.
- 3. Banwell C N, Mc Cash E M, *Fundamentals of Molecular Spectroscopy*, 4th Edition, McGraw–Hill Publishing Company Limited, New Delhi, 2002.
- 4. Bockris J O'M, Reddy A K N, *Modern Electrochemistry 1 and 2A*, Kluwer Academic/Plenum Publishers, New York, 2000.

#### Web Resources



Arrhenius Theory of Electrolytic Dissociation





Standard Hydrogen Electrode

Hydrogen Oxygen Fuel Cell

Semester	Co	urse co	ode		Tit	le of the	Course	e e e e e e e e e e e e e e e e e e e	Но	urs	Credits
V 21UCH53ES02A PHY						DSE- CAL CH	-2: IEMIST	ΓRΥΙ	4	5	3
Course Outcomes	Prog	ramm	e Outc	omes (	POs)	gramme	e Specifi (PSOs)	omes	Mean Score of		
(COs)	<b>PO1</b>	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	1	1	2	3	1	2	3	2	3	3	2.1
CO-2	2	3	2	3	2	2	3	2	1	1	2.1
CO-3	1	4	3	3	2	2	3	1	2	3	2.4
CO–4	1	3	1	4	3	2	2	3	3	1	2.3
CO–5	2	1	1	3	1	2	1	3	1	3	1.8
Mean overall Score									2.14 (Medium)		

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH53ES02B	DSE- 2: PHYSICAL CHEMISTRY- II	5	3

CO No.	CO–Statements	Cognitive Levels
	On successful completion of this course, students will be able to	(K – level)
CO-1	enumerate the basics of electrolytic processes.	K1
CO-2	understand the twelve principles of green chemistry.	K2
CO-3	construct electrodes, galvanic cells and batteries.	K3
CO-4	apply the concepts of EMF in electrochemical reactions.	K3
CO-5	evaluate nanomaterials and analyze their properties and	K4
	applications.	

#### **Unit –I Electrochemistry**

Ohm's law – conductance in metals and electrolytic solution – specific conductance – equivalent conductance – measurement of equivalent conductance – Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and limitations—weak and strong electrolytes according to Arrhenius theory – Ostwald's dilution law, its uses and its limitations – the elementary treatment of Debye–Huckel theory of strong electrolytes–transport number– determination of transport number, Hittorf's method and moving boundary method.

#### **Unit-II Conduction Measurement and Electromotive Force**

Applications of conductance measurements – determination of degree of dissociation – determination of K_a of acid – determination of solubility of sparingly soluble salt–common ion effect–conductometric titrations (acid–base and precipitation)–electrochemical cells–electrolytic cell–reversible and irreversible cells–conventional representation of electrochemical cells–EMF and its measurements – Weston – Cadmium standard cell – computation of cell EMF–relation between free energy and EMF–Gibbs Helmholtz equation and  $\Delta$ H,  $\Delta$ G,  $\Delta$ E – calculations of thermodynamic quantities of cell reaction (S and K).

#### Unit - III Nernst Equation and EMF Measurements

Nernst equation – types of reversible electrodes – gas/metal ion – metal/metal ion – metal/insoluble/anion – redox electrodes – electrode reaction – Nernst equation of electrode reaction – derivation of cell EMF – single electrode potential – reference electrodes – standard hydrogen electrode – standard electrode potential – sign conventions – electrochemical series and its significance – concentration cells with and without transference–liquid junction potential–application of EMF measurements– valency of ions, solubility product, activity coefficient– potentiometric titration – determination of pH using hydrogen, quinhydrone and glass electrodes – determination of pKa of acids by potentiometry– energy conversion – dry cell and lead acid storage battery– H₂–O₂ fuel cell.

#### **Unit-IV Corrosion of Metals**

Physical nature of electrodeposited metals–simultaneous discharge of cations– depolarization of metal deposition– separation of metals by electrolysis– electrochemical passivity– theories of passivity– mechanical passivity – corrosion of metals: mechanism–hydrogen evolution type– corrosion in presence of a depolarizer– differential oxygenation corrosion– electrolytic reduction and oxidation– reversible oxidation–reduction processes– non–reversible processes– electrolytic reduction– anodic and oxidation– methods for preventing corrosion– cathodic and anodic protection– anodic and cathodic inhibitors.

#### (15 Hours)

#### (15 Hours)

(15 Hours)

#### 126

#### Unit–V Nanochemistry

#### (15 Hours)

Basics of nanoscience and nanotechnology – chemistry of nanoparticles– nanotechnology – methods of synthesis of nanomaterials (sol-gel, co-precipitation and plasma arching methods) – SEM and TEM – fullerene – carbon nanotubes – types – synthesis – catenanes and rotaxanes– preparation and properties – applications of nanomaterials.

#### **Books for Study**

1. Glasstone S, *An Introduction to Electrochemistry*, Affiliated East–West Press Pvt. Ltd., New Delhi, 2008.

**Unit–I, II, III and IV** *Chapter 2,3,4,6, 7, 15 and 16* 

2. Atkins P W and Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press, Great Britian, 2014.

**Unit–I and II** Chapter 6

- 3. Pradeep T, *Nano: The Essentials*, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2017. Unit–IV Chapter 1,2,3,4 and 13
- Bockris J O'M, Reddy A K N, *Modern Electrochemistry 2B*, Kluwer Academic/Plenum Publishers, New York, 2000. Unit–V Chapter 12

#### **Books for Reference**

- 1. Castellan G W, Physical Chemistry, 4th Edition, Narosa, New Delhi, 2004.
- 2. Kapoor K L, A Textbook of Physical Chemistry, Vol. 3 Macmillan, India Ltd, 2013.
- 3. Bockris J O'M, Reddy A K N, *Modern Electrochemistry1 and 2A*, Kluwer Academic/Plenum Publishers, New York, 2000.
- 4. Sharma K K, Sharma L K, A *Textbook of Physical Chemistry*, 5th Edition, Vikas Publishing House, New Delhi, 2012.
- 5. Pradeep T, A Textbook of Nanoscience and Nanotechnology, McGrawhill, New Delhi, 2012.

#### Web Resources



Theory of Electrolytic Dissociation





Reference Electrode

Fuel Cell

Semester	Co	urse co	ode			le of the	-	<u>د</u>	Ho	urs	Credits	
V	V 21UCH53ES02B					DSE- AL CH		5	3			
Course Outcomes	Programme Unicomes (PUS)								Programme Specific Outcomes (PSOs)			
(COs)	<b>PO1</b>	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs	
CO-1	1	1	2	3	1	2	3	2	3	3	2.1	
CO-2	1	3	1	2	3	2	2	3	3	1	2.1	
CO-3	2	3	2	3	2	2	3	2	1	1	2.1	
CO-4	2	1	1	3	1	2	1	3	1	3	1.8	
CO–5	1	1	3	3	2	2	3	1	2	3	2.1	
	Mean overall Score											

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH53SP01	Self–Paced Learning: ESSENTIALS OF CHEMISTRY	-	2

CO No.	CO–Statements	Cognitive Levels
	On successful completion of this course, students will be able to	(K – level)
CO-1	describe advanced application of inorganic compounds in biological	K1
	systems.	
CO-2	understand the utility of the synthetic organic reagents.	K1
CO-3	summarize the properties of zinc group metals and identify toxic	K2
	behavior of the metals and related consequences.	
CO-4	relate the ability of the redox reagents and their reactions.	К3
CO-5	examine the building blocks for advanced inorganic materials	K4

#### Unit–I Group 12– The Zinc Group

Abundance, occurrence, extraction and uses of Zn, Cd and Hg–oxidation states– complexes– polycations– Hg(I) complexes–organometallic compounds–biological role of zinc–toxicity of Cd and Hg–bio–accumulation of heavy metals and its consequences.

#### **Unit-II Advanced Inorganic Materials**

Artificially layered materials– quantum wells–solid–state superlattices– artificially layered crystal structures– self–assembled nanostructures– supramolecular chemistry and morphosynthesis– dimensional control in nano structures– bio–inorganic nanomaterials– DNA and nanomaterials biomimetics– bionanocomposites– inorganic–organic nanocomposites.

#### **Unit–III Bioinorganic Chemistry and Polymers**

Bioinorganic catalysis– Zn enzymes, Mg enzymes and Fe enzymes–the reactions of Co containing enzymes–Mo and W enzymes– the nitrogen cycle– the hydrogen cycle– sensors– Fe proteins as sensors–Cu and Zn sensors– biomineralization– chelation therapy–cancer treatment–anti–arthritis drugs–imaging agents.

Rubber as a natural polymer – types of polymers – homopolymers, copolymers – addition and condensation polymers – polymerization reactions –vulcanization of rubber.

#### **Unit–IV Organic Synthetic Reagents**

Synthesis and applications of – BuLi, B₂H₆, CH₂Cl₂, DCC, Grignard reagent, NBS, Ph₃P, PCl₅, NaN₃, NaNO₂, SOCl₂, Me₂S and Me₂CuLi.

#### **Unit-V Organic Redox Reagents**

Structures and applications of the following oxidants- PCC, H₂O₂, m-Cpba, OsO₄, KMnO₄, HIO₄, and SeO₂. Reductants- LiAlH₄, NaBH₄, Raney nickel, Wilkinson catalyst, Lindlar's Catalyst, MPV, Clemmensen and Wolff-Kishner reductions and Birch reduction.

#### **Books for Study**

- 1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Wiley–India, New Delhi, 2010. **Unit-I***Chapter 28*
- 2. Atkins P, Overton T, Rourke J, Weller M and Armstrong F, Shriver and Atkins Inorganic Chemistry, 4th Edition, 2010.
   Unit-IIIChapter 24
   Unit-IIIChapter 26

3. Ahluwalia V K and Prashar R K, Organic Reaction Mechanisms, 4th Edition, Narosa Publishing House, New Delhi, 2011.
 Unit-IVChapter 8 Unit-V Chapter 3 and 4

#### **Books for Reference**

1. Atkins P W, Physical Chemistry, 5th Edition, Oxford University Press, London 1994.

- 2. Finar I L, Organic Chemistry, Vol 1and2, 6th Edition, Addison Wesley Longman Ltd., England, 1996.
- 3. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry* 5th Edition, Pearson Education, Inc., New York, 2014.
- 4. Bruice, P Y Organic Chemistry, 8th Edition., Pearson Ltd., University of California, Santa Barbara, 2011.

Web Resources



Nano scale Therapeutic Drug

**Role of Metals in Enzyme Activity** 

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

Semester	Cou	irse co	ode			Fitle of th	e Course	<u>,</u>		Hours	Credits
V	21U0	CH538	SP01	]		elf–Paced FIALS O	_	2			
Course Outcomes	Prog	gramn	ne Out	comes	(POs)	Progr	amme Sp	es (PSOs)	Mean Score of Cos		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO	04 PSO5	
CO-1	2	3	1	2	3	1	3	3	1	2	2.2
CO–2	2	2	3	3	3	2	2	2	3	3	2.5
СО–3	2	3	2	2	3	2	1	2	2	2	2.1
CO-4	1	3	2	2	2	1	1	3	3	1	1.9
CO–5	2	2	3	3	2	2	2	3	2	3	2.4
	Mean overall Score										2.22 (Medium)

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
V	21USS54SE03	SEC-3: SOFT SKILLS	2	1

### PSOs (Programme Specific Outcomes)

#### After the successful completion of the course, students will learn:

- the various concepts of communication skills as job seekers
- to write a Professional resume as required by the employers
- to demonstrate interview skills and actively participate in GD preparations and presentations in peer groups
- to discover various aspects of self and set short tem and long term goals for successful career and creates a congenial atmosphere
- to have access to solve simple and day to day Arithmetic problems and Verbal and Nonverbal reasoning formulas

#### **Cos (Course Outcomes)**

#### Upon completion of the course, Students will:

- be keen on developing and sustaining Soft Skills required of an educated youth
- be trained to present the best of themselves as job seekers to deal with any problem and conflict situations
- be able to transfer the skills learnt for concrete outcomes and increased productivity of companies
- be able to develop people skills, life skills that are required to be a good human in the long run and set a living standard
- be embedded with Employability skills such as "communication", "teamwork", "initiative, "enterprise", the attributes of "reliability", "balance between work -life", "commitment" and continuous learning

#### Module 1: Effective Communication

**D**efinition of communication, Barriers of Communication, Verbal and Non-verbal Communication; Self introduction matrix, Conversation Techniques, Good manners and Etiquettes, Introduction to Professional Communication, Professional Grooming and Presentation Skills and exercises

#### Module II: Resume Writing & Interview skills

**Resume Writing:** Basic Resume Formats. Types of Resume - Chronological, Functional and Mixed Resume, Steps in preparation of Resume, Sample objectives, Model Resumes. **Interview Skills:** Preparation for interview, Common interview questions, Attitude, Body Language, Mock interviews and Practicum, Figuring out common interview questions and answers

Module III: **Group Discussion:** Definition of GD. The salient features of GD,Factors that influence GD, Outcome of GD, Tips for success in GD, Parameters of GD, Essential Points for GD preparation, GD Topics, Model GD and Practicum.

Module IV: **Personal Effectiveness:** Self Discovery: Personality, Traits of Personality; Personality Tests; Intelligence and Skill Assessment Form. **Goal Setting**: Goal setting Process, Questioneers & Presentations

Module V: **Numerical Ability:** Average, Percentage; Profit and Loss, Area, Volume and Surface Area. (Simple Interest, Compound Interest; Time and Work, Pipes and Cisterns; Time and Distance, Problems on Trains, Illustrations, Boats and Streams; Illustrations-Optional)

# Module VI: Test of Reasoning - Verbal Reasoning: Series Completion, Analogy. Non-Verbal Reasoning

#### **Books for Study**

Melchias G, Balaiah John, John Love Joy (Eds), 2018. Straight from the Traits: Securing Soft Skills, SJC, Trichy.

#### **Books for References**

Aggarwal, R.S. 2010. A Modern Approach to Verbal and Non Verbal Reasoning. S.Chand, New Delhi. Covey, Stephen. 2004. 7 Habits of Highly effective people, Free Press. Egan, Gerard. (1994).

*The Skilled Helper* (5th Ed). Pacific Grove, Brooks/Cole.

Khera ,Shiv 2003. You Can Win. Macmillan Books , Revised Edition.

Melchias G, Balaiah John, John Love Joy (Eds), 2018. Winners in the Making: A primer on soft skills. SJC, Trichy.

#### Other books

Murphy, Raymond. 1998. *Essential English Grammar*. 2nd ed., Cambridge University Press. Sankaran, K., & Kumar, M. *Group Discussion and Public Speaking*. M.I. Pub, Agra, 5th ed., Adams, Media.

Trishna's 2006. *How to do well in GDs & Interviews*, Trishna Knowledge Systems. Yate, Martin. 2005. *Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH54EG01A	GE-1: CHEMISTRY FOR COMPETITIVE EXAMINATIONS	4	3

	CO–Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Levels (K – level)
CO-1	describe the fundamental concepts of chemistry.	K1
CO–2	distinguish the periodic properties of various elements.	K2
СО–3	crack the UPSC, SSC, RRB, TNPSC Group examinations.	K3
CO-4	correlate the properties of Noble metals with Noble gases.	K4
CO–5	apply the knowledge of drugs to treat various human ailments.	K5

#### Unit –I Fundamentals of Chemistry

Matter and its existence- solids, liquids and gases- atoms- constituents of an atom - proton, electron and neutron- elements-molecule-Avogadro number-acid- base and salt- pH and its importance.

#### **Unit – II Periodic Table of Elements**

Periodic table – classification – old and modern periodic tables– extraction of metals, Fe, Au, Ag, Pt – role of metal ions in biological systems – hemoglobin– non–metals – oxygen–chemistry of respiration, nitrogen cycle and noble gases and their uses.

#### **Unit – III Nuclear Energy**

Discovery of radioactivity – isotopes, isobars and isotones– uses of radioisotopes in the field of industry, agriculture and medicine – nuclear fission and nuclear fusion with examples –nuclear power stations in India– nuclear waste management.

#### Unit –IV Chemistry for Human Welfare

Cements-types and manufacture, paints and pigments- types and manufacture, coal-formation and classification, petroleum- formation and fractional distillation – chemistry of steels in railways- food colorants and preservatives – Noble laureates in chemistry.

#### **Unit – V Clinical Chemistry**

Drugs- classification and mode of action- antibiotics-analgesics- antipyretics- disinfectants- antiseptics- anticonvulsants- cardiovascular drugs- anticancer drugs.

#### **Books for Study**

- 1. Puri B R, Sharma L R, Kalia K K, *Principles of Inorganic Chemistry*, 23rd Edition, New Delhi, Shoban Lal, Nagin Chand and Co., 1993.
  - Unit–I Chapter 9 Unit–II Chapter 2 Unit–III Chapter 39
- 2. Jayashree Ghosh, *Fundamental Concepts of Applied Chemistry*, S. Chand and Co. Ltd, 2006. Unit–IV Chapter 1
- 3. Kirpal Singh, *Chemistry in Daily Life*, PHI Learning, 2012. (*e–book*) Unit–IV Chapter 15 Unit–V Chapter 7

# (12 Hours)

(12 Hours)

# (12 Hours)

#### (12 Hours)

# (12 Hours)

#### **Books for References**

- 1. Jeyashre Ghosh, A Text book of Pharmaceutical Chemistry, Tata McGraw Hill Publishing, New Delhi 1993.
- 2. Krishnamurthy N, Jayasubramanian K and Vallinayagam, *Applied Chemistry*, Prentice Hall of India, New Delhi,1990.
- 3. Gem Mathew G D, Chemistry in Everyday Life, Vishal Publishing, Punjab, 2014.

#### Web Source









Food Colorants



Chemistry in Respiration

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

	Outcomes											
Semester	Co	urse co	ode	Title of the Course						urs	Credits	
V	V 21UCH54EG01A					GE-1 CHEMISTRY FOR COMPETITIVE EXAMINATIONS					3	
Course Outcomes	Programme Outcomes (POs)									omes	Mean Score of	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos	
CO-1	3	1	3	1	3	2	3	2	3	3	2.4	
СО–2	1	2	1	3	1	1	1	3	1	3	1.7	
СО-3	2	3	2	1	3	2	2	3	3	1	2.2	
CO-4	3	2	1	2	2	2	3	2	1	1	1.9	
CO–5	3	2	2	3	2	2	3	3	2	3	2.5	
	Mean overall Score											

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
V	21UCH54EG01B	GE-1:	Δ	2
	21UCH54EGUID	<b>EVERYDAY CHEMISTRY</b>	4	3

CO No.	<b>CO – Statements</b> On successful completion of this course, students will be able to	Cognitive Levels (K–Level)
CO-1	identify the different food adulterants, sugar, oils and fats.	K1
СО-2	discuss the calorific values of various fuels and harmful effects of adulterants.	K2
СО–3	apply the knowledge of water chemistry in softening hard water.	K3
CO-4	demonstrate the preparation of simple cosmetics, sugar, oils and fats.	K4
CO-5	analyze the functioning of rocket fuel cells and fractional distillation of coal tar.	K4

#### Unit – I Water

Sources of water – quality characteristics of water – uses of water – water in human body – potability of water – hardness of water – types – determination of hardness – EDTA method – softening of water – zeolite process – demineralization – reverse osmosis – sea water as a source of drinking water – desalting– sterilization and disinfection of water – BOD and COD.

#### Unit - II Oils, Fats and Sugar

Distinction between oils and fats – properties – classification – edible oils – vegetable oils – animal oils – manufacture of oils by solvent extraction – refining of crude vegetable oils – processing of animal fats – manufacture of cane sugar – extraction and purification – defection , sulphitation and carbonation – evaporation – crystallization – separation of crystals – refining – manufacture of sucrose from beet root.

#### **Unit –III Adulterants in food**

Food Adulteration and prevention – common food adulterants – food additives – food colorants– preservatives – flavourants – food poisoning – analysis of adultrants in edible oils, coffee powder, chilli powder, turmeric powder, meat , fish, ghee and milk – harmful effects of food adulterants.

#### Unit –IV Fuels and fuel cells

Modern concept of fuels – classification of fuels – criterion of selection of fuels – natural and artificial solid fuels – calorific value – properties of fuels – advantages of solid fuels over liquid and gaseous fuels – natural gas and LPG – coal and coke – fractional distillation of crude oil – chemistry of fuel cells – examples – hydrogen-oxygen fuel cells in manned spacecrafts – advantages – Fuel cells: The future of clean energy.

#### **Unit – V Cosmetics**

Cosmetics– definition – types of cosmetics – composition of cosmetics – methods of preparation of soap, detergent, face powder, nail polish, deodorants, hair dyes, shampoo, perfumes and face creams – their side effects.

#### **Books for Study**

1. Sharma B K , Industrial Chemistry, Goel publishing house, New Delhi, 2011.Unit–I Chapter 1Unit–IIChapter 38 and 39Unit–IVChapter 4 and 16

#### (12 Hours)

(12 Hours)

# (12 Hours)

(12 Hours)

#### (12 Hours)

- 2. Alex V Ramani, *Food Chemistry*, MJP Publishers, Chennai, 2009. Unit–IIIChapter 8 and 9
- Benson Heather A E, Cosmetic Formulation: Principles and Practice, Taylor and Francis, New York, 2019.
   Unit-VChapter 7 and 13

#### **Books for Reference**

- 1. Ashutosh Kar, Medicinal Chemistry, Wiley Eastern limited, New Delhi, 1993.
- 2. Maison G. De Navarre, The chemistry and manufacture of Cosmetics, Allured books, 2009.

#### Web Resources





Food Adulteration

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	ourse co	de		Ti	tle of the	Но	urs	Credits		
V	21U(	CH54E	G01B	GE-1: EVERYDAY CHEMISTRY						4	3
Course Outcomes	Pro	gramm	e Outco	omes (F	es (POs) Programme Specific Outcomes (PSOs)						Mean Score
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	2	3	2	2	3	3	2	3	2	2.5
CO–2	3	2	3	3	1	3	3	3	3	2	2.6
CO-3	3	2	3	3	3	3	2	2	3	2	2.6
CO-4	3	3	2	2	1	3	3	2	3	2	2.4
CO–5	3	3	3	3	1	3	3	3	2	2	2.6
Mean overall Score									2.54 (High)		

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH53CC09	CORE–9:CHEMISTRY OF BIOMOLECULES	6	5

CO No.	CO–Statements	Cognitive Levels
00110.	On successful completion of this course, students will be able to	(K–Level)
CO-1	overview the chemistry of natural products and hormones.	К1
CO-2	recollect the classification, chemical reactions and structures of sugars.	К2
CO-3	summarize the chemistry of heterocyclics.	K2
CO-4	comprehend the structure, synthesis and analysis of amino acids and proteins.	К3
CO-5	classify and analyze the structure, composition and importance of nucleic acids and lipids.	K4 & K5

#### **Unit** –**I** Carbohydrates

Introduction - classification - nomenclature - physical properties - glucose - cyclic structures chemical properties - mutarotation - anomerism -epimerization - Kiliani-Fischer synthesis - Ruff degradation - fructose -cyclic structures-interconversion of ketose to aldose - conversion of glucose into ascorbic acid - disaccharides: lactose, maltose, cellobiose and sucrose (structures only) - structural differences between starch and cellulose -uses of cellulose and its derivatives.

#### **Unit – II Amino acids and Proteins**

List of amino acids – structures – preparation of amino acids – reactions of amino acids – synthesis of dipeptides: protection, activation and deprotection – Merrifield solid phase synthesis - classification of proteins - terminal residue analysis: N-terminal (Edman Pehr method) - Cterminal analysis (enzymatic and chemical) - Sanger method of identification of amino acid sequence in a polypeptide – primary, secondary and tertiary structures of proteins.

#### Unit -III Nucleic acids, Lipids and Metabolism

Nucleic acids: Types of bases – types of sugars – nucleosides and nucleotides – types of nucleic acids - structure and functions of DNA and RNA.

Lipids: Fatty acids -waxes - fats and oils - membranes - phospholipids - spingolipids prostaglandins.

Metabolism - Coenzymes - haloenzymes - apoenzymes - overall view of metabolism catabolism – anabolism -stages of catabolism - stages of glycolysis - citric acid cycle or tricarboxylic acid (TCA)cycle-NADP+/NADPH-FAD/FADH2.

#### **Unit** –**IV** Heterocyclics

Nomenclature - synthesis of pyrrole, furan and thiophene - molecular orbital pictures - basic strength - reactions of pyrrole, furan and thiophene - mechanism, orientation and reactivity synthesis and reactions of indole, pyridine, quinoline and isoquinoline – heterocyclics containing two hetero atoms - N/O/S - macrocycles - polyaza, polyoxa and polythiamacrocycles - mixed donor macrocycles – application of macrocycles.

#### (18 hours)

(18 hours)

# (18 hours)

(18 hours)

#### Unit –V Alkaloids, Terpenoids, and Steroids

Introduction to alkaloids – classification – occurrence and isolation – structural elucidation of papaverine and nicotine only – only structures of alkaloids: quinine, morphine, atropine, nicotine, coniine, piperine and papaverine – classification and definition of terpenoids – isoprene rule – structure and uses of some essential oils – structural elucidation of geraniol only – structure and functions of steroids only –androgen, esterogen and cholesterol.

#### **Books for Study**

1. Morrison R T and Boyd R N, Organic Chemistry, 7th Edition, Allyn and Bacon Ltd., New York, 2011.

Unit I Chapter 34 and 35	<b>Unit II</b> Chapter 36
Unit III Chapter 36, 33	<b>Unit IV</b> Chapter 30

- Bruice P Y, Organic Chemistry, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
   Unit I Chapter 22 Unit II Chapter 23 Unit III Chapter 27, 28, 26
- 3. Finar I L, Organic Chemistry, Vol: 1 and 2, 6th Edition, Addison Wesley Longman Ltd. England, 1996.
  Unit I vol. 2 Chapter 7 Unit II vol. 2 Chapter 13 Unit V vol. 2 Chapter 8 and 11 Unit V vol. 1 Chapter 14 Unit V vol. 1 Chapter 14

#### **Books for References**

- 1. Stryer L, Berg J M, Tymoczko J L and Gatto G, *Biochemistry*, 9th Edition, W. H. Freeman and Company, New York, 2019.
- 2. Rodwell D, Bender D and Botham K, *Harper's Illustrated Biochemistry*, 31st Edition, McGraw Hill Professional, New York, 2018.

#### Web Resources



Biomolecules– Khan Academy



Biomolecules-PDF

#### (18 hours)

G (	G					tcomes	C				<b>a 1</b> ¹
Semester	Co	urse co	ode		Tit		Course		Ho	urs	Credits
VI	VI 21UCH53CC09					CORI HEMIST OMOLI		5	5		
Course OutcomesProgramme Outcomes (POs)Programme Specific Ou (PSOs)								c Outco	mes	Mean Score	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	2	1	2	2	2	3	2	1	2.1
CO–2	3	1	2	2	3	3	2	1	3	2	2.2
CO-3	2	1	2	3	2	3	1	2	3	2	2.1
CO-4	2	2	1	3	2	2	1	2	3	2	2.0
CO–5	3	2	2	3	3	2	3	2	2	3	2.5
Mean overall Score											2.2 (High)

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	<b>Title of the Course</b>	Hours	Credits	
VI	21UCH63CP04	CHEMISTRY PRACTICAL–IV (Gravimetry and Organic Preparation)	4	3	

CO No.	CO–Statements	Cognitive Levels
	On successful completion of the course, the students will be able to	(K–Level)
CO-1	relate organic preparatory methods with syntheses in pharmaceutical industries.	K1
CO-2	explain principles of precipitation and gravimetric analysis.	K2
CO-3	use organic chemicals and other equipments in laboratories.	K2
CO-4	communicate and explain the acquired analytical knowledge as team members.	К3
CO-5	investigate the metal content of some metals using thermogravimetry.	K4

#### **Unit–I Theory of Gravimetry**

Principles of quantitative precipitation – conditions for precipitation –methods of digestion – quantitative filtrations – techniques of drying –theory of weighing – scientific reporting.

#### **Unit–II Theory of Organic Preparations**

Principles of chemical conversions – Handling of organic chemicals and glassware – filtration techniques – drying techniques – distillation techniques – recrystallization techniques – scientific reporting.

#### Unit-IIIGravimetric Estimations-I

- 1. Estimation of Lead as Lead Chromate
- 2. Estimation of Barium as Barium chromate
- 3. Estimation of Nickel as Nickel–DMG complex
- 4. Estimation of Copper as Copper (I) thiocyanate

#### **Unit-IV Gravimetric Estimations-II**

- 1. Estimation of Magnesium as Magnesium oxinate
- 2. Estimation of Calcium as Calcium oxalate
- 3. Estimation of Barium as Barium sulphate
- 4. Estimation of Iron as Iron (III) oxide

#### **Unit-V Some Organic Preparations**

Preparation of Organic compounds involving the following reactions:

- 1. Hydrolysis
- 2. Esterification
- 3. Nitration
- 4. Bromination
- 5. Oxidation
- 6. Diazotization
- 7. Osazone formation

# 140

### (10 Hours)

### (10 Hours)

(40 Hours)

#### (20 Hours)

(40 Hours)

#### **Book for Study**

1. Laboratory Manual, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli-2

#### **Books for Reference**

- 1. Jeffery G H, Bassett J, Mendham J and Denney R C, *Vogel's Textbook of Quantitative Chemical Analysis*, 5th Edition, Longman Scientific and Technical, Essex, England 1989.
- 2. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edition, Longman Scientific and Technical, Essex, England 1989.
- 3. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002–3098, USA, 2014.

#### Web Resources



Practical Videos

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

Semester	Co	urse co	h		Outcomes Title of the Course				Ho	urs	Credits		
VI		<u>снае са</u>		Chemistry Practical–IV: (Gravimetry and Organic Preparation)						4	3		
Course Outcomes	Course Programme Outcomes (POs) Programme									ime Specific Outcomes (PSOs)			
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos		
CO-1	2	3	2	3	2	2	3	2	3	2	2.4		
CO–2	2	2	2	2	2	2	2	2	2	2	2.0		
CO-3	1	2	1	2	2	1	2	1	2	2	1.6		
CO-4	2	2	1	2	2	2	2	1	2	2	1.8		
CO–5	3	2	2	2	2	3	2	2	2	2	2.2		
Mean overall Score										2.0 (Medium)			

#### SCHEME OF VALUATION

**Chemistry Practical–IV Gravimetry and Preparation INTERNAL** CIA 100 Marks 50 Marks Cumulative mark of Regular Practical Classes Two CIA tests 50 Marks For Each CIA Test 100 marks Test 10 marks Record 10 Marks Results 80 Marks (50 Marks for Gravimetry and 30 marks for Preparation) Scheme of valuation Preparation Gravimetry <2% Error 50 Marks Crude 20 marks Recrystallization 10 marks 3% 40 Marks 4% 30 Marks >4% 20 Marks **EXTERNAL** Total **100 Marks** Short test 10 Marks Results/Analysis 90 Marks (60 Marks for Gravimetry and 30 marks for Preparation) Scheme of valuation **Preparation** Gravimetry <2% Error 60 Marks Crude 20 marks 3% 50 Marks Recrystallization 10 marks 4% 40 Marks >4% 20 Marks

A Minimum of 7 Gravimetric experiments, 5 melting and 5 boiling point determinations might have been done in regular classes

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits	
VI		CHEMISTRY PRACTICAL-V:			
	21UCH63CP05	Organic Analysis and	4	3	
		<b>Determination of Physical</b>			
		Constants			

CO No.	CO–Statements	Cognitive Levels
00110.	On successful completion of this course, students will be able to	(K-Level)
CO-1	understand the preliminary tests of organic qualitative analysis.	K1
CO–2	determine the presence and absence of elements such as N/S/X.	K3
CO-3	identify the functional group of the compounds from characteristic reactions.	К3
CO-4	confirm the functional group by preparing a solid derivative.	K4
CO–5	report their results of the organic analysis in a scientific way.	K4

#### **Unit I: Preliminary tests**

Colour and appearance – solubility tests – acidic/basic/neutral nature – tests for aliphatic and aromatic compounds – tests for saturation/unsaturation

#### Unit II: Tests for elements like N/S/halogens

Preparation of sodium fusion extract –chemistry of converting organic N/S/halogens into inorganic ion in sodium fusion extract – tests for Nitrogen – tests for sulphur – tests for halogens such as chlorine, bromine and iodine – need for blank test

#### **Unit III: Organic Analysis of Compounds**

Tests for carbonyl functional groups – carboxylic acids, esters, aldehydes and ketones, phenol, sulphanilic acid, alcohol and hydrocarbon – Primary and secondary amines, amide, diamide, anilide, and nitro compounds

#### **Unit IV: Preparation of Derivatives**

Confirmation of the functional groups by preparation of solid derivatives/characteristic colour reactions for the functional groups – scientific reporting

#### **Unit V: Determination of Physical constants**

Determination of melting and boiling points of organic compounds of mp/bp below 200 degree celcius. (A minimum of 5 compounds each.)

#### Note:

- 1. Mono-functional compounds are given for analysis. In case of bifunctional compounds such as salicylic acid and sulphanilc acids students are required to report anyone of the functional groups.
- 2. Each student is expected to practice the analysis of at least 15 different organic substances.
- 3. Apart from the TWO CIA tests, one MODEL TEST comprising both Chemistry Practical IV and V for six hours is to be conducted to enable the students ready for semester examination.

#### **Books for Reference**

## 143

## (18 Hours)

#### (18 Hours)

(18 Hours)

# (18 Hours)

(18 Hours)

- 1. Organic Chemistry Lab Manual for Micro Qualitative Analysis, Department of Chemistry, St. Joseph's College, Tiruchirappalli 620002, 2021. (Private circulation)
- 2. Furniss B S, et al., Vogel's Textbook of Practical Organic Chemistry, 7thEdition, ELBS Longman, London, 1984.
- 3. Ganapragasm N S and Ramamurthy G, *Organic Chemistry Lab Manual*, Second Edition, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2007.
- 4. Venkateswaran V, Veeraswamy R, Kulandaivelu A R, *Basic Principles of Practical Chemistry*, 2nd Edition, Sultan Chand and Sons, New Delhi, 1997.

	me of Va	
Chemistry Practical–V: Organic An (A) Internal continuous assessment	alysis and (100 ma	d Determination of Physical Constants
1. Regular Practical Sessions	•	sed on his observation and record notes)
2. CIA I + CIA II tests		ducted for 100 marks each and
2. CHAT + CHAT USIS	•	verted to 25 each)
Scheme for CIA tests I and II		ark each)
1. Analysis	(100 me	50
a. Acid/base/neutral	5	
b. Aliphatic/aromatic	5	
c. Saturated/unsaturated	5	
d. Elements test		
i) Preparation	5	
ii) Test for N present/absent	5	
iii) Tests for S present/absent	5	
iv) Tests for X present/absent	5	
e. Functional group present	7.5	
<b>f.</b> Preparation of derivative	7.5	
2. Melting /Boiling point		30
<b>3.</b> Theory behind practicals – Test		10
4. Record note book		10
(B) Scheme for Semester examination		(100 mark)
1. Analysis		60
1. Acid/base/neutral	5	
2. Aliphatic/aromatic	5 5	
3. Saturated/unsaturated	5	
4. Tests for elements		
i) Preparation		10
ii) Test for N present/absen		_
iii) Tests for S present/abser		5
iv) Tests for X present/abse		5
5. Functional group present	10	
6. Preparation of derivative	10	20
2. Melting/Boiling point		30
Mp/bp less than or equal to 2 degree More than 2 and less than 5 degrees		
More than 5 degrees	20 10	
<b>3. Theory behind practicals – Test</b>		10
	-	

## Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse co	ode	Title of the Course						urs	Credits
VI	21UCH53CP05				CHEMISTRY PRACTICAL–V: Organic Analysis and Determination of Physical Constants					4	3
Course	Prog	ramm	e Outc	omes (I	POs)	Pro	grammo	e Specifi (PSOs)	c Outco	mes	Mean Score
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	1	2	2	3	3	2	1	3	2	2.2
CO–2	2	2	2	3	2	2	1	3	3	2	2.2
CO–3	3	2	2	3	3	2	3	2	2	3	2.5
CO-4	2	3	2	3	2	3	3	2	3	2	2.5
CO–5	3	3	2	1	2	2	2	3	2	1	2.1
Mean overall Score										2.3 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
N/T		DSE–3:	5	2
V I	21UCH63ES03A	INORGANIC CHEMISTRY-II	5	3

CO No.	CO–Statements	Cognitive Levels
CO NO.	On successful completion of this course, students will be able to	(K-Level)
CO-1	list the thermal methods by which polymers and other minerals are characterized for their quality and composition.	K1
СО-2	predict the reactivities of complexes and compare the different pathways they follow when they react.	K2
CO-3	predict the role of different metal ions in biological systems.	K2
CO-4	use the spectrophotometric techniques to test the pollution level of various segments of the current environment.	K3
CO–5	explain the functioning of living systems and may pursue higher studies/research in related subjects.	K4

#### Unit-I Reaction mechanism in coordination complexes

## (15 Hours)

Ligand substitution reactions – rates of ligand substitutions – labile and inert complexes – classification of mechanisms – association, dissociation and interchange.

Ligand substitution in square planar complexes – the nucleophilicity of the entering group – the shape of the transition state – the trans effect – stereochemistry of substitution – pressure and temperature dependance of the substitution.

Ligand substitution in octahedra complexes- rate laws and their interpretation – the Eigen-Wilkins mechanism – the Fuoss-Eigen equation-the activation of octahedral complexes – leaving group effects – the effects of spectator ligands – steric effects – activation energetics – associative activation.

Base hydrolysis-redox reactions - the inner sphere and outer sphere mechanisms.

#### Unit–II Organometallic Chemistry

Stable electron configurations -18 electron compounds -16 electron square planar compounds - electron count preference - electron counting and oxidation states - neutral ligand method - donor-pair method.

Nomenclature of organometallic compounds with special reference to hapticity.

Types of ligands – CO, phosphines, hydrides, dinitrogen, alkyl, alkenyl, alkynyl and aryl ligands, alkene and alkyne ligands, benzene and arene, cyclopentadiene.

#### Unit–III Bio–inorganic Chemistry

Metal ions in biology and their vital role in the active site, structure and functions of metallo proteins and enzymes– ion transport mechanism in cell membrane – Na and K pumps– ionophores – structures and characteristic features of haemoglobin and myoglobin – Vitamin  $B_{12}$  – blue copper proteins.

#### Unit–IV Gravimetric and Thermogravimetric Methods

**Gravimetric analysis**: Mechanism of precipitation – solubility products – common ion effect – Types of precipitation – co–precipitation and post precipitation – homogeneous precipitation. **Thermal Analysis**: Principle, Instrumentation and applications of TGA, DTA and DSC.

#### 146

#### (15 Hours)

## (15 Hours)

#### (15 Hours)

#### Unit–V Colorimetry, Spectrophotometry and Spectrofluorimetry (15 Hours)

General discussion – theory of spectrophotometry and colourimetry.

Classification of methods of 'colour' measurement or comparison – standard series method – balancing method – photoelectric photometer method – wavelength selection – radiation sources – cells – data presentation – layout of instruments – derivative spectrophotometry – the origins of absorption spectra. spectrofluorimetry – general discussion – instruments for fluorimetric analysis – some applications of fluorimetry.

#### **Books for Study**

- Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 7thEdition, Oxford University Press, Oxford, UK, 2018.
   Unit–II Chapter 21 Unit–II Chapter 22 Unit–III Chapter 26
- Jeffery G H, Bassett J, Mendham J and Denney R C, Vogel's Textbook of Quantitative Chemical Analysis, 5thEdition, Longman Scientific and Technical, Essex, England, 1989. Unit–IV Chapter 11 Unit–V Chapters 17 and 18

#### **Books for Reference**

- 1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5thEdition, Pearson Education, New York, 2014.
- 2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4thEdition, Pearson Education, New York, 2012.
- 3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rdEdition, John–Wiley and Sons. Inc., New York, 1995.
- 4. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002–3098, USA, 2014.

#### Web Resources



Coordination Chemistry–Swayam



Coordination Chemistry–Introduction

Semester	Course code			Title of the Course				Но	urs	Credits	
VI	21UCH63ES03A			DSE–3: INORGANIC CHEMISTRY–II			5	5	3		
Course Outcomes	Programme Outcomes (POs)					Programme Specific Outcomes				Mean Score of	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	2	3	2	2	2	2	3	2	2	2	2.2
CO–2	2	3	1	3	2	2	3	1	3	2	2.2
CO-3	3	2	1	2	2	3	2	1	2	2	2.0
CO-4	3	2	2	2	3	3	2	2	2	3	2.4
CO–5	2	2	2	2	2	2	2	2	2	2	2.0
Mean overall Score							2.16 (Medium)				

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63ES03B	DSE–3: INORGANIC CHEMISTRY–III	5	3

	CO–Statements	Cognitive
CO No.	On successful completion of the course, the graduates will be able to	Levels (K–Level)
CO-1	identify the chromatographic method by which separation or purification of materials are done.	K1
CO-2	predict the reactivities of complexes and compare the different pathways they follow when they react.	K2
CO-3	predict the role of different metal ions in biological systems.	K2
CO-4	use the chromatographic methods to test extent to which the various segments of the current environment are polluted.	К3
CO–5	explain and interpret the functioning of living systems and may pursue higher studies/research in related subjects.	K4 & K5

#### **Unit–I Reaction Mechanism in Coordination Complexes**

#### (15 Hours)

Ligand substitution reactions - rates of ligand substitutions - labile and inert complexes classification of mechanisms - association, dissociation and interchange.

Ligand substitution in square planar complexes – the nucleophilicity of the entering group – the shape of the transition state - the trans effect - stereochemistry of substitution - pressure and temperature dependance of the substitution.

Ligand substitution in octahedral complexes -rate laws and their interpretation - the Eigen-Wilkins mechanism – the Fuoss-Eigen equation- activation of octahedral complexes – leaving group effects - the effects of spectator ligands - steric effects - activation energetics - associative activation – base hydrolysis – redox reactions – the inner sphere and outer sphere mechanisms

#### **Unit–II Organometallic Chemistry**

Stable electron configurations - 18 electron compounds - 16 electron square planar compounds electron count preference - electron counting and oxidation states - neutral ligand method donor-pair method.

Nomenclature of organometallic compounds with special reference to hapticity.

Types of ligands – CO, phosphines, hydrides, dinitrogen, alkyl, alkenyl, alkynyl and aryl ligands, alkene and alkyne ligands, benzene and arene, cyclopentadiene.

#### **Unit–III Bio–inorganic Chemistry**

Metal ion in biology and their vital role in the active site-structure and functions of metallo proteins and enzymes. ion transport mechanism in cell membrane - Na and K pumps- ionophores - structures and characteristic features of haemoglobin and myoglobin - Vitamin  $B_{12}$  - blue copper proteins.

#### Unit-IV Column and Thin-layer Chromatography

Introduction - Types of liquid chromatography - Equipment for HPLC -Derivatization -Quantitative analysis – Thin-layer chromatography – High performance thin-layer

(15 Hours)

#### (15 Hours)

#### (15 Hours)

chromatography (HPTLC) –Determination of aspirin, phenacetin and caffeine in a mixture – Thin–layer chromatography – The recovery of separated substances by elution techniques.

#### **Unit-V Gas Chromatography**

#### (15 Hours)

Introduction –apparatus –programmed–temperature gas chromatography – quantitative analysis by GLC – elemental analysis using gas chromatography – determination of aluminium by gas chromatographic analysis of its tris(acety1acetonato) complex – analysis of a mixture using the internal normalization method – determination of sucrose as its trimethylsilyl derivative using GLC.

#### **Books for Study**

- 1. Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 7thEdition, Oxford University Press, Oxford, UK, 2018.
- Unit-I Chapter 21Unit-II Chapter 22Unit-III Chapter 26

2. Jeffery G H, Bassett J, Mendham J and Denney R C, *Vogel's Textbook of Quantitative Chemical Analysis*, 5th Edition., Longman Scientific and Technical, Essex, England, 1989.

Unit–IV Chapter 8 Unit–V Chapter 9

#### **Books for Reference**

- 1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
- 2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
- 3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John–Wiley and Sons. Inc., New York, 1995.
- 4. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002–3098, USA, 2014.

#### Web Resources



Coordination Chemistry–Swayam

Coordination Chemistry–Introduction

Semester	Course code				Tit	le of the	Course	<u>)</u>	Ho	urs	Credits
VI	21UC	21UCH63ES03B			DSE–3: INORGANIC CHEMISTRY III 5					5	3
Course Outcomes	Prog	ramm	e Outc	omes (	(POs)	Prog	gramme	e Specifi (PSOs)	c Outco	omes	Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	2	3	2	2	2	2	3	2	2	2	2.2
CO–2	2	3	1	3	2	2	3	1	3	2	2.2
СО–3	3	2	1	2	2	3	2	1	2	2	2.0
CO-4	3	2	2	2	3	3	2	2	2	3	2.4
CO-5	2	2	2	2	2	2	2	2	2	2	2.0
Mean overall Score								2.16 (Medium)			

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	Course Title	Hours	Credits
VI	21UCH63ES04A	DSE– 4: PHYSICAL CHEMISTRY-III	5	3

CO No.	CO–Statements	Cognitive Levels
	On successful completion of this course, students will be able to	(K–Level)
CO-1	describe the kinetics of photochemical reactions	K1
CO-2	understand the theories of reaction rate	K2
СО-3	applying the concept of surface chemistry, distinguish unimolecular and bimolecular surface reactions.	К3
CO-4	analyze the symmetry of the molecules using group theory	K4
CO–5	explain and illustrate the rate and order of the reactions.	K4 & K5

#### Unit –I Chemical Kinetics I

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – factors influencing the rate of a reaction – derivations of rate constants for zero, first and second order reactions – fractional order reactions – half–life period – pseudo first order reactions and examples – methods of determination of order of a reaction (integration, graphical, half–life, Ostwald's dilution method and experimental).

#### Unit –II Chemical Kinetics II

Steady state approximation – chain reactions and explosion reaction – temperature dependence of reaction rates – Arrhenius parameters – theories of reaction rates – simple collision theory – limitations – Lindmann's hypothesis of unimolecular reactions – theory of absolute reaction rates – influence of ionic strength on reaction rate – types of complex reactions – reversible or opposing, consecutive and parallel reaction.

#### **Unit–III Adsorption and Catalysis**

Homogeneous and heterogeneous catalysis – acid–base catalysis, inversion of cane sugar– enzyme catalysis – Michaelis–Menten equation – adsorption – heat of adsorption – factors influencing adsorption – physical adsorption and chemical adsorption – adsorption of gas by solids –Langmuir theory of adsorption – unimolecular surface reaction – bimolecular surface reaction – Freundlich adsorption isotherm – Gibbs adsorption isotherm for adsorption of solutions.

#### **UNIT – IV Kinetics of Photochemical Reactions**

Thermal chain reactions –  $H_2$ – $Br_2$  reaction – dissociation of acetaldehyde – comparison of thermal and photochemical chain reactions. photochemical reaction – laws of photochemistry – quantum yield –primary and secondary process – HI decomposition – HBr decomposition – kinetics of hydrogen – bromine reaction – kinetics of hydrogen – chlorine reaction – photochemical equilibrium – photo dimerization of anthracene – photosensitizations – chemiluminescence –phosphorescence.

#### (15 Hours)

(15 Hours)

(15 Hours)

# (15 Hours)

#### (15 Hours)

#### **Unit-V Group Theory**

Symmetry operations and symmetry elements –the symmetry classification of molecules – groups –consequences of symmetry – polarity – chirality – symmetry operations – matrix representations –construction of character table.

#### **Books for Study**

- Rajaram J and Kuriacose J C, *Kinetics and Mechanism of Chemical Transformation*, 1st Edition, Macmillan India Ltd., New Delhi, 1993. Unit–I – IV Chapter 2,4,5,6,9,10 and11
- 2. Laidler K J, *Chemical Kinetics*, 3rd Edition, Pearson Publication, Chennai, 1987. Unit–I IV Chapter 1, 2, 4,5,7,8 and 10
- Cotton F A, Chemical Applications of Group Theory, 3rd Edition, John Wiley and Sons, New York, 1990.
   Unit–V Chapter 2 and 3

#### **Books for Reference**

- 1. Castellan G W, Physical Chemistry, 4th Edition, Narosa, New Delhi, 2004.
- 2. Bhattacharya P K, *Group Theory and its Chemical Applications*, Himalaya Publishing House, New Delhi, 1986.
- 3. Sharma K K and Sharma L K, *A Textbook of Physical Chemistry*, 5th Edition, Vikas Publishing House, New Delhi, 2012.
- 4. Atkins P, Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press Great Britian, 2014.

#### Web Resources





Symmetry elements and operations

Photochemistry

Outcomes	_	-	_	_
Semester	Course code	Title of the Course	Hours	Credits
VI	21UCH63ES04A	DSE–4: PHYSICAL CHEMISTRY- III	5	3

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

• •	-100		50-111	PH	YSICA	AL CHI	EMISTE	RY- III	•		0
Course Outcomes	Programme (Dutcomes (POs)						Mean Score of				
(COs)	<b>PO1</b>	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Cos
CO-1	1	1	3	3	2	2	1	1	2	3	1.9
CO-2	2	1	1	3	1	2	1	3	1	3	1.8
CO-3	2	2	2	3	2	2	2	2	1	1	1.9
CO-4	1	3	1	2	3	2	2	3	3	1	2.1
CO–5	1	1	2	3	1	2	3	2	3	3	2.1
Mean overall Score								1.96 (Medium)			

Semester	Course Code	Course Title	Hours	Credits
VI	21UCH63ES04B	DSE–4:	5	3
		PHYSICAL CHEMISTRY - IV		

CO No.	CO–Statements On successful completion of this course, students should be able to	Cognitive Levels (K–Level)
CO-1	define rate, order and molecularity of reactions.	K1
СО-2	understand the basics of statistical thermodynamics	K2
CO-3	distinguish unimolecular and bimolecular surface reactions.	K2
CO-4	apply the concepts of thermo chemistry	К3
CO-5	understand the theories of reaction rate	K4

#### **Unit – I Chemical Kinetics I**

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – factors influencing the rate of a reaction – derivations of rate constants for zero, first and second order reactions – fractional order reactions – half–life period – pseudo first order reactions and examples – methods of determination of order of a reaction (integration, graphical, half–life, Ostwald's dilution method and experimental).

#### Unit – II Chemical Kinetics II

Steady state approximation – chain reactions and explosion reaction – temperature dependence of reaction rates – Arrhenius parameters – theories of reaction rates – simple collision theory – limitations – Lindmann's hypothesis of unimolecular reactions – theory of absolute reaction rates – influence of ionic strength on reaction rate.

#### Unit – III Adsorption and Catalysis

Homogeneous and heterogeneous catalysis – acid–base catalysis, inversion of cane sugar– enzyme catalysis – Michaelis–Menten equation – adsorption – heat of adsorption – factors influencing adsorption – physical adsorption and chemical adsorption – adsorption of gas by solids–Langmuir theory of adsorption –unimolecular surface reaction – bimolecular surface reaction – Freundlich adsorption isotherm – Gibbs adsorption isotherm for adsorption of solutions.

#### **Unit – IV Thermochemistry**

Change of internal energy and enthalpy in chemical reactions – exothermic and endothermic reactions – relation between enthalpy of a reaction at constant volume and constant pressure –standard enthalpies of reactions, combustion, neutralization, solution, formation – determination of enthalpies of reactions – Kirchhoff equation – Hess's law – bomb calorimeter – bond energy and its applications.

#### **Unit – V Statistical Thermodynamics**

#### (15 Hours)

(15 Hours)

## (15 Hours)

#### (15 Hours)

(15 Hours)

Permutation and combination – combinatory rule – probability theorems – micro and macrostates –phase space – thermodynamic probability – statistical equilibrium – Maxwell – Boltzmann statistics and its derivation – relation between entropy and probability.

#### **Books for Study**

- Rajaram J and Kuriacose J C, *Kinetics and Mechanism of Chemical Transformation*, 1st Edition, Macmillan India Ltd., New Delhi, 1993. Unit–I – IV Chapter 2,4,5,6,9,10 and11
- 2. Laidler K J, *Chemical Kinetics*, 3rd Edition, Pearson Publication, Chennai, 1987. Unit–I IV Chapter 1, 2, 4,5,7,8 and 10
- Cotton F A, *Chemical Applications of Group Theory*, 3rd Edition, John Wiley and Sons, New York, 1990.
   Unit–V Chapter 2 and 3

#### **Books for Reference**

1. Castellan G W, Physical Chemistry, 4th Edition, Narosa, New Delhi,2004.

2. Bhattacharya P K, *Group Theory and its Chemical Applications*, Himalaya Publishing House, New Delhi, 1986.

3. Sharma K K and Sharma L K, A Textbook of Physical Chemistry, 5th Edition, Vikas Publishing House, New Delhi, 2012.

4. Atkins P, Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press Great Britian, 2014.

#### Web Resources





Symmetry elements and operations

Photochemistry

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

Semester	Co	ourse co	ode	Title of the Course				Ho	urs	Credits	
VI	21U0	CH63E	S04B	PI	IYSIC	DSE - AL CHI	-4: EMISTR	Y -IV	4	5	3
Course Outcomes	Prog	gramm	e Outco	omes (I	mes (POs) Programme Specific Outcomes (PSOs) Post post post post						Mean Score of
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	1	1	2	3	1	2	3	2	3	3	2.1
CO–2	1	3	1	2	3	2	2	3	3	1	2.1
CO-3	2	2	2	3	2	2	2	2	1	1	1.9
CO–4	1	1	3	3	2	2	1	1	2	3	1.9
CO–5	2	1	1	3	1	2	1	3	1	3	1.8
Mean overall Score									1.96 (Medium)		

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63CE01	COMPREHENSIVE EXAMINATIONS	_	2

	CO–Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Level (K–Level)
CO-1	recognize appropriate reaction mechanisms for the selective organic reactions	K1
CO-2	summarize the properties of elements and fundamentals of nuclear chemistry	K2
CO-3	identify the reactivity of organic molecules by electronic effects	K3
CO-4	simplify the basics of physical chemistry	K4
CO–5	evaluate various concepts of physical chemistry to minimize environmental problems	К5

#### Unit I Periodic Properties and Nuclear Chemistry

**Periodic properties**: Mendeleev's periodic classification – modern periodic table – grouping of elements in to s, p, d and f blocks – periodic properties and their variations– ionization energy – factors influencing the IE – electron affinity – electronegativity, chemistry of s, p, d and f block elements.

**Nuclear Chemistry**: Isotopes, isobars and isotones – determination of nuclear masses by J J Thomson's method– theory of radioactivity – radioactive series – radioactive isotopes – mass defect– binding energy– fusion and fission reactions – plutonium and hydrogen bombs – applications of radioactivity.

#### **Unit – II Electronic Effects**

**Electronic Effects:** inductive effect, mesomeric effect, electromeric effect, resonance effect, hyperconjugative effect – isomerism in organic molecules – structural and stereoisomerism with appropriate examples.

#### **Unit III Concepts in Physical Chemistry**

**Gaseous State**: Kinetic theory of gases – molecular velocities – root mean square, average and most probable velocities – Maxwell law for distribution of molecular speed – collision number – mean free path – fundamental gas laws – universal gas equation – the gas constant (R) and its units in different forms – deviation from ideal behaviour – van Der Waals equation for real gases – critical phenomenon – PV isotherm for real gases – critical temperature – critical volume.

**Chemical Thermodynamics**: Three laws in chemical thermodynamics and fundamentals of statistical thermodynamics.

**Chemical Kinetics**: Zero, first, second and third order reactions with examples-molecularityderivation of rate law and half-life period.

#### **Unit – IV Essentials of Physical Chemistry**

Phase rule–One, two and three component systems–fundamentals of electrochemistry–chemistry of solids, solution and colloids.

Fundamentals of photochemistry-theory of atomic and molecular spectroscopic techniques.

#### Unit -V Organic Reaction Mechanisms - An Overview

Elimination – addition reactions – electrophilic and nucleophilic substitution – nucleophilic at aliphatic, aromatic and at carbonyl carbons – pericyclic reactions – stereochemistry of reaction mechanism – chemoselectivity – regio and stereoselectivity of organic reactions – reactions at allylic carbons – beta and alpha alkylations.

#### **Books for Study**

- Lee J D, Concise Inorganic Chemistry, Black Well Science, UK. 2006. Unit–I Chapter 6
- Morrison R T, Boyd R N and Batcharjee S K, Organic Chemistry, 7th Edition, Pearson, New York, 2009.
   Unit–II Chapter 1 and 2
- Atkins P and Paula J D, *Physical Chemistry*, 8th Edition, Oxford University Press, New Delhi, 2006.

Unit–III Chapter 1 Unit–III Chapter 6

 Bruice P Y, Organic Chemistry, 8th Edition University of California, Santa Barbara, Pearson Ltd, 2011. Unit-V Chapter 9

#### **Books for Reference**

- 1. Huheey J E, Keiter E A, Keiter R L and Medhi O K, *Inorganic Chemistry–Principles of Structure and Reactivity*, 4th Edition, Pearson, New Delhi , 1993.
- 2. March J, Advanced Organic Chemistry-Reactions, Mechanisms and Structure, 4th Edition, John Wiley & Sons, New York, 1992.

#### Web Resources









Periodic Properties

Inductive Effects

Drug Development

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific

Outcomes											
Semester	Co	urse co	ode		Title of the Course				Но	urs	Credits
VI	<b>21U</b>	21UCH63CE01 C				omprehensive Examinations				-	2
Course	Ducc		o Outo	om og ()		Pro	gramm	e Specifi	c Outco	mes	Mean
Outcomes	Prog	gramm	e Outc	omes (1	POS)	(PSOs)				Score	
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of Cos
CO-1	3	3	1	2	1	3	1	1	3	1	1.9
CO–2	1	3	1	3	1	3	1	1	3	1	1.8
CO–3	3	3	1	3	1	3	3	1	3	2	2.3
CO–4	2	2	1	3	2	3	1	2	3	2	2.1
CO–5	3	3	3	3	3	3	3	3	3	3	3.0

	2.22	
Mean overal	Score (High)	

Semester	<b>Course Code</b>	Title of the Course	Hours	Credits
VI	21UCH64SE04A	SEC– 4 (WS): TRENDS IN CHEMISTRY	2	1

	CO–Statements	Cognitive
CO No.	On successful completion of this course, students will be able to	Levels (K–Level)
CO-1	recall the concepts of acids and bases, pH scale, pKa values and buffer solutions	K1
CO-2	understand the physics and chemistry of materials	K1
CO-3	discuss the design of drugs and their importance in biomedical fields	K2
CO-4	examine the applications of smart materials in various fields	K3
CO-5	Identify and evaluate the chromatographic techniques and their applications in various fields	K4 & K5

#### Unit - I Organic Acids, Bases and Solvents

pKa and pH – carboxylic acids– alcohols– phenols – amines – approximate pKa values – effect of structure on pKa – electronegativity – inductive effect – resonance effect – effect of pH on structure – buffer solutions – Lewis acids and bases – polarity of solvents – solvent index.

#### **Unit – II Isolation and Purification Techniques**

General considerations – filtration – recrystallization – sublimation – solvent extraction – drying of liquids or solution – distillation at atmospheric pressure – steam distillation – vacuum distillation – chromatography – TLC, column, GC and HPLC techniques.

#### **Unit – III Discovery and Design of Drugs**

Naming of drugs – proprietary and generic names – lead compounds – molecular modifications – random screening – serendipity in drug discovery – receptors – drugs as enzyme inhibitors – drug resistance – therapeutic index – QSAR: Quantitative Structure Activity Relationship – molecular modeling – combinatorial organic synthesis – antiviral drugs – economics of drugs.

#### **Unit – IV Material Science**

Conductors – insulators – semi–conductors – superconductors – capacitors – super–capacitors – organic conductors – optical materials – NLO – theory and processing – chemical and biosensors.

#### **Unit – V Smart Materials**

Types of smart materials – piezoelectric and electrostrictive materials – magentostrictive materials – electrorheological and magnetorheological effects – shape memory alloys –photochromosim – intelligent gels.

#### **Books for Study**

- 1. Bruice P Y, *Organic Chemistry*, 8th edition, Pearson Ltd, University of California, Santa Barbara, 2011.
- Unit–I Chapter 1 Unit–III Chapter 30
- Vogel A I, *Text book of Quantitative Chemical Analysis*, 6th Edition, Pearson Education Limited, London, 2008.
   Unit–II Chapter 10 and 13

#### 159

#### (6 Hours)

#### (6 Hours)

## (6 Hours)

(6 Hours)

#### (6 Hours)

- Lee J D, Concise Inorganic Chemistry, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.
   Unit–IV Chapter 3
- 4. Newton D E, *Chemistry of New Materials*, Facts on File, Inc, New York. Unit–V Chapter 5

#### **Books for References**

- 1. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edition, Longman Scientific and Technical, Essex, England, 1989.
- 2. Rajendran V and Kani M, *Material Sciences*, 11th reprint, TATA McGraw Hill, New Delhi, 2010.
- 3. Ghosh J, A Text Book of Pharmaceutical Chemistry, Tata McGraw Hill publishing, New Delhi, 1993.

#### Web Resources



Purification of Organic Compounds





Gas chromatography

Super Capacitors

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse co	ode		Tit	le of the	Course	)	Ho	urs	Credits
VI	VI 21UCH64SE04A			SEC – 4 (WS): TRENDS IN CHEMISTRY				2	2	1	
Course OutcomesProgramme Outcomes (POs)Programme Specific Outcomes (PSOs)									Mean Score of		
(COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	3	2	2	2	2	3	2	2	2	2	2.2
CO–2	2	2	2	2	3	2	2	2	2	3	2.2
CO-3	2	2	3	2	2	2	2	3	2	2	2.2
CO-4	1	2	2	3	2	1	2	2	3	2	2.0
CO–5	1	2	2	3	2	1	2	2	3	2	2.0
Mean overall Score										2.12 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH64SE04B	SEC – (WS): ADVANCES IN CHEMISTRY	2	1

CO No.	CO–Statements	<b>Cognitive Levels</b>
CU NO.	On successful completion of this course, students will be able to	(K – level)
CO-1	write the different sources of high energy radiations and explain the methods to detect radiations	K1 & K2
СО-2	list the twelve principles of green chemistry and categorize the microwave and sonication reactions	K1 & K4
СО-3	predict the different types of polymers and examine the processes in rubber industries	K2 & K4
CO-4	understand the concepts of stereochemistry and identify the configurational nomenclature	K2 & K4
CO-5	develop the preparation methods and determine the synthetic applications of active methylene compounds and $\alpha$ , $\beta$ -unsaturated carbonyl compounds	K3 & K5

#### **Unit–I Stereochemistry**

Stereoisomerism – types – geometrical isomerism – cis-trans and Z and E isomers – optical isomerism – chirality – optical activity – measurement of optical activity – polarimeter – concept of enantiomerism, diastereomerism – configurational nomenclature – D–L, R–S, erythro and threo conventions – meso and d,l– forms of tartaric acid – concepts of racemization and resolution.

#### Unit–II Active Methylene Compounds and α,β–unsaturated Carbonyl Compounds

#### (6 Hours)

(6 Hours)

Malonic ester – synthetic applications –ethyl acetoacetate – preparation and synthetic applications –unsaturated carbonyl compounds – structure and properties– preparation– electrophilic and nucleophilic additions– Michael addition– Diels Alder reaction– quinones.

#### **Unit–III Green Chemistry**

Emergence – twelve principles – planning of green synthesis – examples of green reactions from condensation, oxidation, reduction, rearrangement and addition reactions – microwave and sonication reactions.

#### **Unit–IV Polymers**

Polymers – free radical vinyl polymers – ionic polymers – step–reaction polymers – copolymers – types of copolymers – stereochemistry of vinyl polymers – Ziegler–Natta catalyst – natural rubber – vulcanization – applications of polymers – processes in rubber industries – dendrimers – divergent and convergent synthesis – types of dendrimers – metallodendrimers – applications of dendrimers – fibres – elastomers – plastics.

#### **Unit-V Radiation Chemistry**

Sources of high energy radiations – interaction of high energy radiations with matter – detection of radiations – dosimeters – primary and secondary processes – radiolysis of water – hydrated electron – G value.

## (6 Hours)

(6 Hours)

#### (6 Hours)

#### **Books for Study**

- 1. Morrison R T and Boyd R N, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.
- Unit–I Chapter 4 Unit–II Chapter 27
- Anastas P T, *Text Book on Green Chemistry*, Oxford University Press, United Kingdom, 2006. Unit–III Chapter 1
- 3. Huges G, *Radiation Chemistry*, Oxford series, United Kingdom, 1973. Unit–V Chapter 2

#### **Books for Reference**

- 1. Pine S H, Organic Chemistry, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.
- 2. Finar I L, Organic Chemistry, 6th Edition, Addison Wesley Longman Ltd., England, 1996.
- 3. Ahluwalia V K, Green Chemistry, Ane books Ltd, Chennai, 2009.

#### Web Resources



Stereochemistry



Green Chemistry

#### Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse co	ode		Tit	le of the	Course		Ho	urs	Credits
VI	VI 21UCH64SE04B				SEC –4 (WS): ADVANCES IN CHEMISTRY					2	1
Course	Prog	gramm	e Outc	omes (l	POs)	Pro	gramm	amme Specific Outcomes (PSOs)			
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	of COs
CO-1	3	3	2	1	2	2	2	3	2	1	2.1
CO-2	3	2	2	3	3	2	3	2	2	3	2.5
CO-3	2	1	2	3	2	3	1	2	3	2	2.1
CO-4	3	1	2	2	3	3	2	1	3	2	2.2
CO–5	2	2	1	3	2	2	1	2	3	2	2.0
Mean overall Score									2.2 (High)		

Sem	ester	Course code	Title of the course	Hours	Credits
V	<b>I</b>	21UCH64EG02A	GENERIC ELECTIVE 2: FOOD AND NUTRITION	4	3

CO No.	CO–Statements	Cognitive levels
00110	On successful completion of the course, students will be able to	(K–Level)
CO -1	improve the health standard of humankind by eliminating harmful effects of food adulterants.	K1
CO –2	understand the composition of food.	K2
CO – 3	acquire the knowledge of biological functions of water.	K2
CO –4	apply the food conversion operations in the contemporary life.	K3
CO -5	analyse and interpret the common adulterants present in various food stuffs.	K4 & K5

#### **Unit – I Composition of Food**

Definition ,classification and composition of food -world food requirement - food safety for the consumer nutrition – basic chemical constituents of food – food borne diseases.

#### **Unit – II Biological Functions of Water**

Role and Function of water in Biological Systems - dietary requirements and sources - physical properties of water - solute-water interactions.

#### **Unit –III Food Conversion Operations**

Size Reduction - screening - mixing - emulsification - filtration - centrifugation - extraction crystallization.

#### **Unit – IV Testing of Food Adulteration**

Common adulterants in food-testing methods of all food adulterants- natural food pigmentsintroduction and classification.

#### **Unit –V Health Problems of Food Adulteration**

Principal adulterants and their health effects-new product development- definition- importance need of product development - steps of product development.

#### **Books for Study**

1. Aurand L W and Wood A E, Food Chemistry. The AVI Publishing Co., Connecticut, 1973. **Unit– I** *Chapter 1 and 2* **Unit–II** Chapter 7

3. Belitz H D, Grosch W and Schieberler P, Food Chemistry. Springer, Berlin, 2004.

**Unit–IV** Chapter 9 **Unit–III** Chapter 13

4. DeMan, J M, Principles of Food Chemistry, A Chapman and Hall Food Science Book, Aspen Publ., Inc., Gaithersburg, Maryland, 1999. Unit-I Chapter 6.3, 6.4, 6.5 and 6.6

# (12 Hours)

#### (12 Hours)

#### (12 Hours)

(12 Hours)

(12Hours)

#### **Books for Reference**

- 1. Alex Ramani V, Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009.
- 2. Fennama O R, Food Chemistry, Marcel Dekker, Inc., New York, 1996.
- 3. Gopalan C, Rama Sastri B V, and Balasubramaniam S C, *Nutritive Value of Indian Foods*, National Institute of Nutrition, ICMR, Hyderabad, 1989.
- 4. Meyer L H, Food Chemistry, Reinhold Publications, Corporation, New York, 1976.

#### Web Resource







Food processing

Tests for Food Adulterants

Food Chemistry-Intro

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Semester Course code Title of the Course Hours					urs	Credits				
VI 21UCH64EG02A			GENERIC ELECTIVE -2: FOOD AND NUTRITION				2	4	3		
Course Outcomes	Programme Outcomes (POs)				POs)	Programme Specific Outcomes (PSOs)				Mean Score of	
(COs)	(COs) <b>PO1 PO2 PO3</b>			PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	COs
CO-1	3	3	1	2	1	2	2	3	2	1	2.0
CO–2	2	2	3	2	2	3	2	2	3	2	2.3
CO–3	2	2	1	3	2	2	1	2	3	2	2
CO–4	3	2	2	3	2	2	3	2	2	3	2.4
CO–5	2	1	2	3	2	3	3	2	1	2	2.1
	Mean overall Score									2.16 (Medium)	

Semester	Course code	Title of the course	Hours	Credits
VI	21UCH64EG02B	GE -2: WASTE MANAGEMENT	4	3

CO No.	CO–Statements On successful completion of the course, students will be able to	Cognitive levels (K–Level)					
CO –1	apply the knowledge of solid waste into useful	K1					
CO –2	increase the consumer awareness of waste minimization issues	K1					
CO – 3	understand the protection of the environment through effective waste	K2					
	management measures						
CO -4	design and manufacture of products that avoid or minimize waste generation	K3					
CO –5	analysis and recommend the people about the protection of health and wellbeing of people by providing an affordable waste collection service	K4 & K5					

#### **Unit – I Introduction to Environment**

Ecosystem –meaning– types –components– structure – functions, levels of organization in nature– food chain and trophic structure, biogeochemical cycles, energy flow.

#### Unit – II Municipal solid waste

Definition – sources and types of solid waste– composition and its determinants of solid waste– factors influencing of municipal solid waste – generation–methods of sampling and characterization.

#### **Unit – III Collection and Transfer**

Collection of solid waste – collection system, equipments – labour requirement – factors affecting collection–need for transfer operation – transfer stations – types – transport means and methods – location of transport stations – manpower requirement.

#### **Unit – IV Processing Techniques and Recovery of Energy**

Processing techniques – purposes mechanical volume reduction – chemical volume reduction – components separation – methods – drying and dewatering–recovery of resources, conversion products and energy recovery– incineration with heat recovery.

#### **Unit – V Disposal of Solid Wastes**

Disposal of municipal and bio-wastes- various methods – principal features of an incinerator – site selection and plant layout of an incinerator – sanitary landfill– methods of operation – advantages and disadvantages of sanitary land fill.

#### **Books for Study**

- John Pichtel Waste Management Practices CRC Press, Taylor and Francis Group 2005. Unit–1 Chapter 1 Unit–II Chapter 4
- LaGrega, M.D. Buckingham, P.L. and Evans, J.C. *Hazardous Waste Management*, McGraw Hill International Editions, New York, 1994.
   Unit– III Chapter 2

### (12 Hours)

(12 Hours)

(12 Hours)

(12 Hours)

#### (12 Hours)

#### 165

Richard J. Watts, *Hazardous Wastes – Sources*, *Pathways*, *Receptors*, John Wiley and Sons, New York, 1997.
 Unit– IV Chapter – 2.3 and 2.5
 Unit– V Chapter – 7.1,7.2, 7.5

#### **Book for Reference**

- 1. George Techobanoglous, *Integrated Solid Waste Management*, 2nd Edition,, McGraw Hill, New York, 1993.
- 2. Techobanoglous Thiesen Ellasen, *Solid Waste Engineering Principles and Management*, McGraw Hill, New York, 1997.
- 3. *Manual on Municipal 1 Solid waste Management*, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.

#### Web Resource:







Solid Waste Management

Environment

Solid & Hazardous waste Management

# Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Co	urse co	ode		Tit	le of the	Course		Но	urs	Credits
VI 21UCH64EG02B WAST				GE-2: TE MANAGEMENT			2	4	3		
Course Outcomes	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)				Mean Score		
(COs) P01 P02 P03 P04 P05			PSO1	PSO2	PSO3	PSO4	PSO5	of Cos			
CO-1	3	2	2	3	2	2	3	2	2	3	2.4
CO–2	3	3	1	2	1	2	2	3	2	1	2.0
CO-3	2	1	3	2	2	3	2	1	3	2	2.1
CO–4	2	1	2	3	2	3	3	2	1	2	2.1
CO–5	2	2	1	3	2	2	1	2	3	2	2.0
Mean overall Score									2.28 (High)		

## B.Sc. CHEMISTRY SYLLABUS - 2017

SCHOOLS OF EXCELLENCE with CHOICE BASED CREDIT SYSTEM (CBCS)



#### SCHOOL OF PHYSICAL SCIENCES St. JOSEPH'S COLLEGE (Autonomous)

Special Heritage Status Awarded by UGC Accredited at 'A' Grade (3rd cycle) by NAAC College with Potential for Excellence Conferred by UGC DBT-STAR & DST-FIST Sponsored College **TIRUCHIRAPPALLI - 620 002, INDIA** 

#### SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

#### UNDERGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to work towards the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014 - 15, to standup to the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system allows the enhanced academic mobility and enriched employability of the students. At the same time this system preserves the identity, autonomy and uniqueness of every department and reinforces their efforts to be student centric in curriculum designing and skill imparting. These five schools will work concertedly to achieve and accomplish the following objectives:

- Optimal utilization of resources both human and material for the academic flexibility leading to excellence.
- Students experience or enjoy their choice of courses and credits for their horizontal mobility.
- The existing curricular structure as specified by TANSCHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) a uniqueness of the choice based credit system.
- Human excellence in specialized areas
- Thrust in internship and / or projects as a lead towards research and
- The multi-discipline nature of the newly evolved structure (School System) caters to the needs of stake-holders, especially the employers.

#### What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practicals, field visits, tutorials and nature of project work.

For UG courses, a student must earn a minimum of 150 credits as mentioned in the table below. The total number of minimum courses offered by a department are given in the course pattern.

#### SUMMARY OF HOURS AND CREDITS UG COURSES

Part	Semester	Specification	No. of Courses	Hours	Credits	Total Credits
I	I-IV	Languages (Tamil/Hindi/French/Sanskrit)	4	16	12	12
П	I-IV	General English	4	20	12	12
	I-VI V-VI	Core Theory Practicals Project Work	11-16 3-6 1	90	60	
	IV-VI	Core Electives	3	12	12	ł
ш	V	Self-paced Learning (Partial Online Course)	1	-	2	
	VI	Comprehensive Examination	1	-	2	
=	I-VI	Allied	4/6	24	20	
	III & V	Extra Credit Courses	2	-	(4)	-
	VI	Internship	1	-	2	98
	V VI	Skilled Based Electives: Between Schools (BS) Within School (WS)	1	2 2	2 2	
	V	Inter Departmental Courses (IDC) Soft Skills / NCC	1	2	2	
1V	I II III	Non-Major Courses (NMC) Communicative English Computer Literacy Environmental Studies (Partial Online Course)	1 1 1	- 2 2	5 2 2	-
	I-IV	Value Education	4	8	8	23
	I-V	SHEPHERD & Gender Studies	-	-		
v	I-V	AICUF, Fine Arts, Nature Club, NCC, NSS	-	-	-	
	V	Career Guidance & Training	-	-	-	5
		TOTAL		180	150	150 (+4 extr credits

#### **Course Pattern**

The Undergraduate degree course consists of five vital components. They are as follows:

- Part -I : Languages (Tamil / Hindi / French / Sanskrit)
- Part-II : General English
- Part-III : Core Course (Theory, Practical, Core Electives, Allied, Project, Internship and Comprehensive Examinations)
- Part-IV : SBE, NMC, Value Education, Soft Skills/National Cadet Corps and Environmental Studies (EVS)
- Part-V : Community Service (SHEPHERD) and Gender Studies, AICUF, Fine Arts, Nature Club, NCC, NSS, etc.

#### Non-Major Courses (NMC)

There are three NMC's – Communicative English, Computer Literacy and Environmental Studies offered in the I, II & III Semesters respectively.

#### **Extra Credit Courses**

In order to facilitate the students gaining extra credits, the extra credit courses are given. There are two extra credit courses – Massive Open Online Courses (MOOC) and Skill-based Course – offered in the III and V Semesters respectively.

According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Skill based course is offered by the department apart from their regular class hours.

#### Value Education Courses

There are four courses offered in the first four semesters for the First & Second UG students.

#### Non-Major Elective / Skill Based Elective

These courses are offered in two perspectives as electives "Within School" (WS) and "Between School" (BS).

#### **Subject Code Fixation**

The following code system (11 characters) is adopted for Under Graduate courses:

Year of	UG Code of	Semester	Specification	Subject	Running no.
Revision	the Dept		of the Part	Category	in that part
$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
17	U##	x	x	xx	xx
17	UCH	1	3	2	01

#### For Example :

I B.Sc. Chemistry, first semester **General Chemistry-I** The code of the paper is 17UCH130201.

Thus, the subject code is fixed for other subjects.

- 00 Languages (Tamil / Hindi / French / Sanskrit)
- 01 General English
- 02 Core (Theory, Practical, Comprehensive Exams, Internship and Project)
- 03 Core Electives
- 04 Allied
- 05 Extra Credit Courses
- 06 Skill Based Electives (BS) & (WS)
- 07 Soft Skill
- 08 NMC (Communicative English, Computer Literacy/SAP)
- 09 EVS (Environmental Studies)
- 10 Value Education
- 11 Community Service (SHEPHERD) and Gender Studies
- 12 AICUF / Nature Club / Fine Arts / NCC / NSS etc.

#### EXAMINATION: Continuous Internal Assessment (CIA)

<b>UG - Distribution of CIA Marks</b>						
Passing Minin	mum: 40 Marks					
Library Referencing	5					
3 Components	35					
Mid-Semester Test	30					
End-Semester Test	30					
CIA	100					

#### MID-SEM & END-SEM TEST

Centralised - Conducted by the office of COE

- 1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective + Descriptive elements; with the existing question pattern PART-A, PART-B, and PART-C.
- 2. CIA Component III for UG & PG will be of 15 marks and compulsorily objective multiple choice question type.
- 3. The CIA Component III must be conducted by the department / faculty concerned at a suitable computer centres.
- 4. The 10 marks of Part-A of Mid-Sem and End-Sem Tests will comprise only: **Objective Multiple Choice Questions**; **True / False**; and **Fill-in the Blanks**.
- 5. The number of hours for the 5 marks allotted for Library Referencing work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses of the semester.
- 6. English Composition once a fortnight will form one of the components for UG General English.

#### SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: Objective MCQs only (30 Marks)

Answers are to be marked on OMR score-sheet. The OMR score-sheets will be supplied along with the Main Answer Book. 40 minutes after the start of the examination the OMR score-sheets will be collected

#### Part-B & C: Descriptive (70 Marks)

**Part-B:** 5 x 5 = 25 marks (Inbuilt Choice); **Part-C:** 3 x 15 = 45 marks; 3 out of 5 questions (Open Choice).

#### The Accounts Paper of Commerce will have

**Part-A**: Objective = 25**Part-B**: Descriptive  $3 \times 25 = 75$  marks.

**Duration of Examination must be rational;** proportional to teaching hours 90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

#### **Grading System**

#### 1. Grading

The total marks will be calculated by adding both CIA and the end-semester examinations for each of the courses. The total marks thus obtained will then be graded as per details provided in the following Table-1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by Semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) respectively. These two are calculated by the following formulae:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}, \quad WAM \text{ (Weighted Average Marks)} = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

where, 'C_i' is the Credit earned for the Course-*i*,

'G_i' is the Grade Point obtained by the student for the Course '*i*',

- 'M' is the marks obtained for the course 'i', and
- 'n' is the number of Courses Passed in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

#### 2. Classification of Final Results

i) For each of the three parts, there shall be separate classification on the basis of the CGPA, as indicated in the following Table-2.

- ii) For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management/Literature as Outstanding/Excellent/Very Good/Good/Above average/Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided he/she has secured the prescribed passing minimum in the LCs and the ELCs.
- iii) Grade in Part-IV and Part-V shall be shown separately and it shall not be taken into account for classification.
- iv) Absence from an examination shall not be taken as an attempt.

#### Table-1: Grading of the Courses

Marks Range	<b>Grade Point</b>	<b>Corresponding Grade</b>
90 and above	10	О
80 and above but below 90	9	A+
70 and above but below 80	8	А
60 and above but below 70	7	B+
50 and above but below 60	6	В
40 and above but below 50	5	С
Below 40	0	RA

#### **Table-2: Final Result**

CGPA	<b>Classification of Final Results</b>	<b>Corresponding Grade</b>
9.00 and above	О	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	А	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	В	Above Average
4.00 to 4.99	С	Average
Below 4.00	RA	Re-appearance

Credit based weighted Mark System isadopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.

#### **Declaration of Result:**

Mr./Ms. ______ has successfully completed the Under Grduate in ______ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part-III is ______ and the class secured is ______ by completing the minimum of 150 credits. The candidate has acquired ______ (if any) more credits from SHEPHERD / AICUF/ Fine Arts / Sports & Games / NCC / NSS / Nature Club etc. The candidate has also acquired ______ (if any) extra credits offered by the parent department courses.

#### **B.Sc. CHEMISTRY**

#### Course Pattern - 2017 Set

Sem		Part	Code	Subject Title	H rs	Crs			
	Ι	Language	17UGT110001	Tamil I/Hindi I/ French I/Sanskrit I	4	3			
	II	English	17UGE120101	General English I	5	3			
		• 7	17UCH130201	General Chemistry I	7	4			
		<i>a</i>	(a)	Chemistry Practical I	3	(a)			
Ι	III	Core	0		3	(a)			
	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	6	5						
		NMC			-	5			
			2	2					
		30	22						
	Ι	Language	17UGT210002		4	3			
	п				5	3			
		English		8	5	3			
					3	4			
п	III	PartCodeSubject 1itleI1Language17UGT110001Tamil I/Hindi I/ French I/Sanskrit I1IIIEnglish17UCH130201General English I1IIICore $@$ Chemistry Practical I1 $@$ Chemistry Practical II11 $@$ Chemistry Practical II1 $@$ Chemistry Practical II1 $W$ NMC17UCF14001Essentials of humanity1 $W$ NMC17UGT210002Tamil II/Hindi II/French II/Sanskrit II1IIEnglish17UGT220102General English II1IIIEnglish17UCH230203Chemistry Practical I1IIICore17UCH230204Chemistry Practical II1IIICore17UCH230204Chemistry Practical II1IIIAllied17UCH230204Chemistry Practical II1IVNMC17UCH230204Chemistry Practical II1IVNMC17UCH230205General English III1IILanguage17UGT310003Tamil II/Hindi II/French II/Sanskrit III1IILanguage17UCH330205General English III1IIIAllied40CH330403AAllied: Physics 7-11IIIAllied17UCH330205General Chemistry 1I1IIIAllied17UCH330403AAllied: Physics -11IIIAllied17UCH330403AAllied: Physics 7-11IIIAllied	3	4					
11			6	5					
					2	2			
I	IV				2	2			
		v. Edn	170FC 241002		2 30				
	T	Y	171107210002			26			
					4	3			
	Ш	English		8	5	3			
			17UCH330205	General Chemistry III	4	3			
		Coro	17UCH330206	Essentials of p-Block Elements	4	3			
		Core	(a)	Chemistry Practical III	3	a.			
	III Alli Extra C				<u> </u>				
		Allied			4	4			
ш					2	(a)			
m						Allied			-
		Extra Credit	0	· ·					
			17UCH330501	Massive Open Online Course	-	(2)			
				Environmental Studies					
	IV	NMC/EVS	17UCE340901		2	2			
			17UEC341003A						
п		V. Edn			2	2			
			170105110051	8	30	20			
	T	Languaga	17UGT410004		4	3			
					5	3			
	ш				6	5			
					3	3			
			17 0CH 430208		3	3			
			17UCH430301A	Chemistry of Materials (or)	4	4			
			17UCH430301B	Health and Hygiene					
IV	ш	(ws)	1700014204044	Alliad Dhyraiga II (an)	4	4			
					4	4			
		Allied		· · · · · · · · · · · · · · · · · · ·					
					2	2			
			T7UCH430405B	Allied Biochemistry Practical					
	W VEL		17UFC441004A	Formation of Youth-II (or)	2	2			
	11	v. Ean	17UFC441004B	Religion Doctrine-II	2	2			

			17 UCH530209	Inorganic Chemistry I	5	4				
			17 UCH530210	Organic Chemistry I	5	4				
			17 UCH530211	Physical Chemistry I	4	3				
		Core	@	Chemistry Practical IV	4	@				
		core	@	Chemistry Practical V	4	@				
	Ш	Extra Credit Course	17UCH530502	Extra Credit Course	-	(2)				
V		Core Elective II (WD)	17UCH530302A 17UCH530302B	Selected Topics in Chemistry-I (or) Selected Topics in Chemistry-II	4	4				
		SPL	17UCH530213	Essentials of Chemistry (Partial online course)	-	2				
	IV-V	Core	17UCH430212	Internship (During summer holidays)	-	2				
	IV	SB Elective-I	17UCH540601	Inter-disciplinary Skill Based Course – Food and Nutrition (BS)	2	2				
	IV	IDC	17USS540701A	Soft skills	2	2				
	IV	IDC	17USS540701B	National Cadet Corps (for NCC Cadets)	2	2				
				Total for Semester V	30	23+(2)				
			17UCH630214	Inorganic Chemistry II	5	4				
			17UCH630215	Organic Chemistry II	5	4				
		Core	17UCH630216	Physical Chemistry -II	6	4				
VI						Core	17UCH630217	Chemistry Practical IV	4	4
	III		17UCH630218	Chemistry Practical V	4	4				
VI			17UCH630219	Comprehensive Examination	-	2				
		Core Elective III (WD)	17UCH630303A 17UCH630303B	Chemistry of Biomolecules (or) Pharmaceutical Chemistry	4	4				
	IV	SB Elective II	17UCH640602	Everyday Chemistry (WS)	2	2				
				Total for SEMESTER VI	30	28				
I -VI	V	Shepherd	17UCW651101	Community service Work (SHEPHERD) & Gender studies		5				
				Total Credit for All Semesters	180	150 +(4				

: numbers according to the subject chosen

ctical examination in the following even semester.

#### Programme Outcomes (POs):

- 1. Undergraduate students are to be passionately engaged in initial learning with an aim to think differently as agents of new knowledge, understanding and applying new ideas in order to acquire employability/self-employment.
- 2. Undergraduate students are trained to take up higher learning programmes.
- 3. Undergraduate students are made to be competent and socially responsible citizen of India.

- 4. Undergraduate students are to be exposed to technical, analytical and creative skills.
- 5. Undergraduate students are to be imparted with a broad conceptual background in the Biological sciences / Computing sciences / Languages and culture / Management studies / Physical sciences.

#### **Programme Specific Outcomes (PSOs):**

- 1. Human Values, Ethics and Social Responsibilities in the context of learning Chemistry
- 2. Communicative Skills and the Creative mind towards learning chemistry
- 3. Positive approach towards Environment and Ecology from the Chemistry perspective
- 4. Critical thinking and the Analytical mind, Students develop for the indepth knowledge in Chemistry
- 5. The relevance of extension of Chemistry in the social context for solving social issues
- 6. Employability Skills shall enable the students to find jobs in core-chemistry fields
- 7. Entrepreneurial Skills are developed in students so as to make them start their own industries / business in core-chemistry fields
- 8. Analytical or Experimental Skills make the students capable of doing research tasks in the field of chemistry.

#### பருவம்: 1 17UGT110001

#### மணி நேரம்: 4 புள்ளிகள்: 3

#### பொதுத்தமிழ்-I பாடத்தின் விளைவு

- சமூக மாற்றச் சிந்தனைகளை உள்ளடக்கிய தற்கால இலக்கியப்பரப்பை அறிதல்
- புதுக்கவிதை, சிறுகதை, உரைநடை ஆகியவற்றின் இலக்கியத்திறன் கண்டறிதல்.
- சந்திப்பிழையின்றி எழுதும் திறன் பெறுதல்.
- வாழ்க்கை வரலாற்றுக் கட்டுரைகளை வாசிக்கும் திறன் பெறுதல்.
- அன்றாடப் பயன்பாட்டிலுள்ள ஆங்கிலச்சொற்களுக்குப் பொருத்தமான சொற்களை உருவாக்கச்செய்தல்
- அரசுப்போட்டித் தேர்வுகளுக்கேற்ப தமிழ்மொழியில் பயிற்சி அளித்தல்.

,		- • • •
அலகு-1	மகாகவி பாரதியார் கவிதைகள்	
	பாரதிதாசன் கவிதைகள்	
	நாமக்கல் கவிஞர் கவிதைகள்	
	உரைநடை - முதல் மூன்று கட்டுரைகள்	(12 மணி நேரம்)
அலகு-2	பாவலரேறு பெருஞ்சித்திரனார் பாடல்கள்	
	கண்ணதாசன் கவிதைகள்	
	இலக்கிய வரலாறு (பக். 239- 300)	
	இலக்கணம் -வலிமிகும் இடங்கள்	(14 மணி நேரம்)
அலகு-3	சமூகக்கவிதைகள்	
	இலக்கிய வரலாறு (பக்.300 -362)	
	சிறுகதை - முதல் ஆறு சிறுகதைகள்	(14 மணி நேரம்)
அலகு-4	அரசியல் கவிதைகள்	
	இலக்கணம் - வலி மிகா இடங்கள்	(10 மணி நேரம்)
அலகு-5	மொழிபெயர்ப்புக்கவிதைகள்	
	சிறுகதை- 7 முதல் 12 முடிய உள்ள சிறுகதை	கள்
	உரைநடை- 4முதல் 6 முடிய உள்ள கட்	டுரைகள்
		(10 மணிநேரம்)

#### பாடநூல்

- 1. பொதுத்தமிழ்- செய்யுள் திரட்டு- தமிழாய்வுத்துறை வெளியீடு-2017-2020
- சமூகவியல் நோக்கில் தமிழ் இலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2
- 3. உரைநடை நூல் தமிழாய்வுத்துறை வெளியீடு.
- சிறுகதைத்தொகுப்பு : (நாட்டுடைமையாக்கப்பட்ட படைப்பாளர்களின் சிறுகதைகள்), தமிழாய்வுத்துறை வெளியீடு.

S	Credits	n	Moon Conn of	De la conte	6	4.2	4.2	3.9	4.5	4.0	3.8	4.1
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes	Hours	4	Maan	INCALL								
ecific O					PSO8	5	5	5	5	5	5	Score
ume Spo					<b>FOS</b>	4	4	4	5	5	3	Mean Overall Score
rogram			utcome		90Sd	3	3	3	5	4	4	Mean (
and P ₁	5		ecific <b>0</b>	(PSOs)	<b>PSO5</b>	3	3	3	Э	3	5	
tcomes	he Pape	പ്പിയുള്ളുന്നു.	nme Sp	(PS	PSO4	4	4	4	4	4	4	
me Ou	Fitle of the Paper	oluli (big	<b>Programme Specific Outcomes</b>		PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	5	5	5	5	4	
rogram					PSO2	4	4	3	5	4	4	
mes, Pı					PSO1	5	5	4	5	4	4	
Outco			\$			5	4	3	4	4	4	
Course			utcome		P04	3	3	4	4	4	3	
ix for (	ode	INN	<b>Programme Outcomes</b>	(POs)	PO3	4	5	5	4	5	5	
p Matr	Course Code		Progra		P02	5	5	4	5	5	5	
tionshi	Ŭ	I	-		P01	5	5	4	5	5	5	
Rela	Semester	-	Course	Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

Note:

Result: The Score for this Course is 4.1 (Very High Relationship)

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2		4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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Scali	
ues	$\left  \right $

Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs	
Valu	Mann Scores of COs = Total of Values	Total No. of POs & PSOs	

#### Semestre: I 17UGH110001

#### Hours/Week: 4 Credits: 3

#### **Course Outcomes**

At the end of the course, a student should be able to demonstrate...

HINDI-I

- * Knowledge and understanding of Hindi Conversations
- * Improvement of the writing skills.
- * Knowledge of Grammar forms
- * Effective communicative skills in Hindi.
- * The introduction of socially relevant subjects in Modern Hindi Literature
- * Appreciation the features of Modern Hindi Prose.

#### Unit-I

#### 8 hours

Dr Abdul Kalam, Ling Badaliye, Vachan Badaliye, Baathcheeth-Aspathal Mein

#### Unit-II

#### 12 hours

Hamara Rajchinha, Noun Ling, Kaarak Chinha, Chaar Baayee, Baathcheeth, Dookan Mein

#### Unit-III

#### 12 hours

Moun hee mantra hai, Vachan, Kaarak, Vishwamitra Ka yagna, Baathcheeth, Hotel mein

#### Unit-IV

#### 14 hours

14 hours

Veer Shivaji, Pronoun, Danush Yagna, Baathcheeth-Maidaan mein

#### Unit-V

Rajatilak Kee Thaiyaree, Adjectives, Baathcheeth-Pareeksha ke baare mein

#### **Books Recommended**

- 1. Dakshina Bharathi Hindi Prachar Sabha, Thiagaraya Nagar, Chennai -600 017, Subhodh Hindi Patamala-2, Bharath Milap, Bharath-1, 2016.
- 2. Ramdev, Vyakaran Pradeep, Hindi Bhavan, 63, Tagore Nagar, Allahabad 2,2016.

Hours Credits 4 3	Mean Score of COs		3.2	3.0	2.8	2.9	3.2	3.4
		PSO6	4	2	4	5	3	3
	comes	PSO5	4	m	4	7	3	3
	Programme Specific Outcomes (PSOs)	PSO3 PSO4 PSO5	ю	3	n	4	3	4
aper	mme Specifi (PSO ₃ )	PSO3	2	4	7	4	4	2
Title of the Paper Hindi-I	Progra	PS02	2	4	2	4	4	3
Title		PSOI	2	4	2	4	3	4
		P05	4	2	4	2	3	3
	tcomes	P04	3	3	e C	3	3	4
	Programme Outcomes (POs)	PO3	4	2	2	2	3	4
Course Code 17UGH110001	Progra	P02	4	3	2	2	3	4
Cours 17UGH		P01	4	3	n	3	3	4
Semester I	Course Outcomes	(COs)	C01	C02	C03	C04	CO5	C06

Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	ŝ
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
Valu	Total of Values	Total No. of POs & PSOs
	Maan Soona of COs =	

#### Semestre: I 17UGF110001

#### Heures /Semaine: 4 Credits: 3

#### FRANÇAIS-I

#### **Course Outcomes**

- * Introduire la langue et la culture française aux étudiants
- * Comparer la culture de l'Inde et de la France
- * Familiariser l'étudiant avec le vocabulaire, la grammaire et les conversations se présenter
- * Donner des informations en Français
- * Conjuguer des verbes, Avoir Etre Aller Faire

#### Unit-I: Al'aéroport Kamaraj domestic de Chennai

Saluer, demander et dire le nom, présenter quelqu'un, se présenter, souhaiter la bienvenue a quelqu'un, demander et dire l'identité de quelqu'un. Grammaire : Etre, s'appeler, pronoms sujets, interrogation

#### Unit-II : A l'Université

#### (10 heures)

(10 heures)

Demander comment on se porte, présenter quel qu'un, prendre congé, exprimer, l'appréciation.

Grammaire : Articles définis et indéfinis, genre des noms, adjectifs, présent de l'indicatif : verbes réguliers en er, être avoir, apprendre, prépositions a, en, au, aux.

#### Unit-III : Au café

#### (10 heures)

Dire ce qu'on aime, donner des informations, exprimer l'admiration, demander des informations sur quelqu'un.

Grammaire : Adjectifs interrogatifs, présent de l'indicatif : avoir, verbes en er, savoir, qu'est ce que c'est?, adjectifs possessifs, négation ,adjectifs irréguliers

#### Unit-IV : A la plage

#### (15 heures)

Proposer une sortie, accepter, refuser la proposition

Grammaire : phrases au singulier et au pluriel, pronom indéfini- on, il y a, adjectifs démonstratifs, négation, interrogation, présent de l'indicatif : faire, voir, aller, sortir, connaitre

#### Unit-V: Un concert et chez Nalli

#### (15 heures)

Inviter, accepter, exprimer son incapacité d'accepter, complimenter, parlé au téléphone, demander le prix, protester contre le prix.

Grammaire : Présent de l'indicatif : verbes en er, venir, pouvoir, vouloir, articles contracte, avec, a chez, le futur, interrogation est ce que, adverbes interrogatifs, adjectifs possessifs, accord de l'adjectif, adjectifs exclamatifs, très/trop, présent de l'indicatif : acheter-regarder, l'impératif.

#### Manuel:

- 1. K.Madanagobalane, Synchronie-1, Samhitâ Publication, 2011.
- Livre de référence:
- 1. Annie Berthet /B_atrix Sampsonis/ Catherine Hugot /V_ronnique M Kizirian / Monique Waendendries, Alter Ego A1, Hachette, 2006.
- 2. Yves Loiseau/R_gineM_rieux, Connexions 1, Didier, 2011.

-	Course Code [7UGF110001	Code 10001				Title	Title of the Paper French-I	aper				Hours Credits 4 3	Credits 3
		Progra	Programme Outcomes (POs)	tcomes			Progr	Programme Specific Outcomes (PSOs)	Specific Out (PSOs)	tcomes			
-	POI	P02	PO3	P04	P05	PSO1	PSO2	PS03	PSO4	PSO5	PSO6	Mean Score of COs	core of S
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	e	4	Э	3	e	б	ю	б	2	4	3	3.]	
			а. С		n		к.		Mea	Mean Overall Score	Score	3.	l

81-100% 5 4.1-5.0 Very High

> 4 3.1-4.0 High

3 2.1-3.0 Moderate

2 1.1-2.0 Poor

Very poor

0.0-1.0

Mapping Scale Relation Quality

61-80%

41-60%

21-40%

1-20%

Note:

 $\label{eq:main_source} \mbox{Mean Overall Score for } COs = \frac{Total \ of \ Mean \ Scores}{Total \ No. \ of \ COs}$ 

Total of Values Total No.of POs & PSOs

Mean Score of COs =

Values Scaling:

Semester: I Hou 17UGS110001	urs/Week: 4 Credits : 3
SANSKRIT-I	
Course Outcomes At the end of the course, a student should be able to demonst * Knowledge and understanding of basic Sanskrit grammar * Knowledge and understanding of essential Sanskrit vocab * Introduction of the writing skills * Introduction of Sanskrit Aksharas. * Introduction of Present tense forms * Implementation of good thoughts from Subashitani	
U <b>nit-I</b> Akharavivaranam – Svaras & Vyanjanaani – Samyukta Akshar	<b>8 hours</b> rani.
<b>Unit-II</b> Shabdadayah – Aakaaraanta, ikaar aantah. ukaaraantah. Shabdadayah – Aakaaraanta, iikaar aantah. uukaaraantah.	12 hours
U <b>nit-III</b> Anuvaada Prayogah.	12 hours
U <b>nit- IV</b> Lat Lakarh – Parasmai – Pada Prayogah = Vakyarupah.	14 hours
U <b>nit-V</b> Subhaashitaani	14 hours
<ul> <li>Books Recommended</li> <li>1. Kulapathy, K. M., Saral Sanskrit Balabodh, Bharathiya Vi Munshimarg, Mumbai-400 007, 2014</li> </ul>	idya Bhavan,

- Munshimarg, Mumbai-400 007, 2014
  R.S. Vadhyar & Sons, Book-Sellers and Publishers, Kalpathi, Palghat-678003, Kerala, SOuth India, Shabdha Manjari, 2014
- Balasubramaniam R., Samskrita Akshara Siksha, Vangals Publication, 14th Main Road, JP Nagar, Bangalore -78, 2015.

Semester I	Cours 17UGS	Course Code 7UGS110001				Title S	Fitle of the Paper Sanskrit-I	aper I				Hours 4	Credits 3
Course		Progra	Programme Outcomes (POs)	tcomes			Progra	Programme Specific Outcomes (PSOs)	s Specific Ou (PSOs)	teomes			
Uutcomes (COs)	101	P02	P03	P04	P05	PSOI	PS02	PS02 PS03 PS04 PS05 PS06	PSO4	PSO5	90Sd	Mean Score of COs	n Score of COs
C01	5	3	5	4	4	3	3	3	3	3	4	~	1.
C02	4	e	4	4	4	4	4	4	4	e	4	~	3.3
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C04	4	en.	e	4	æ	æ	4	4	3	£	4		3.0
CO5	4	4	4	ю	4	4	С	e	3	4	4	~	<b>-</b> .
C06	5	4	4	4	4	з	С	ю	3	3	4	~	Γ.
									Mea	Mean Overall Score	Score		

5 4.1-5.0 Very High

4 3.1-4.0 High

> 2.1-3.0 Moderate

1.1-2.0 Poor

0.0-1.0 Very poor

Mapping Scale Relation Quality

81-100%

61-80%

41-60%

21-40%

1-20%

Note:

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total of Values Total No. of POs & PSOs

Mean Score of COs =

Values Scaling:

#### Semester: I 17UGE120101

#### Hours/Week: 5 Credits: 3

#### **GENERAL ENGLISH-I**

#### **Course Outcome**

- * Introduce themselves to the others
- * Narrate simple experiences in a coherent manner
- * Understand the underlying meaning in the text
- * Describe accurately what he/she observes and experiences
- * Converse with friends about their likes and dislikes
- * Write leave letters using the appropriate format and language

#### Unit-I:

- 01. Personal Details
- 02. Positive Qualities
- 03. Listening to Positive Qualities
- 04. Relating and Grading Qualities
- 05. My Ambition
- 06. Abilities and Skills
- 07. Self-Improvement Word Grid
- 08. What am I doing?
- 09. What was I doing?
- 10. Unscramble the Past Actions
- 11. What did I do yesterday?

#### Unit-II:

- 12. Body Parts
- 13. Actions and Body Parts
- 14. Value of Life
- 15. Describing Self
- 16. Home Word Grid
- 17. Unscramble Building Types
- 18. Plural Form of Naming Words
- 19. Irregular Plural Forms
- 20. Plural Naming Words Practice
- 21. Whose Words?

#### Unit-III:

22. Plural Forms of Action Words

- 23. Present Positive Actions
- 24. Present Negative Actions
- 25. Un/Countable Naming Words
- 26. Recognition of Vowel Sounds
- 27. Indefinite Articles
- 28. Un/Countable Practice
- 29. Listen and Match the Visual
- 30. Letter Spell Check
- 31. Drafting Letter
- Non-Detailed:
- "The Merchant of Venice" from Six Tales From Shakespeare

#### Unit-IV:

- 32. Friendship Word Grid
- 33. Friends' Details
- 34. Guess the Favourites
- 35. Guess Your Friend
- 36. Friends as Guests
- 37. Introducing Friends
- 38. What are We Doing?
- 39. What is (s)he / are they Doing?
- 40. Yes / No Question
- 41. What was s/he doing?
- 42. Names and Actions
- 43. True Friendship
- 44. Know your Friends
- 45. Giving Advice/Suggestions
- 46. Discussion on Friendship
- 47. My Best Friend
- Non-Detailed:
- "The Taming of the Shrew" from Six Tales From Shakespeare

#### Unit-V:

- 48. Kinship Words
- 49. The Odd One Out
- 50. My Family Tree
- 51. Little Boy's Request

52. Occasions for Message

53. Words denoting Place

54. Words denoting Movement

- 55. Phrases for Giving Directions
- 56. Find the Destination
- 57. Giving Directions Practice
- 58. SMS Language
- 59. Converting SMS
- 60. Writing Short Messages
- 61. Sending SMS
- 62. The family debate
- 63. Family Today

#### Non-Detailed: "The Tempest" from Six Tales From Shakespeare

#### Textbook

1. Joy, J.L. & Peter, F.M. Let's Communicate 1, New Delhi, Trinity Press, 2014. Print.

#### Non-Detailed Text

1. Dodd, E F. Six Tales From Shakespeare. London: Macmillan, 1987. Print. (First three tales)

							E 9	Title of the Paper General English-I	he Pape English-	r -I				Hours 4	Hours Credits 4 3
es	tcomes	Programme Outcomes (POs)	itcomes				ł	Programme Specific Outcomes (PSOs)	nme Spo (PS	Specific Or (PSOs)	Itcome			Mean Score of	core of
<u> </u>	P04 P0	<u> </u>	<u> </u>		P05	PSO1	PSO2	PSO1 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8	PSO4	PSO5	PSO6	PSO7	PSO8	5	SO
4	4			4	_	5	4	4	4	n	3	4	4	÷.	3.80
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3	3 3	3 3	3 3	З		4	4	3	4	4	5	4	4	3.	3.90
											Mean (	Mean Overall Score	Score	e.	3.85

4.1-5.0 Very High

3.1-4.0 High

2.1-3.0 Moderate

1.1-2.0 Poor

0.0-1.0 Very poor

Scale Relation Quality

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total No. of POs & PSOs Total of Values

Mean Score of COs

Values Scaling:

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Note:

4

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#### Semester I 17UCH130201 CENEDAL CHEMISTRY L

#### GENERAL CHEMISTRY-I

#### **Course Outcomes**

- 1. Students shall explain the behaviour and interactions between matter and energy at both the atomic and molecular levels.
- 2. Students shall use standardized names and symbols to represent atoms, molecules, ions and apply on chemical reactions.
- 3. Students shall predict the atomic structure, chemical bonding or molecular geometry based on accepted models.
- 4. Students shall apply quantitative reasoning skills to matter and energy and also study the physical or chemical changes that occur.
- 5. Students shall use accepted models to describe the reactions between gaseous systems and become aware of their physical properties.
- 6. Students shall demonstrate competence in collecting and interpreting data from their knowledge on analytical techniques.

#### Unit 1: Basic Quantum Chemistry

#### (18 hrs)

Hours/Week: 7

Credit: 4

CGS and SI units – Basic, Derived and Subsidiary Units – Dimensional Analysis – Atomic Structure – Bohr Model – Sommerfield Model – Quantum Mechanical Theory and Atomic Spectra – Duality of Electrons - de Broglie Equation – Photoelectric Effect – Compton Effect – Davisson and Germer Experiment – Heisenberg's Uncertainty Principle – Schrodinger's Wave Equation – Eigen Values – Eigen Functions – Significance of Wave Functions – Radial and Angular Symmetry of Wave Functions – Shapes of Atomic Orbitals – Particle in a Box Model.

#### Unit 2: Periodic Table

(18 hrs)

Mendeleev's periodic classification – Modern Periodic Table – Grouping of Elements in to s, p, d and f blocks – Periodic Properties and their variations – Atomic Radii and their functional forms – Determination of Ionic Radii by Pauling's Method – Slater's Rules – Screening Constant and Effective Nuclear Charge – Ionic Radii of isoelectronic ions – Ionization Energy – Factors influencing the IE – Electron Affinity – Electronegativity – Density – Melting and Boiling Points

#### Unit 3: Covalent Bonding

#### (18 hrs)

Covalent Bonding Concepts – Concept of Hybridization – Types of Hybridizations – sp³, sp² and sp hybridizations with examples – Covalent Bond Properties – Bond Length, Bond Angle, Bond Polarity – Dipole moment – Electronic Effects: Inductive Effect, Mesomeric Effect, Electromeric Effect, Resonance Effect, Hyper conjugative Effect – Isomerism in Organic Molecules – Structural and Stereoisomerism with appropriate examples – Naming of Organic Molecules with one or two functional groups – IUPAC Nomenclature and Rules.

#### Unit 4: Gaseous State

Gaseous State – Kinetic Theory of Gases – Molecular Velocities – Root Mean Square, Average and Most Probable Velocities – Maxwell Law for Distribution of Molecular Speed – Collision Number – Mean Free Path – Fundamental Gas Laws - Universal Gas Equation – The Gas Constant (R) and its units in different forms – Deviation from Ideal Behaviour – van der Waals Equation for Real Gases – Critical Phenomenon – PV Isotherm for Real Gases – Critical Temperature – Critical Volume

#### **Unit 5: Analytical Methods**

(18 hrs)

(18 hrs)

Analytical Chemistry - Chemical Analysis - Types of Chemical Analysis – Qualitative and Quantitative Analysis – Qualitative Inorganic Analysis – Dry Test, Flame Test, Wet Test – Testing of Simple and Interfering Acid Radicals – Elimination of Interfering Acid Radicals – Identifying the Groups of Basic Radicals – Testing of the Basic Radicals belonging to different Groups - Volumetric Analysis – Principle – Standard Solutions – Normality and Molarity – Principles of Titrations – Theory of Indicators - Types of Titrations – Acidimetry, Alkalimetry, Permanganometry, Dichrometry, Iodometry, Argentometry, Complexometry. Error analysis: Accuracy – Precision – Error – Types of Errors – Mean – Median – Mode – Standard Deviation – Variance – Normal Distribution Curve

#### **Text Books**

- 1. Puri B R, Sharma L R and Kalia K K, *Principles of Inorganic Chemistry*, 23rd Ed,. (1993) Shoban Lal Nagin Chand & Co., New Delhi.
- 2. Bhal B S and Arun Bhal, *Advanced Organic Chemistry*, 12th Ed., (1997) Sultan Chand & Co., New Delhi.
- 3. Puri B R, Sharma L R and Kalia K K, *Principles of Physical Chemistry*, 23rd Ed,. (1993) Shoban LalNagin Chand & Co., New Delhi.

#### **Reference Books**

- 1. Lee J D, Concise Inorganic Chemistry, (2006), Black Well Science, UK.
- 2. Morrison R T, Boyd R N and Batcharjee S K, *Organic Chemistry*, 7th Ed., (2009), Pearson New York
- 3. Peter Atkins and Julio De Paula, *Atkin's Physical Chemistry*, (2006), Oxford University Press, New Delhi.

Credits 5	Mean Score of	COS	32	3.2	32	2.9	3.2	3.2	3.1
Hours 7	Mean								
		PSO8	4	4	б	4	3	3	Score
		PSO7	5	S	S	m	4	5	Mean Overall Score
	itcomes	PSO6	4	4	S	4	5	4	Mean (
r TRY-I	cific Ou Os)	PSO5	5	4	2	ŝ	1	2	
Title of the Paper GENERAL CHEMISTRY-I	Programme Specific Outcomes (PSOs)	P03 P04 P05 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	2	4	ю	5	4	4	
itle of tl RAL CI	rogram	<b>PSO3</b>	4	7	4	-	1	3	
GENEI		PSO2	5	-	S	2	5	5	
		PSO1	1	n	1	4	2	1	
		P05	с	2	2	2	1	1	
	itcomes	P04	2	5	ε	-	4	4	
de 201	Programme Outcomes (POs)	P03	4	4	-	7	5	2	
Course Code 17UCH130201	Prograi	P01 P02	2	2	4	2	2	4	
S 5		P01	1	-	ы	S	4	3	
Semester I	Course Outcomes	(COs)	co1	C02	CO3	C04	CO5	CO6	

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Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	e	4	v
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

	Total of Mean Scores	Total No. of COs
/alues Scaling:	Mean Overall Score for COs = Total of Mean Scores	
Valu	Total of Values	Total No. of POs & PSOs

Mean Score of COs

#### Semester I 17UCH130401

#### Hours/Week: 6 Credit: 5

#### **ALLIED MATHEMATICS-I** FOR CHEMISTRY

#### **Course Outcomes**

- 1. Training the students in mastering the techniques of various branches of Mathematics.
- 2. Motivating the students to apply the techniques in their respective major subjects.
- 3. Introducing the basic knowledge of differentiation.
- 4. Understanding the concept of matrices and its applications.
- 5. Solving the problems in trigonometry.
- 6. Application of Leibnitz and Cayley
- 7. Techniques of Linear Equations
- 8. Techniques in Series summations

#### UNIT-I

Partial fractions - Binomial series - Summation of series - Finding terms -Coefficient of  $x^n$  (simple problems only). (Chapter 1 – sec 1.1 – 1.2, pages: 1-27).

#### UNIT-II

Exponential series - Summation - Logarithmic series - Summation.(Chapter 1 - sec 1.3, pages: 28 - 48).

#### UNIT-III

Matrices - Rank of a matrix - Solving simultaneous linear equation in three unknowns using Elementary Operations method - Eigen values and Eigen vectors – Verification of Cayley Hamilton theorem. (Chapter 3- sec 3.2 - 3.4, pages: 137-160).

#### **UNIT-IV**

Higher Derivatives - Formation of equations involving derivatives -Applications of Leibnitz's theorem. (Chapter 6 – sec 6.1, pages: 266 – 281).

#### **UNIT-V**

Expansion of cos q and sin q –Powers of sines and cosines of q in terms of functions of multiples of q. (Chapter 5- sec 5.1 - 5.4, pages: 220 - 242).

ValueLean Score of COs =Total No. of POs & PSOs	Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
	Valu	Total of Values	Total No. of POs & PSOs

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Note:

# Result: The Score for this Course is 3.9 (High Relationship)

C	S	Mean Score of COs		3.54	3.69	3.92	3.60	4.31	4.08	4.00	4.08	3.90
Hours	7	Mean		3	e.	ŝ	3	4	4	4	4	3
			PSO8	4	S	S	4	4	3	5	3	Score
			PSO7	5	4	e	5	5	4	3	5	Verall S
	mistry)	itcomes	PSO6	4	4	ю	4	4	5	3	3	Mean Overall Score
5	or Chei	scific O1 Os)	PSO5	2	2	4	4	3	5	5	4	
he Pape	CS-I (F	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	3	4	ю	3	5	5	ю	5	
Title of the Paper Allied: MATHEMATICS-I (For Chemistry)	EMATI	Progran	PSO3	2	5	4	3	5	3	4	5	
	MATHH P		PSO2	4	ю	5	3	5	4	5	4	
	Allied: N		PSO1	3	3	5	3	4	4	5	3	
			P05	5	4	3	2	2	4	3	3	
		utcomes	P04	4	7	4	4	4	4	3	4	
ode	401	mme Or (POs)	P03	3	5	4	3	4	4	4	4	
Course Code	17UCH130401	Programme Outcomes (POs)	P02	ю	4	ю	3	3	4	4	5	
Ů	171	d	P01	4	n	5	4	5	4	5	5	
Semester	I	Course Outcomes	(COs)	c01	C02	c03	C04	CO5	CO6	CO7	CO8	

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

#### Text Book & References

- 1. Ancillary Mathematics, Vol.-I, 2009 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay, Kandaswamy.
- 2. Engineering Mathematics-M.K.Venkatraman.
- 3. S.Narayanan and T.K.Manicavachagam Pillay, Trigonometry.

Semester I		Hours/Week:2
17UFC141001		Credits: 2
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### ESSENTIALS OF HUMANITY

### **Course Outcome**

- 1. To ensure creating awareness among the youth on human values.
- 2. To ensure educating the youth, the basic principles of value education.
- 3. To ensure the process of analyzing, appreciating and personalizing values as our own.
- 4. To ensure that students develop various dimensions of human personality.
- 5. To ensure the youth empowering the gender sensitization, gender differences and gender roles.
- 6. To ensure preparing the students for the smooth transfer from the stage of teenage to earlier adulthood.

### Unit-I

Principles of Value Education - Introduction - Value Education-Characteristics of Values – Kinds of Values

### Unit-II

Development of Human Personality - Personality traits - Theories of Personality - Discovering self- Defense mechanism - Power of positive thinking

### Unit-III

Dimensions of Human Development - Physical development - Intellectual development - Emotional development - Social Development - Moral development - Spiritual development

### Unit-IV

Responsible Parenthood - Human sexuality - Sex and love - Becoming a spouse - Responsible Parenthood

### Unit-V

Gender Equality and Empowerment - Historical perspective - Education & economic development -Crimes against Women-Women's rights

### Text Book:

Essentials of Humanity, Department of Foundation course, St.Joseph's College, Tiruchirappalli-2, 2016.

Scores COs

Mean No. of

of Total of Total

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Mean Overall Score for COs

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Score of COs

Mean

Total of Values

Values Scaling:

ery High

4.1-5.0

3.1-4.0 High

Moderate

2.1-3.0

1.1-2.0

Poor

ery poor 0.0-1.0

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Relation

Scale

Quality

Mean Overall Score for $COs = \frac{Total of Mean Scores}{Total No. of COs}$	
Total of Values Total No. of POs & PSOs	
Mean Score of COs =	

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20/07	1
	1
1.1-2.0	0.0-1.0 1
	Very poor
	1 0.0-1.0 Very poor

Note:

Hours Credits	3	Mean Score of	COS	4.2	4.4	4.3	.1	.1	.1	4.2	Bosult: The Score for this Course is 4.3 (Very High Beletionshin)
Hours	4	Mean S	5	4	4	4	4	4	4	4	Tich Dol.
			PSO8	4	3	3	б	3	3	Score	[ mon
			PSO7	4	4	4	4	4	4	verall	01.00
		Itcomes	PSO6	2	3	3	б	3	3	Mean Overall Score	Contraction of the second s
L		cific Oi Os)	PSO5	4	4	3	3	3	3		o for thi
Title of the Paper	5ເມີເມຼົ-II	Programme Specific Outcomes (PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	5	4	4	4	4		ho Coor
itle of th	பொதுத்தமிழ்-II	rogram	PS03	5	5	5	5	5	5		T +l m
Η	)		PS02	5	5	5	5	5	5		ď
			PS01	5	5	5	5	5	5		
			P05	4	5	5	4	4	4		
		Programme Outcomes (POs)	P04	4	4	4	ы	3	5		
ode	002	mme Ot (POs)	P03	4	5	4	4	4	5		
<b>Course Code</b>	17UGT210002	Prograi	P01 P02	4	5	5	5	5	5		
ပီ	171		P01	5	4	5	5	5	5		
Semester	Π	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6		

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

### பருவம்: 2 17UGT210002

### மணி நேரம்: 4 புள்ளிகள்: 3

### பொதுத்தமிழ்-II

### பாடத்தின் விளைவு

- சமூக மாற்றச் சிந்தனைகளை உள்ளடக்கிய தற்கால இலக்கியப்பரப்பை அறிதல்
- பக்தி இலக்கியங்களின் வழி இறையியல் கோட்பாடுகளை அறிதல்
- உரைநடைக் கட்டுரை எழுதும் திறன் பெறுதல்- இலக்கணமரபுகளை அறிதல்
- பல்வேறு சமயங்களின் வாழ்வியல் கருத்துக்களை அறிந்து பின்பற்றுதல்
- காப்பியங்களில் உள்ள சமுதாயக் கருத்துக்களை அறிந்துகொள்ளுதல்.
- இதிகாசங்கள் உணர்த்தும் நீதிகளை அறியச்செய்தல். அரசுப்போட்டித் தேர்வுகளுக்கேற்ப பொதுக்கட்டுரைகளும் மொழிப்பயிற்சியும் மாணவர்களுக்கு அளித்தல்.

அலகு: 1	(12 மணி நேரம்)
சிலப்பதிகாரம்	- அந்திமாலைச் சிறப்பு செய்காதை
இலக்கிய வரலாறு	- சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய.
இலக்கணம்	- எழுத்திலக்கணம்
அலகு: 2	(12 மணி நேரம்)
மணிமேகலை	- உலக அறவி புக்க காதை
பெரியபுராணம்	- தடுத்தாட்கொண்ட புராணம்
அலகு: 3	(12 மணி நேரம்)
கம்பராமாயணம்	- கும்பகர்ணன் வதைப்படலம்
உரைநடை	- 7 முதல் 9 முடிய உள்ள கட்டுரைகள்
அலகு: 4	(12 மணி நேரம்)
சீறாப்புராணம்	- மானுக்குப் பிணை நின்ற படலம்
இலக்கணம்	- சொல்லிலக்கணம்
இலக்கிய வரலாறு	- தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள்
	முடிய.
அலகு: 5	(12 மணி நேரம்)
இரட்சணிய யாத்திரிகம்	- மரணப்படலம்
உரைநடை	- 10 முதல் 12 வரையிலான கட்டுரைகள்
பாடநூல்:	
1. செய்யுள் திரட்டு, தமி	ழாய்வுத்துறை வெளியீடு, 2017-10
2. சமூகவியல் நோக்கில்	தமிழ் இலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு,
தூய வளனார் கல்லூ	ரி, திருச்சிராப்பள்ளி-2
· ·	

3. உரைநடை நூல் - தமிழாய்வுத்துறை வெளியீடு.

32

Semestre: II	
17UGH210002	

### Hours/Week: 4 Credits : 3

### HINDI-II

### **Course Outcomes**

At the end of the course, a student should be able to demonstrate...

- their effective communicative skills in Hindi
- the introduction of socially relevant subjects in Modern Hindi Literature
- to appreciate the features of Modern Hindi one act plays and short stories
- the ability to fill in application forms Hindi
- use Hindi vocabulary and grammar patterns in a culturally proper ways.
- the ability to write about famous Hindi authors .

### Unit-I

### 8 hours

12 hours

Paeeksha, Lekak Parichaya, Khani kee Basha – Shyli, Verb, Dhathu, Artha likiye ulte Shabda likiye.

### Unit-II

### 12 hours

Lekak Parichaya Ekanki kee, Basha Shyli, Ander Nagaree, Sankalan Traya, Pareek shaka Khani ke paatra, Kal, Vachya.

### Unit-III

Chief Kee daavath, Ekanki ke Paatra, Ekankikaar, Ne ka Prayog, Adverb

### Unit-IV

14 hours

Do Kalakar, Bahoo kee Vidha, Kahaanikaar, Prepositions, conjunctions

### Unit-V

### 14 hours

Kahani ke paatra, Ekanke ke paatra, lekak parichaya, Interjunctions, Avikari Shabda

### **Books Recommended**

- 1. Dakshina Bharath Hindi Prachara Sabha, Thiagaraya Nagar, Chennai 600 017, Subodh Hindi Patamala-2, Ekanki, Hindi, 2016.
- 2. Ram Dev Hindi Bhavan, Vyakaran Pradeep, 63, Tagore Nagar, Alahabad, 2, 2013.

Course Code 17UGH210002			Title of the Paper Hindi-II	Paper I				Hours Credits 4 3
me Out (POs)	Programme Outcomes (POs)		Progr	Programme Specific Outcomes (PSOs)	Specific Out (PSOs)	comes		
P03	PO4 PC	PO5 PS01	01 PS02	PSO3	PSO4	PS05	PSO6	Mean Score of COs
	3 4	1 3	2	3	4	4	4	3.5
	3	4	4	3	3	7	2	2.8
	3	1 2	4	4	2	e	4	3.0
-	е С	4	ŝ	3	4	m	e	3.0
	3	3	3	4	3	4	3	3.1
	4	4	ŝ	ю	ы	ю	2	3.3
					Meai	Mean Overall Score	Score	3.1

### 35

Very High

4.1-5.0

<u>3.1-4.0</u> High

Moderate

2.1-3.0

1.1-2.0 Poor

ery poor

0.0-1.0

Scale Relation Quality

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Note:

Total of Mean Scores

**Mean Overall Score for COs** 

Total No. of POs & PSOs

Mean Score of COs

Total of Values

Values Scaling:

Total No. of COs

### Course Outcomes * Faire connaissa

Semestre: II

17UGF210002

- * Faire connaissance des journaux, des courriels, des lettres
- * Comprendre les conversations téléphoniques.
- * Décrire quelque chose
- * Demander son chemin
- * Parler des activités du week-end
- * Accepter, refuser, exprimer la certitude.

### Unit-I: Nouvelles de L'inde

### (10 heures)

Heures/Semaine: 4

Credits: 3

Montrer son inquiétude, s'excuser, exprimer son appréciation, décrire quelqu'un, décrire quelque chose

FRANÇAIS-II

**Grammaire:** Présent : verbes en er,-ir, le futur, interrogation totale, féminin d'autres adjectifs.

### Unit-II: A la gare Central station

(10 heures)

Réserver des billets, demander des renseignements, donner des renseignements

**Grammaire:** pronoms compléments d'objet direct, présent l'impératif :payer ,partir/sortir, l'impératif, expression du temps, construction avec infinitif

### Unit-III : Un lit dans la Cuisine

(10 heures)

Donner des ordres, localiser, bire qu'une proposition est stupide ou bizarre **Grammaire :** Verbes en er-ranger, mettre impératif, il faut, devoir +infinitif, prépositions de lieu

### Unit-IV: Pierre apprend a conduire et mangez –vous correctement ? (15 heures)

Rassurer, exprimer l'indirection exprimer l'autorisation, avertir, demander des informations sur les habitudes de quelqu'un, offrir a manger ou a boire, accepter, refuser, exprimer la certitude.

**Grammaire:** impératif-être, avoir, savoir, pronoms compléments d'objet indirect, le passe compose avec avoir expression de la quantité-articles partitifs, adverbes, pronoms directs et indirects, pronom en, présent des verbes –manger, boire ,offrir ,prendre, la condition avec si.

### Unit-V: Ils ont eu tort tous les deux !et Comment as-tu passe le weekend (10 heures)

Demander son chemin, indiquer le cheminin a quelqu'un, reprocher / conseiller, parler des activités du week-end, demander a quelqu'un de se taire

**Grammaire:** le passe compose, adverbes mots interrogatifs, le passe compose avec être, faire du....pouvoir, vouloir.

### Manuel:

1. K. Madanagobalane, Synchronie -1, Samhitâ publication, 2011.

### Livre de référence:

- 1. Annie Berthet / B_atrix Sampsonis / Catherine Hugot / V_ronnique M kizirian / Monique Waendendries, Alter Ego A1, Hachette, 2006
- 2. Yves Loiseau / R_gine M-rieux, Connexions 1, Didier ,2011

Semester	Course	<b>Course Code</b>				Title	<b>Fitle of the Paper</b>	aper				Hours	Credits
Π	17UGF	17UGF210002				-	French-II	_				4	e
Course		Progra	Programme Outcomes (POs)	tcomes			Progra	Programme Specific Outcomes (PSOs)	Specific Out (PSOs)	tcomes			
Outcomes (COs)	P01	P02	PO3	P04	P05	PSOI	PS02	PSO3	PSO4	PSO3 PSO4 PSO5	PSO6	Mean Score of COs	core of )s
C01	4	4	2	3	4	3	з	2	2	3	ю	3.	0
C02	с	m	e	n	4	ю	ŝ	5	2	2	С	2.8	~
CO3	3	7	3	2	4	3	3	2	2	3	3	2.7	-
C04	ю	m	4	ю	4	ю	ю	e	e	e	e	3.2	2
CO5	3	3	4	3	4	2	4	4	4	4	5	3.6	9
CO6	3	4	3	3	3	3	4	4	3	4	4	3.5	5
									Mea	Mean Overall Score	Score	3.1	1

Outcomes Snecific e m Proo hng for Matrix Relationship

Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	0/08-19	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Ouality	Verv noor	Poor	Moderate	High	Verv High

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total No. of POs & PSOs

Ш

Mean Score of COs

Total of Values

### Semester: II 17UGS210002

### Hours/Week: 4 Credits : 3

### SANSKRIT-II Course Outcomes

At the end of the course, a student should be able to demonstrate...

- * knowledge and understanding of basic Sanskrit grammar
- * knowledge and understanding of essential Sanskrit vocabulary
- * knowledge and understanding of the appropriateness of basic Sanskrit structures and expressions in a given context
- * the ability to understand short passages in written Sanskrit on everyday topics
- * the ability to produce short passages in written Sanskrit on everyday topics
- * introduction of basic grammar (Avyaya Imperfect tense and Sandirules. Samasah.)

Unit-I8 hoursVisheshanaah8 hoursSaravanaama shabdas.12 hoursUnit-II12 hoursSandhi Niyamaah Abhyaasah.(Guna, Visarga, Dirgha, Vrddhi)12 hoursUnit-III12 hoursLang lakaarah. Kriyapadaani14 hours

Gopala Vimshathi. (1-10) slokas.

Unit-V 14 hours

Avyayas, Tatpurusha, Karma dhaaraya samaasah.

### **Books Recommended**

- 1. Paundrapuram Ashram, Srirangam -620 006. Gopalavimshathi, 2014
- 2. R.S. Vadhyar & Sons, book Sellers and Publishers, Kalpathi, Palghat-678 003, Kerala, Southe India, Shabdha Manjari, 2014
- 3. Kulapthy, K. M., Saral Sanskrit Balabodh, Bharathiya Vidya Bhavan, Munshimarg, Mumbai 400007, 2014

38

Semester 11	Course	Course Code				Title	Title of the Paper	aper				Hours Credits	Credits
П	1/062	7000120001				ñ	Sanskrit-II					t	n
Course		Progra	Programme Outcomes (POs)	tcomes			Progra	mme Sp (PS	Programme Specific Outcomes (PSOs)	tcomes			
Outcomes (COs)	P01	P02	PO3	P04	P05	PSOI	PS02		PSO4	PSO3 PSO4 PSO5	PSO6	Mean Score of COs	core of )s
C01	5	e	5	4	4	3	ю	3	4	4	e	3.2	5
C02	4	33	4	4	4	3	ю	3	3	4	e	3.0	0
CO3	4	ę	б	4	4	ю	С	e	4	4	e	3.0	0
C04	4	3	3	4	3	3	3	4	4	4	3	3.	0
CO5	4	4	4	ю	4	С	4	4	4	ю	4	3.2	5
CO6	5	4	4	4	4	3	3	3	4	4	3	3.2	2
									Mea	Mean Overall Score	Conro	2	

Specific Outcomes ramme Σ Relatio

Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	0/ 07-1				
Scale	-	2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:	Mean Overall	
Valu	Total of Values	Total No. of POs & PSOs

Total of Mean Scores Total No. of COs

Ш

Mean Overall Score for COs

Mean Score of COs =

### Semester: II 17UGE220102

### Hours/Week: 5 Credits: 3

### **GENERAL ENGLISH-II**

### **Course Outcome**

- * Ask open-ended questions in real-life situations
- * Use polite expressions in appropriate ways
- * Use correct punctuation marks and capital letters
- * Use appropriate vocabulary
- * Put ideas into a cohesive paragraph
- * Develop positive self-esteem and thereby communicate effectively

### Unit-I

- 01. Education Word Grid
- 02. Reading Problems and Solutions
- 03. Syllabification
- 04. Forms for Expressing Quality
- 05. Expressing Comparison
- 06. Monosyllabic Comparison
- 07. Di/polysyllabic Comparison
- 08. The best monosyllablic Comparison
- 09. The best di/polysyllabic Comparison
- 10. Practising Quality Words

### Non-Detailed:

"Julius Caesar" from Six Tales From Shakespeare

### Unit–II:

- 11. Wh Words
- 12. Yes/No Recollection
- 13. Unscramble Wh Questions
- 14. Wh Practice
- 15. Education and the Poor
- 16. Controlled Role play
- 17. Debate on Education
- 18. Education in the Future
- 19. Entertainment Word Grid
- 20. Classify Entertainment Wordlist
- 21. Guess the Missing Letter

- 22. Proverb-Visual Description
- 23. Supply Wh Words
- 24. Rearrange Questions
- 25. Information Gap Questions

### Unit-III:

- 26. Asking Questions
- 27. More about Actions
- 28. More about Actions and Uses
- 29. Crime Puzzle
- 30. Possessive Quiz
- 31. Humourous News Report
- 32. Debate on Media and Politics
- 33. Best Entertainment Source

### Unit-IV:

- 34. Career Word Grid
- 35. Job-Related Wordlist
- 36. Who's Who?
- 37. People at Work
- 38. Humour at Workplace
- 39. Profession in Context
- 40. Functions and Expressions
- 41. Transition Fill-in
- 42. Transition Sord Selection
- 43. Professional Qualities
- 44. Job Procedures
- 45. Preparing a Resume
- 46. Interview Questions
- 47. Job Cover Letter Format
- 49. E-mailing an Application
- 50. Mock Interview

### Non-Detailed:

### "King Lear" from Six Tales From Shakespeare

### Unit-V:

- 51. Society Word Grid
- 52. Classify Society Wordlist

- 53. Rearrange the Story
- 54. Storytelling
- 55. Story Cluster
- 56. Words Denoting Time
- 57. Expressing Time
- 58. What Can You Buy?
- 59. Noise Pollution
- 60. Positive News Headlines
- 61. Negative News Headlines
- 62. Matching Conditions
- 63. What Whould You Do?
- 64. If I were the Prime Minister
- 65. My Dream Country

### Non-Detailed: "Macbeth" from Six Tales From Shakespeare

### Textbook

- 1. Joy, J.L. & Peter, F.M. *Let's Communicate 2*, New Delhi: Trinity Press, 2014. Print.
- **Non-Detailed Text**
- 1. Dodd, E F. *Six Tales From Shakespeare*. London: Macmillan, 1987. Print. (Last three tales)

Hours Credits	Mean Score of	COs	3.9	4.0	3.6	3.8	3.9	3.9	3.8
Hours	Mean	0							
-		PSO8	4	m	4	4	5	4	Core
		PSO7	4	4	4	4	5	4	Veral
	tcomes	PSO6	e	4	ю	5	4	5	Mean Overall Score
	cific O	PSO5	e	4	ю	5	4	4	
Title of the Paper	Programme Specific Outcomes (PSOa)	PO5 PSO1 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8	e	4	4	ω	3	4	
itle of the	Program	<b>FOS</b>	4	4	4	б	3	ю	
ΕC	5	PSO2	4	5	3	4	4	4	
		PS01	5	5	ю	4	4	4	
		P05	4	4	4	4	4	3	
	Programme Outcomes	P04	4	4	4	4	4	ю	
ode	mme Or		4	4	4	б	4	4	
Course Code	Progra	P02	4	n	e	т	3	4	
5 F		P01	5	4	4	4	4	5	
Semester 11	LI Course Outcomos	(COs)	C01	C02	CO3	C04	CO5	C06	

Specific Outcomes rogramme OUTER j Relations

Note:

Result: The Score for this Course is 3.8 (High Relationship)

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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Total of Mean Scores

Ш COS

Score for

**Mean Overall** 

Total No. of POs & PSOs

Mean Score of COs

Total of Values

COs

Total No. of

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Сог	ırse C
1.	Stud
2.	Stud

### r II 230202

### Hours/Week: 5 Credit: 3

### **GENERALCHEMISTRY-II**

### **Dutcomes:**

- lents shall understand the chemistry of alkanes
- dents shall become aware of the fundamental aspects of stereochemistry and its influence on chemical properties
- 3. Students will learn the chemical aspects of Metallurgy
- 4. Students shall become aware of the chemistry of radioactive elements
- 5. Students shall learn the Thermodynamic principles and Thermochemistry aspects
- 6. Students shall learn to apply the concept of thermodynamics in real life context.

### Unit 1: Alkanes

Nomenclature of alkanes and cycloalkanes - Petroleum source of alkanes -Methods of preparing alkanes - chemical properties - Mechanism of free radical substitution in alkanes - Conformational isomerism in ethane and nbutane. Preparation and Properties of Cycloalkanes - Conformational isomerism in cycloalkanes - Baeyer's strain theory - Conformational analysis of cyclohexane, mono-and di- substituted cyclohexane

### **Unit 2: Stereochemistry**

(12 hrs)

(12 hrs)

Stereoisomerism - Types - Geometrical Isomerism - Cis-Trans and Z-E isomerisms - Optical isomerism - Chirality - Optical activity - Measurement of optical activity - Concept of enantiomerism, diastereomerism -Configurational nomenclature - D-L, R-S, erythro-threo conventions - meso and d,l- forms of tartaric acid - Concepts of Racemization and Resolution -Concepts of anomerization and epimerization - Walden Inversion -Asymmetric synthesis –Stereoselective and Stereospecific reactions

### **Unit 3: Metallurgy**

### (12 hrs)

Occurrence of metals in ore-forms - General metallurgical processes: Methods of Dressing of Ore - Hand-picking; Gravity separation; Magnetic concentration; Electrostatic concentration; Floating processes, Calcination, Roasting in Reverberatory and Blast furnaces, Methods of reduction to free metals - Smelting; Heating in air; Treating with Aluminium; Electrometallurgy; Amalgamation; Hydrometallurgy, Fluxing Processes -Acid and Basic fluxes, Refining and Purification processes – Liquation; Distillation; Oxidation; Electro-refining

### **Unit 4: Nuclear Chemistry**

### (12 hrs)

Isotopes – Isobars – Determination of Nuclear masses by JJ Thomson's method, Dampster's Mass spectral method – Packing fraction – Radiations emitted by radioactive substances – Half-life period – Radioactive equilibrium – Soddy-Fajan displacement law – Theory of Radioactivity – Radioactive series – Radioactive isotopes, isobars and isotones – Artificial Transmutation of elements – Induced or Artificial Radioactivity – Release of Nuclear energy: Mass Defect, Binding Energy, Fusion and Fission Reactions – Plutonium and Hydrogen Bombs – Applications of Radioactivity

### **Unit 5: Thermodynamics**

### (12 hrs)

Chemical Thermodynamics – System and Surrounding – Types of systems – Intensive and Extensive Properties – Thermodynamic processes – State and Path functions – Concept of Heat and Work – First Law of thermodynamics – Meaning of Internal Energy, Enthalpy and Heat Capacity – Relationship between  $C_p$  and  $C_v$  – Quantifying the W, q, dU and dH during the reversible and irreversible processes of expansion of ideal and real gases under isothermal and adiabatic conditions – Joule-Thomson effect – Relationship between  $\mu_{JT}$  and other thermodynamic quantities – Calculation of Joule-Thomson coefficient for ideal and real gases – Inversion Temperature – Zeroeth Law of thermodynamics – Absolute Scale of Temperature

### **Text Books**

- 1. Puri, B. R., Sharma L R and Kalia K K, *Principles of Inorganic Chemistry*, 23rd Ed,. (1993) ShobanLalNagin Chand & Co., New Delhi.
- 2. Bhal, B. S. and Arun Bhal, *Advanced Organic Chemistry*, 12th Ed., (1997) Sultan Chand & Co., New Delhi.
- 3. Puri, B. R., Sharma, L. R. and Kalia, K K, *Principles of Physical Chemistry*, 23rd Ed,. (1993) ShobanLalNagin Chand & Co., New Delhi.

### **Reference Books**

- 1. Lee J D, Concise Inorganic Chemistry, (2006), Black Well Science, UK.
- Morrison R T, Boyd R N and Batcharjee S K, Organic Chemistry, 7th Ed., (2009), Pearson New York
- 3. Peter Atkins and Julio De Paula, *Atkins' Physical Chemistry*, (2006), Oxford University Press, New Delhi.

46

Hours Credits 3	Mean Score of	COS	2.92	3.08	3.23	3.08	3.69	3.46	3.24
Ĥ	N	PS08	2	3	4	-	4	4	core
		PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	2	e	4	4	5	3	Mean Overall Score
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r FRY-II	Programme Specific Outcomes (PSOs)	PSO5	2	2	б	2	4	3	
Title of the Paper GENERAL CHEMISTRY-II	nme Spo (PS	PS04	4	4	3	ю	2	4	
litle of t RAL CI	Progran	<b>PSO3</b>	2		2	5	4	4	
GENE		PSO2	с	2	4	4	ю	4	
		PSO1	4	n	4	4	4	3	
	S	P05	2	5	2	7	4	4	
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Course Code 17UCH230202	Progra	PO1 P02 P03 P04	2	2	2	ę	4	2	
σĘ		P01	4	4	4	S	4	3	
Semester II	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

### 47

Scores

Total of Mean

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for COs

**Mean Overall Score** 

Total No. of POs & PSOs

Mean Score of COs

Total of Values

Values Scaling:

Total No. of COs

ery High

High

3 2.1-3.0 Moderate

21-40% 2 1.1-2.0

Poor

ery poor

0.0-1.0

Scale Relation Quality

4.1-5.0

81-100%

61-80% 4 3.1-4.0

41-60%

1-20%

Mapping

Note:

### Semester II 17UCH230203

### Hours/Week: 3 Credit: 4

### CHEMISTRY PRACTICAL-I (Inorganic Qualitative Analysis)

### **Course Outcome**

- * Students shall learn the techniques of semi micro qualitative analysis of inorganic salt mixtures.
- * Students become familiar with elimination of interfering acid radicals.

### Unit-1: Working in Chemistry Lab

Introduction – Personal protection – Nature of Chemicals – Toxic, Corrosive, Explosive, Inflammable, Carcinogenic, other hazardous chemicals – Safe storing and handling of chemicals – Disposal of chemical wastes – Glassware – Handling of Glassware – Handling of different types of equipment's like Bunsen burner, Certifuger, Kipp's Apparatus, etc. – Ventilation facilities – Philosophy of Lab Safety – First-Aid techniques – General work culture inside the chemistry lab- importance of wearing lab coat, eye glasses.

### Unit -2: General Principles of Qualitative Analysis

Principle of Flame testing – Concept of solubility and solubility product – Theory of Acids and Bases – Concept of pH and Buffer action – Commonion effect – Redox reactions – Theory of testing acid radicals (simple and interfering) – Principle of grouping of cations – Theory of testing cations.

### Unit-3: Semi-micro Qualitative Analysis

- 1. Analysis of simple acid radicals: carbonate, sulphide, sulphate, chloride, bromide, iodide, nitrate
- 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, chromate, arsenite
- 3. Elimination of interfering acid radicals and Identifying the groups of basic radicals
- 4. Analysis of basic radicals (group-wise): Lead, copper, bismuth, cadmium, antimony, iron, aluminium, chromium, zinc, manganese, nickel, calcium, strontium, barium, magnesium, ammonium
- 5. Repeating the tests in no. 04.
- 6. Repeating the tests in no. 04.
- 7. Analysis of a mixture-I containing two cations and two anions (of which one is interfering type)
- 8. Analysis of a mixture-II containing two cations and two anions (of which one is interfering type)

- 9. Analysis of a mixture-III containing two cations and two anions (of which one is interfering type)
- 10. Analysis of a mixture-IV containing two cations and two anions (of which one is interfering type)
- 11. Analysis of a mixture-V containing two cations and two anions (of which one is interfering type)
- 12. Analysis of a mixture-VI containing two cations and two anions (of which one is interfering type)
- 13. Analysis of a mixture-VII containing two cations and two anions (of which one is interfering type)
- 14. Analysis of a mixture-VIII containing two cations and two anions (of which one is interfering type)

### Unit-4: Some Applied Experiments (Demonstration only)

- 15. Analysis of water for the presence of ions like calcium, magnesium, iron, sulphate, chloride, fluoride, carbonates.
- 16. Analysis of Cement for the presence of ions like calcium, aluminium, iron, zinc, sulphate, chloride, phosphate
- 17. Analysis of soil for the presence of minerals like potassium, sodium, nitrate, chloride, phosphate.
- 18. Analysis of a binary alloy.

### **Reference:**

 Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & sons, (1997)

### Semester II 17UCH230204

### Hours/Week: 3 Credit: 4

### CHEMISTRY PRACTICAL-II (Volumetric Analysis)

### **Course Outcomes**

- * Students shall learn the techniques of titrimetric analyses.
- * Students will become familiar with safe-handling of chemical balance

### Unit-1: Introduction to Quantitative Analysis

Introduction – Types of Quantitative analyses – Theory of significant figures – Error analysis – Principles of Chemical Balances (double-pan and singlepan) – Apparatus used in titrimetric analysis – Handling of Chemical balances and other apparatus – Concept of Molecular weight, Formula weight, Equivalent weight – Concentrations of solutions – molarity, Formality, Normality, Weight percentage.

### Unit-2: General Principles of Titrimetry (Volumetric analysis)

Principle of titrimetry – Primary and secondary standards – Preparing standard solutions – Standardizing the secondary standard solutions – Types of titrimetric analyses – Principal reactions – Concepts of acids, bases, oxidants, reductants – Theory of Indicators – Calculations for strengths of solutions and the amounts of substances in solutions.

### Unit-3: Titrimetric Quantitative Analysis

- 1. Preparation of a standard solution (Weighing in Chemical balance)
- 2. Making up a given solution and doing a titration
- 3. Preparing a standard solution and doing a titration
- 4. Making up a given solution and doing a double titration
- 5. Estimation of strength of a solution
- 6. Estimation of HCl by NaOH using a standard oxalic acid solution
- 7. Estimation of Na₂CO₃ by HCl using a standard Na₂CO₃ solution
- 8. Estimation of Oxalic acid by KMnO₄ using a standard oxalic acid solution
- 9. Estimation of  $K_2$  Cr₂O₇ by Standard  $K_2$  Cr₂O₇ solution
- 10. Estimation of  $K_2 Cr_2 O_7$  by Thio solution
- 11. Estimation of Iron (II) by KMnO₄ using a standard Mohr's salt solution
- 12. Estimation of KMnO₄ by thio using a standard potassium dichromate solution
- 13. Estimation of Iron (II) by K₂Cr₂O₇ using a standard Mohr's salt solution
- 14. Estimation of Copper (II) sulphate by  $K_2 Cr_2 O_7$  solution
- 15. Estimation of Copper by standard  $CuSO_4$  solution

- 16. Estimation of Magnesium (II) by EDTA solution
- 17. Estimation of Calcium by permanganometry

### **Unit-4: Some Applied Experiments**

- 18. Estimation of Total Hardness of water
- 19. Estimation of Antacid
- 20. Estimation of Bleaching powder

### **Reference:**

- 1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, New Delhi, Second edition, Sultan Chand & sons, (1997).
- 2. Bassett, J. *et al.*, Vogel's Textbook of Quantitative Inorganic Analysis, (4th edition), ELBS Longman, (1985).

Semester II		Hours/Week: 6
17UCH230402		Credit: 5
	ALLIED MATHEMATICS-II	

### **Course Outcomes**

- 1. Training the students in mastering the techniques of various branches of Mathematics.
- 2. Motivating the students to apply the techniques in their respective major subjects.
- 3. Understanding the concept of definite integral.
- 4. Trained to solve the problems in Laplace transforms.
- 5. Solve the problems in differential equations.
- 6. Applications of definite integrals
- 7. Concepts Homogeneous and non homogeneous equations
- 8. Applications of Transforms in Differential equations

### UNIT-I

Integration – Integrals of functions containing linear functions of x – Integrals of functions involving  $a^2 + x^2$  – Integrals of rational algebraic functions – Integration of irrational functions. (Book 1: Chapter 1: sec 6.1, 6.2, 7 (omit 7.4), 8 case (i) to (iv) only, pages: 7–13, 23–31, 39–47)

### UNIT-II

Properties of definite integrals – Simple applications – Integration by parts– Bernoulli's formula – Evaluation of double integrals (omit problems involving changing the order of Integration and applications). (Book 1: Chapter 1: sec. 11, 12, 15, pages: 61 – 72, 93 and 94; Chapter 3: sec. 2.2, pages: 163-170).

### UNIT-III

Differential equations of first order – variable separable – Homogeneous equations – Non-homogeneous equations – Linear equation – Bernoulli's equation. (Book 1: Chapter 4: sec. 1-5, pages 205 – 218).

### UNIT-IV

Second order linear equations with constant coefficients – particular integrals for  $e^{kx}$ , sinkx, coskx,  $x^n$  and  $e^{kx}X$ . (Book 2: Chapter 3: sec. 1-4, pages: 42-60).

### UNIT-V

Laplace transforms – Definition – some general theorems – Inverse transform - solving ordinary differential equations using Laplace transformation. (Book 1: Chapter 7: sec. 7.1 - 7.7, pages 289 - 315).

### **Text Book**

- 1. Ancillary Mathematics, Vol II, 2009 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay, Kandaswamy.
- 2. Ancillary Mathematics Book II: Narayanan, Manicavachagom Pillay.

### References

- 1. Engineering Mathematics M.K. Venkatraman.
- 2. Differential Equations and its applications S.Narayanan, T.K. Manicavachagom Pillay.
- 3. S.Narayanan, T.K. Manicavachagom Pillay, Calculus.

Course Code 17UCH230402			1	Allied: ]	TATEN	Title of the Paper HEMATICS-II (Fo	he Pape CS-II (	Title of the Paper Allied: MATHEMATICS-II (For Chemistry)	emistry)			Hours 7	Hours Credits
ime Out (POs)	0	Programme Outcomes (POs)				Progran	nme Sp (PS	Programme Specific Outcomes (PSOs)	utcome			Mean S	Mean Score of
<u> </u>		P04	P05	PS01	PS02	PSO3	PSO4	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	PSO6	PSO7	PSO8	Э	COs
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		2	4	3	e	S	4	2	4	4	5	3.	3.69
		4	5	4	S	S	S	4	4	5	4	4	4.53
		4	5	3	3	3	3	4	4	5	4	3.	3.60
		4	3	5	5	4	3	4	3	3	5	3.	3.92
		4	4	4	4	3	5	5	5	4	3	4.	4.08
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## Result: The Score for this Course is 3.9 (High Relationship)

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Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
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Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Ouality	Verv DOOF	Poor	Moderate	High	Very High

Scores COs

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11 COs

**Mean Overall Score for** 

Total No. of POs & PSOs

Values

of

Total

11

Mean Score of COs

No.

Total Total

### Semester II 17UCE240802A

Hours/Week: 2 Credit: 2

### **COMPUTER LITERACY**

### **Course Outcomes**

- 1. Understand the basics of Computer Systems
- 2. Familiar with the applications of MS-Office / HTML & CSS
- 3. Know the statistical data analysis using R
- 4. Aware the latest trends and technologies such as Mobile Computing, Big Data and Analytics, Cloud Computing.
- 5. Understand the concepts of social networking sites.
- 6. Knowledge in Cyber Crime and Cyber Ethics.

### **Unit-I: Computer System**

Computer - An Introduction - Hardware Components - Input and Output Technologies - Computer Hierarchy- Software Fundamentals - Systems Software and Os-Application Software-Software Licensing - Open Systems-Open Source Software- Programming Languages- Information Systems-General It Trends.

### Unit-II: (For Non-CS)

Microsoft Word: Introduction - Word Environment - Opening and Creating a New Document - Saving Documents - Proofing Features - Printing a Document - Formatting Text - Working with Shapes and Lists - Line and Paragraph Spacing- Working with Tables - Columns and Ordering- Working with Pictures- Working with Headers and Footers - Using Indents and Tabs - Using Mail Merge.

Microsoft Excel: Introduction - Document Creation - Renaming a worksheet - Office user interface - Open a New Workbook - Columns, Rows, and Cells - Selecting a cell - - Basic data entry, fill handle - - Insert columns - Arithmetic Calculations & Formulas - Excel Formulas- Calculate with Functions -Function Library - Graphs and Charts - Printing the Document.

Microsoft Powerpoint: Starting PowerPoint - Working with Slides - Applying Theme - Animation- Transitions - Views.

### Unit-II: (For CS)

HTML: Introduction - HTML generations - HTML Tags - Headings -Paragraphs - Comments - Line Breaks - Formatting Tags - Hyperlinks -Images - Lists - Tables - Frames - Forms.

CSS: Introduction – Use of External Style Sheet – Defining Styles – Use Relative Sizing – Use Numbered Value for Color.

### **Unit-III: Statistical Data Analysis**

Introduction - R Programming Language - Basic R Commands - Univariate and Bivariate Statistical Measures - Graphic Representation of Statistical Data - Lab Exercise.

### **Unit-IV: SMAC**

Introduction - Understanding the Enterprise of Tomorrow - Social Networking - Mobile Computing - Big Data and Analytics - Cloud Computing

### **Unit-V: Cyber Crime**

Definition - List of Cyber Crimes - Cyber Ethics- Unethical Behaviour -Securing information privacy and confidentiality - Internet Ethics - Indian Information Technology Act - Advantages of Cyber Laws - National e-Governance Plan (NeGP) - eCommerce - Electronic Fund Transfer (EFT)

### **Book for Study**

1. Department of Foundation Course, "Computer Literacy", St. Joseph's College, 2017.

### **Books for Reference**

- 1. Alexis Leon, "Introduction to computers", Vikas Publishing House Pvt. Ltd., New Delhi, 2008.
- 2. Alexis Leon and Mathew Leon, "Introduction to computers with Ms Office 2000", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2005.

Course Code 7UCE240802A					COM	Title of the Paper COMPUTER LITERACY	he Pape LITER	r ACY				Hours Credits 2 2	redits 2
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4	4	1	4	4	4	4	4	ю	4	4	4	4.08	
4	4		4	4	4	4	4	e	4	4	4	3.77	
4	4		4	5	4	4	4	e	4	4	4	4.15	
4	4		4	4	4	4	4	3	4	4	4	4.15	
4	4		4	5	4	4	4	4	4	4	4	4.31	
									Mean (	Mean Overall Score	Score	4.10	

57

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Values Scaling:

Very High

4.1-5.0

3.1-4.0 High

Moderate

Very poor 0.0-1.0

Mapping Scale Relation Quality

2.1-3.0

2 1.1-2.0 Poor

81-100%

61-80%

41-60%

21-40%

1-20%

Note:

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Semester II	
17UFC241002	

### Hours/Week: 2 Credits: 2

### **FUNDAMENTALS OF HUMAN RIGHTS**

### **Course Outcome**

- 1. To ensure acquiring the knowledge about the historical background of human rights.
- 2. To ensure sensitizing the young the values of human rights.
- 3. To ensure the importance of human rights in the Indian context.
- 4. To ensure learning the fundamental duties in the constitution of India.
- 5. To ensure educating the youth in respecting and protecting the rights of every other human being.
- 6. To ensure teaching the youth on the vulnerabilities of women and children.

### Unit-I

Introduction, Classification of Human Rights, Scope of Human Rights, Characteristics of Human Rights, and Challenges for Human Rights in the 21stCentury.

### Unit-II

Human Rights in Pre-World War Era, Human Rights in Post-World War Era, Evolution of International Human Rights Law - the General Assembly Proclamation, Institution Building, Implementation and the Post Cold War Period. The ICC.

### Unit-III

Introduction, Classification of Fundamental Rights, Salient Features of Fundamental Rights, and Fundamental Duties

### Unit-IV

Women's Human Rights, Issues related to women's rights, and Rights of Women's and Children

### Unit-V

Human Rights Violations, Human Rights Violations in India - the Human Rights Watch Report, January 2012, Human Rights Organizations.

### Text Book:

1. Techniques of social Analysis: Fundamentals of Human Rights, Department of Foundation course, St.Joseph's College, Tiruchirappalli, 2015.

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Total

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Score of COs

Mean

Total of Values

Values Scaling:

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High

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Moderate

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Poor

ery poor 0.0-1.0

4.1-5.0

3.1-4.0 High

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Relation Quality

Note:

பருவம்: 3 17UGT310003

### பள்ளிகள்: 3

(12 மணி நேரம்)

(12 மணி நேரம்)

### பொதுத்தமிழ்-III

### பாடத்தின் விளைவு

- செம்மொழியாம் தமிழ் மொழியின் சிறப்பை அறிதல்.
- பண்டை இலக்கியங்கள் உணர்த்தும் அறக்கருத்துகளை அறிதல்
- புதினம் வாயிலாகத் தற்காலச் சமுதாயச் சிக்கல்களையும், அதற்கான தீர்வுகளையும் ஆராயும் திறன் பெறுதல்
- மானுட வாழ்வில் அகம், புறம் பற்றிய பாகுபாட்டை தமிழ்ச்செய்யுள் வாயிலாக அறிகல்.
- தமிழர்களின் ஈகையும் வீரமும் எடுத்துரைக்கும் புறச்செய்திகளை அறிதல்
- நீதிநூல்கள் மனித வாழ்வை செம்மைப்படுத்தும் பாங்கினை உணர்த்துதல்.

### **ച്ച**லகு: 1 (12 மணி நேரம்) நெடுநல்வாடை (முழுமையும்) அலகு: 2 (12 மணி நேரம்) குறுந்தொகை - பாடல்கள் - (32, 323, 305, 290, 168) யாப்பிலக்கணம் (வெண்பா, ஆசிரியப்பா) அலகு: 3 (12 மணி நேரம்) கலித்தொகை - பாடல்கள் - (குறிஞ்சிக்கலி-15, பாலைக்கலி-9, மருதக்கலி-15,

நெய்தற்கலி-22, (ழல்லைக்கலி-07) இலக்கிய வரலாறு - முதற்பாகம் ('தமிழ் மொழியின் தொன்மையும சிறப்பும'

(மதல் 'சங்க தொகை நூல்கள்' (மடிய) புதினம்.

### அலகு: 4

பதிற்றுப்பத்து - பாடல்கள் (12, 24,) புறநானூறு - பாடல்கள் (46, 86, 122, 214, 246) அணியிலக்கணம்

### . എസങ്ര: 5

திருக்குறள் - ஈகை, ஆள்வினை உடைமை, நிறை அழிதல் ஆகிய அதிகாரங்கள் நாலடியார் - இளமை நிலையாமை(11), பிறன்மனை நயவாமை(82), பெருமை(185), அறிவின்மை(254), காமநுதலியல்.(391).

இலக்கிய வரலாறு - சங்க இலக்கியங்களின் தனித்தன்மைகள் முதல் இரட்டைக் காப்பியங்கள் முடிய

60

### பாடநூல்கள்:

- 1. செய்யுள் திரட்டு, தமிழாய்வுத் துறை வெளியீடு (2017-2020).
- 2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை
- 3. புதினம் (ஒவ்வொரு கல்வியாண்டும் ஒவ்வொரு புதினம்). காணாமல் போன கவிதை (2017-18).

<u>e</u>	Course Code 17UGT310003					<u>ة</u> ٦	Title of the Paper பொதுத்தமிழ்-III	he Pape 5.01 ý-H	нП				Hours 5	Credits 3
grami (	lĕĭ	Programme Outcomes (POs)	omes				Programme Specific Outcomes (PSOs)	nme Sp (PS	Specific O (PSOs)	utcome			Mean Score of	core of
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	S.		3	4	5	S	5	5	5	4	e	S	4.	5
	S.		5	4	5	5	5	5	5	4	5	5	4.8	8
	4		4	4	5	S	5	5	5	n	e	S	4.3	3
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Mapping

Scale

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61-80%

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POs & PSOs

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Total

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Score of COs

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Total of Values

Values Scaling:

Very High

4.1-5.0

3.1-4.0 High

Moderate

2.1-3.0

1.1-2.0

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Very poor

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Relation

Quality

Note:

Semestre: III	Hours/Week: 4
17UGH310003	Credits: 3
HINI	)I-III

### **Course Outcomes**

At the end of the course, a student should be able to demonstrate...

- * the ability to enable the students to complete the pre-reading task to comprehend the local and global issues in the lessons.
- * the ability to enable the students to complete the post-reading task centering on Grammar and Skill Development.
- * the relevance of Bhakthi Movement in Hindi Literature.
- * the ability to imagine and write poems.
- * the ability to quote poetry in Speeches.
- * the ability to write friendly and formal letters.

### Unit-I

### 8 hours

Tera Sneh Na Kho oon, Kavi Parichaya, Patra Likne ke Kaaran, Patra Kee Avashyakatha, Sandhi keeiye, Vigrah Keejiye

### Unit-II

### 12 hours

12 hours

14 hours

Ek boondh, Tera Sneh Na Kho oon kavitha kee manovygnaik stiti, Chutti Patra, Sandhi

### Unit-III

Ekloondh Kavitha Ka Uddeshya, Kabir Ke Dohe, Nagar Palika ko Patra,

### Samas

### Unit-IV

14 hours

Vimal Indu Kee Vishal Kiranen, Rahim Ke Dohe, Naukari Keliye Avedan Patra, Upasarga

### Unit-V

Thulasi ke Dohe, Kitab Maangne Keliye Patra, Pratyaya, Kaviparichaya

### **Books Recommended**

- 1. Dakshina Bharath Hindi Prachara Sabha, Thiagaraya Nagar, Subodh Hindi, Paatamala-3, Chennai-600 017, Hindi, 2016.
- 2. DBHP Sabha, T.Nagar, Chennai-600 017, Abihav Patralekhan, 2016
- 3. Ram Dev, Vyakaran Pradeep, Hindi Bhavan, 63 Tagore Nagar, Alahabad 2,2016.

Credits		ore of s								
Hours Credits 4 3		Mean Score of COs	3.6	3.0	3.2	2.9	3.2	3.3	3.2	
		PSO6	4	s	m	4	4	3	Score	
	comes	PSO5	4	e	ŝ	3	3	3	Mean Overall Score	
	Programme Specific Outcomes (PSOs)	PSO4	4	5	n	3	3	3	Mear	
lper	mme Specifi (PSOs)	PSO3	3	e	4	3	3	3		
Title of the Paper Hindi-III	Progra	PSO2	ю	e	ю	3	4	3		
Title H		PSO1	e	e	e	3	e	3		
		PO5	4	2	4	3	ю	3		
	tcomes	P04	3		ę	3	ŝ	4		
	Programme Outcomes (POs)	P03	4	2	ę	2	ю	4		
Code 310003	Progra	P02	4	e	m	2	e	4		

**Relationship Matrix for** 

Course Code 17UGH310003

Semester III

POI

Outcomes (COs)

Course

# elationship)

m | m | m | m

C03 C04 C05

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total No.of POs & PSOs

H.

Mean Score of COs

**Fotal of Values** 

Values Scaling:

		Rel		_		
	a	2 (High I	81-100%	s	4.1-5.0	Very High
3	ll Score	se is 3.	81-		4	Ver
3	Mean Overall Score	his Cour	%0		4.0	ţh
3	Mea	ore for t	61-80%	4	3.1-4.0	High
3		Result: The Score for this Course is 3.2 (High Rel	0%0		3.0	erate
3			41-60%	m	2.1-3.0	Moderate
3		Note:	21-40%		1.1-2.0	Poor
3			21-4	7	1.1-	Po
4			1-20%		0.1-0.0	Very poor
4			1-2		0.0	Very
4						
4			Mapping	Scale	Relation	Quality
CO6						

### Semestre: III 17UGF310003

### Heures /Semaine: 4 Credits : 3

### FRANÇAIS-III

### **Course Outcomes:**

- * Comparer la culture de l'Inde et de la France
- * Familiariser l'étudiant avec le vocabulaire, la grammaire et les conversations
- * Connaître des journaux, des courriels, des lettres
- * Parler des projets de vacances
- * Exprimer l'étonnement
- * Parler de ses projets d'avenir, exprimer l'opposition.

### Unit-I: Un entretien et Au restaurant

### (10 heures)

Demander des informations personnelles à quelqu'un, donner des informations, répondre à une proposition. Réserver une table, demander la carte, commander, apprécier les plats, demander l'addition.

**Grammaire:** Imparfait, Imparfait et passé composé, expression du temps, expression de la conséquence.Le futur, présent des verbes peser, rejoindre, le passé récent, le présent progressif, le futur proche, Restriction-ne...que, moi aussi...

### Unit-II : Enfin les vacances ! et Un autre institut (10 heures)

Raconter son emploi du temps quotidien, parler des projets de vacances, exprimer l'étonnement. Rassurer/consoler, s'indigner

**Grammaire:** Verbes pronominaux, pronom y, quelqu'un/ne...personne, quelque chose/ne...rien, ne...jamais, Déjà/ne...pas encore, chacun, adjectifs indéfinis.Pronoms relatifs, impératif, indicateurs de temps : de...a, a partir de....jusqu'a, depuis, pendant.

### Unit-III : Un Indien célèbre visite la France et Qui dépense plus? (10 heures)

Demander des informations sur quelqu'un, demander une opinion, donner son opinion. Dire à quelqu'un d'être prudent, faire des reproches à quelqu'un, se justifier.

**Grammaire:** Pronoms relatifs composés, pronoms compléments d'objet directs et indirectes, opposition savoir/Connaitre, connecteurs chronologiques, nombre ordinaux.Le comparatif, c'est+ nom+ qui, il reste, encore, il y a, souvent.

### Unit-IV: Penser à son avenir -

(15 heures)

Parler de ses projets d'avenir, exprimer l'opposition.

**Grammaire :** Style direct/indirect, proposition introduite par que, mots d'enchaînement – donc, pourtant.

### Unit-V: L'astrologie (15 heures)

Exprimer des conditions, dire quelque chose n'a pas d'importance, proposer quelque chose.

Grammaire: Le conditionnel – la condition.

### Manuel:

1. K.Madanagobalane, Synchronie-II, Samhitâ Publication, 2011.

### Livre de référence :

- 1. Annie Berthet /B_atrix Sampsonis/ Catherine Hugot /V_ronnique M Kizirian / Monique Waendendries, Alter Ego A1, Hachette, 2006.
- 2. Yves Loiseau/R_gineM_rieux, Connexions 1, Didier, 2011.

Semester III	Course	Course Code				Title	Fitle of the Paper Example III	aper I				Hours Credits	Credits
Course		Progra	Programme Outcomes	tcomes			Progra	mme Sp(	Programme Specific Outcomes	tcomes		F	6
Outcomes (COs)	POI	P02	P03	PO4	P05	PSO1	PS02	PSO3	PSO3 PSO4 PSO5	PS05	PSO6	Mean Score of COs	core of )s
C01	4	4	2	3	4	4	2	3	3	2	2	3.0	0
C02	e	e	3	ю	4	4	2	ю	4	2	e	3.	1
C03	з	7	3	2	4	3	4	3	3	3	3	3.	0
C04	n	e	4	ю	4	2	ю	e	ю	4	4	3.3	6
CO5	з	n	4	3	4	2	ю	ю	4	4	4	3.4	4
CO6	3	4	3	3	3	3	3	3	4	4	4	3.4	4
									Mean	Mean Overall Score	Score	33	~

## comes Relati

Result: The Score for this Course is 3.2 (High Relationship)

Vote:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Total of Mean Scores Total No. of COs

11

Mean Overall Score for COs

Total of Values Total No. of POs & PSOs

Mean Score of COs =

Values Scaling:

Semester: III
17UGS310001

### Hours/Week: 4 Credits: 3

### SANSKRIT-III

### **Course Outcomes**

At the end of the course, a student should be able to demonstrate...

- * Knowledge and understanding of essential Sanskrit vocabulary in a given topic
- * Knowledge and understanding of the appropriateness of basic Sanskrit structures in Slokas
- * Knowledge of the basic Sanskrit poetry.
- * An idea on Epics and Puranas.
- * The usage of Upasargas.
- * The familiarization the history of Sankrit literature Vedas Puranas and Natakas.

U <b>nit-I</b> Romodantam. Balakandam. 1-15	8 hours
Unit-II Romodantam. Balakandam. 15-30	12 hours
Unit-III Vedas – Vedangas. vivaranam.	12 hours
Unit-IV Puranas. Upanishads.	14 hours
TI - 4 X7	141

### Unit-V 14 hours

Upasargas. Bhavishyat Kaalah

### **Books recommended:**

- 1. Parameshwara, Ramodantam, LIFCO, Chaennai, 2015.
- 2. R.S. Vadhyar & Sons, Book-Sellers and Publishers, Kalpathi, Palghat-678003, Kerala, South India, History of Sanskrit Literature, 2015.
- 3. Kulapathy, K.M., Saral Sanskrit Balabodh, Bharathiya Vidya Bhavan, Munshimarg, Mumbai-400 007, 2015.

Semester	Cours	Course Code				Title	Title of the Paper	aper				Hours Credits	Credita
Ш	2001	7065310003				20	Sanskrit-III					4	r
Course		Progra	Programme Outcomes (POs)	tcomes			Progra	mme Sp (PS	Programme Specific Outcomes (PSOs)	tcomes			
Outcomes (COs)	P01	P02	P03	P04	P05	PS01	PSO2	PSO3	PSO3 PSO4	PSO5	PSO6	Mean Score of COs	core of )s
C01	s	m	5	4	4	ю	e	e	e	n	4	3.1	
C02	4	3	4	4	4	4	3	3	3	4	4	3.	1
CO3	4	3	3	4	*	4	4	4	3	3	4	3.	1
C04	4	e	3	4	ŝ	4	4	4	3	4	4	3.	1
CO5	4	4	4	3	4	3	3	4	3	4	4	3.	1
CO6	5	4	4	4	4	3	3	3	3	4	3	3.	1
									Mea	Mean Overall Score	l Score	3.1	1

## comes ú Relatio

Result: The Score for this Course is 3.1 (High Relationship)

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Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High
		Values Scaling:	Scaling:		

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total No. of POS & PSOS

Total of Values

Ш

Mean Score of COs

### Semester: III 17UGE320103

### Hours/Week: 5 Credits: 3

### **GENERAL ENGLISH-III**

### **Course Outcome**

- * Comprehend the local and global issues through the lessons
- * Do the tasks centering on skill development and enhance their Grammar Using and Writing Skills
- * Use interactive skills
- * Train and develop the Listening and Reading Skills of the learners through teacher-led reading practice
- * Enhance their Listening, Reading, Speaking, and Writing Skills
- * Develop their Creative and Critical Thinking and Speaking Skills

### Unit-I: *Suggestions to Develop Your Reading Habit

- 1.0 Introduction
- Objectives 1.1
- Listening and Reading Skills through Teacher-led Reading Practice 1.2
- Glossary 1.3
- 1.3.1 Words
- 1.3.2 Phrases
- Reading Comprehension 1.4
- Critical Analysis 1.5
- Creative Task 1.6
- General Writing Skill: Letter Writing: Informal 1.7
- Grammar: Simple Present Tense 1.8
- Non-Detailed Text: Dickens, Charles. Hard Times. 1.9

### Unit-II: *The Secret of Success: An Anecdote

- 2.0 Introduction
- Objectives 2.1
- Listening and Reading Skills through Teacher-led Reading Practice 2.2
- Glossary 2.3
- 2.3.1 Words
- 2.3.2 Phrases
- Reading Comprehension 2.4
- Critical Analysis 2.5
- Creative Task 2.6
- General Writing Skills: Letter Writing: Formal 2.7

- 2.8 Grammar: Present Continuous Tense
- 2.9 Non-Detailed Text: Dickens, Charles. Hard Times.

### Unit-III: *The Impact of Liquor Consumption on the Society

- 3.0 Introduction
- 3.1 Objectives
- 3.2 Listening and Reading Skills through Teacher-led Reading Practice
- 3.3 Glossary
- 3.3.1 Words
- 3.3.2 Phrases
- 3.4 Reading Comprehension
- 3.5 Critical Analysis
- 3.6 Creative Task
- 3.7 General Writing Skills: Letter to Newspaper
- 3.8 Grammar: Simple Past Tense
- 3.9 Non-Detailed Text: Dickens, Charles. Hard Times.

### Unit-IV: * Dr. A.P.J. Abdul Kalam: A Short Biography

- 4.0 Introduction
- 4.1 Objectives
- 4.2 Listening and Reading Skills through Teacher-led Reading Practice
- 4.3 Glossary
- 4.3.1 Words
- 4.3.2 Phrases
- 4.4 Reading Comprehension
- 4.5 Critical Analysis
- 4.6 Creative Task
- 4.7 General Writing Skill: Write a letter applying for a job
- 4.8 Grammar: Past Continuous Tense
- 4.9 Non-Detailed Text: Dickens, Charles. Hard Times.

### Unit-V: *Golden Rule: A Poem

- 5.0 Introduction
- 5.1 Objectives
- 5.2 Listening and Reading Skills through Teacher-led Reading Practice
- 5.3 Glossary
- 5.3.1 Words
- 5.3.2 Phrases

- 5.4 Reading Comprehension
- 5.5 Critical Analysis
- 5.6 Creative Task
- 5.7 Grammar: Simple Future Tense
- 5.8 General Writing Skill: Circular-Writing
- 5.9 Non-Detailed Text: Dickens, Charles. Hard Times.

### Unit-VI: *Hygiene

- 6.0 Introduction
- 6.1 Objectives
- 6.2 Listening and Reading Skills through Teacher-led Reading Practice
- 6.3 Glossary
- 6.3.1 Words
- 6.3.2 Phrases
- 6.4 Reading Comprehension
- 6.5 Critical Analysis
- 6.6 Creative Task
- 6.7 General Writing Skill: Writing an Agenda for a Meeting
- 6.8 Grammar: Future Continuous Tense
- 6.9 Non-Detailed Text: Dickens, Charles. Hard Times.

### Textbook

1. Jayraj, S. Joseph Arul et al. Trend-Setter: An Interactive General English Textbook for Under Graduate Students. New Delhi: Trinity, 2016. Print.

### **Non-Detailed Text:**

1. Dickens, Charles. Hard Times. Wordsworth: Printing Press, 1854. Print.

Hours Credits	Mean Score of	50	4.84	4.92	4.92	4.84	4.84	4.84	4.86
Hours 5	Mean		4	4	4	4	4	4	4
		PSO8	4	4	4	4	4	4	Score
		PSO7	5	5	5	5	5	5	Mean Overall Score
	itcomes	PSO6	5	5	5	5	5	5	Mean C
r II	cific Oı Os)	PSO5	5	5	5	5	5	5	
he Pape nglish-I	Programme Specific Outcomes (PSOs)	PO3 P04 P05 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	5	S	5	5	5	5	
Title of the Paper General English-III	rogran	PSO3	5	S	5	5	5	5	
T Ge	Η	PSO2	5	S	5	5	5	5	
		PSO1	5	S	5	5	5	5	
		P05	4	S	5	4	4	4	
	atcomes	P04	5	S	5	5	5	5	
de 103	Programme Outcomes (POs)	P03	5	5	5	5	5	5	
Course Code 17UGE320103	Prograu	P02	5	5	5	5	5	5	
C0 17U		P01	5	S	5	5	5	5	
Semester III	Course Outcomes	(COs)	c01	C02	CO3	C04	CO5	CO6	

Intromes

Result: The Score for this Course is 4.86 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	-	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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### Mean Overall Score for COs

Total No. of POs & PSOs

Total of Values

Mean Score of COs

Total of Mean Scores

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No. of

Total ]

### Semester III 17UCH330205

### Hours/Week: 4 Credit: 3

### **GENERAL CHEMISTRY-III**

### **Course Outcomes**

- 1. Students learn synthetic methodology and chemical modifications of alkenes, dienes and alkynes.
- 2. Students know the chemical processes involved in polymerization and learn the chemistry of Natural Rubber.
- 3. Students learn how to use these natural and synthetic polymers.
- 4. Students understand the efficient way of converting work in to energy and vice versa from the Thermodynamics perspective.
- 5. Students get to know the energy changes involved in the natural and the industrial processes - that are the applications of Thermodynamics.
- 6. Students understand the method of enhancing the efficiency of the certain industrial processes.

### Unit 1: Alkenes

### (12 hrs)

Nomenclature - Geometrical Isomerism - Petroleum source of alkenes and aromatics - General methods of preparation of alkenes - Elimination mechanisms (E,, E, CB) – Electrophilic addition- General mechanism -Addition of HX(Markovnikov and Anti- Markovnikov's)- Addition of bromine-Addition of water (Oxymercuration-Demercuration, Hydroborationoxidation)- Hydroxylation(Syn- and anti-dihydroxylation)- Reduction - Diels-Alder reaction- ozonolysis.

### **Unit 2: Dienes and Alkynes**

(12 hrs)

Dienes: Types-MO of conjugated diene- General methods of preparation of Dienes - Physical properties - 1,2-1,4- addition of HX to conjugated dienesozonolysis

Alkynes: Nomenclature-General methods of preparation of alkynes -Physical properties - Electrophilic addition of HX, water (Markovnikov and Anti- Markovnikov's), Hydrogen (to form Z-&E-alkenes)-Diels-Alder Reaction - Deprotonation: formation of alkynyl anions - ozonolysis

### Unit 3: 's' Block elements

### (12hrs)

Position of Hydrogen in the periodic table- isotopes of hydrogen- ortho and para hydrogen. s-block elements - alkali metals-general characteristics similarities in properties- anomalous behaviour of Li-diagonal relationship between Li and Mg-oxides, hydroxides, halides of alkali elements -Alkaline earth metals- general characteristics- similarities in properties-anomalous behaviour of Be- diagonal relationship between Be and Al-comparison of alkali and alkaline earth elements.

### Unit 4: Thermodynamics II

### (12 hrs)

Second law of Thermodynamics – limitations of I law – Different statements of II law - spontaneous process – Carnot's cycle and its efficiency, Carnot theorem – Entropy – Entropy as a function of P,V and T- Entropy change in phase change – Entropy of mixing – Entropy as a criterion of spontaneous and equilibrium processes in isolated systems-significance of entropy – Gibbs function(G) – Helmholtz function(A) as thermodynamic quantities -  $\Delta A$  and  $\Delta G$  as criteria for thermodynamic equilibrium and spontaneity – Their advantage over entropy change – Variation of  $\Delta A$  and  $\Delta G$  with P,V and T – Gibbs Helmholtz equations and their applications – Thermodynamic equation of state – Maxwell's relations

### Unit 5: Thermodynamics III

### (12 hrs)

Equilibrium constant and free energy change - Thermodynamic derivation of law of mass action – Kp, Kc of  $NH_3$ ,  $PCl_5$  and  $CaCO_3$  system – Thermodynamic interpretation of Le Chatelier principle (concentration, Temperature, Pressure) - addition on inert gases – Reaction isotherm – van't Hoff equation – van't Hoff isochore – Clapeyron equation – Clausius Clapeyron equation and applications- Statement of third law –Nernst heat theorem and apparent exceptions to third law.

### **Textbook:**

- Bahl B.S. and ArunBahl, *Advanced Organic Chemistry*, (12th edition), New Delhi, Sultan Chand & Co. (1997).
- Puri B.R., Sharma L.R., Kalia K.K., *Principles of Inorganic Chemistry*, (40th edition) New Delhi, Shoban Lal, Nagin Chand & Co. (2000).
- 3. Puri B.R., Sharma L.R., Pathania M.S., *Principles of Physical Chemistry*, (40th edition), New Delhi, ShobanLal, Nagin Chand & Co. (2000).

### **Reference:**

- 1. Morrison R.T. and Boyd R.N., *Organic Chemistry* (6th edition), New York, Allyn & Bacon Ltd. (1976).
- 2. Lee J.D., *Concise Inorganic Chemistry*, UK, Black well science (2006)
- 3. Peter Atkins and Julio De Paula, *Atkins' Physical Chemistry*, (2006) Oxford University Press, New Delhi.

the Paper HEMISTRY mme Specifi (PSOs) (PSOs) 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Title of the Paper           Frogramme Specific Outcomes           PSO2         PSO3         PSO4         PSO5           PSO2         PSO3         PSO4         PSO5           PSO2         PSO3         PSO4         PSO5         PSO6         2         4         4         3         3         4         2         2         4         4         4         4         3         3         4         4         2         3         4         4         3         3         4         4         3         3         4         4         3         3         4         4         3         3         4         4         3         3         4         4         3         3         4         4         3         3         4         4         3         3         4         4         3         3         4         3         3         4         3         3         4         3         3         3         4         3         3         4         3         3         4         3         3         3         4         3         3         <	Title of the PaperGENERAL CHEMISTRY-IIIFrogramme Specific O(PSO3PSO1PSO3PSO4124412441124223412341234	GENE           POS         PSO1         PSO2           2         1         2           2         2         2           4         1         1           4         2         2         2           2         1         2         2           2         1         2         2           2         1         2         2           2         1         2         2           2         1         2         2           2         1         2         2	Outcomes           0s)         0d           03         PO4           03         PO4           03         3           03         2           1         3           2         3           2         2           2         2           2         3	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$
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# Result: The Score for this Course is 3.29 (High Relationship)

Scores

Total of Mean

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Mean Overall Score for COs

Total of Values Total No. of POs & PSOs

Score of COs

Mean

Values Scaling:

No. of COS

Total ]

Very High

4.1-5.0

3.1-4.0

High

Moderate

2.1-3.0

1.1-2.0

Poor

Very poor

0.0-1.0

Relation

Scale

Quality

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Note:

75

### Semester III Hours/Week: 4 17UCH330206 Credit: 3 ESSENTIALS OF *p*-BLOCK ELEMENTS

### **Course Outcomes**

- 1. Students learn about basic introduction of boron, carbon, nitrogen, oxygen, halogen and noble gas group family elements.
- 2. Students learn about structure and shape of boron, carbon, nitrogen, oxygen, halogen and noble gas group family elements.
- 3. Students learn about reducing and oxidizing nature of boron, carbon, nitrogen, oxygen, halogen and noble gas group family elements.
- 4. Students learn about polymerization and dimerization nature of boron, carbon group family elements.
- 5. Students learn about acidic, basic, complex formation of nitrogen group family elements and learn about paramagnetic, diamagnetic and coloring nature of nitrogen and oxygen group family elements.
- 6. Students learn about the formation of hydrides, halides and oxides nitrogen, oxygen, halogen group family elements.

### Unit I: Boron group elements

### (12 Hours)

General Characteristics of Boron group elements with reference to electronic configuration, oxidation states, metallic character and inert pair effect - Diagonal relationship between B and Si. Acid strength of trihalides of boron – structure of diborane and borazole. Preparation, properties and structures of ortho boric acid. Borax bead test. Dimeric structure of AlCl₃ – Zintl phases

### Unit II: Carbon group elements

### (12 Hours)

General characteristics of carbon group elements with reference to electronic configuration, oxidation states, metallic character, inert pair effect and catenation. Allotropy- structure of graphite and diamond. Differences between  $CO_2$  and  $SiO_2$ . Differences between  $CCl_4$  and  $SiCl_4$ . Preparation, properties and uses of silicon carbide and silicones. Reducing character of stannous chloride – Silicates and their types

### Unit III: Nitrogen group elements

(12 Hours)

Differences between nitrogen and rest of the family members - A comparative study on hydrides, halides and oxides of nitrogen group elements. Structure and basic character of ammonia. Oxyacids of nitrogen ( $HNO_2$ ,  $HNO_3$ ) and phosphorous ( $H_3PO_3$ ,  $H_3PO_4$  and  $H_4P_2O_7$ ). Preparation, properties and structure of hydrazine

### Unit-IV: Oxygen group elements

(12 Hours)

Anomalous behaviour of oxygen- paramagnetic nature of oxygen – Structure, preparation, properties, and uses of sulphuric acid, Caro's acid, Marshall's acid and oleum- Oxides: classification of oxides based on chemical behaviour - acidic oxides, basic oxides, amphoteric oxides and neutral oxides. Classification of oxides based on oxygen content – normal oxides, peroxides, superoxides, dioxides, sub oxides and mixed oxides. Structure, preparation, and oxidizing and reducing properties of hydrogen peroxide

### Unit V: Halogens and Noble gases

(12 Hours)

Peculiarities of fluorine - Hydrides, oxides and oxy acids of halogens. Structure, preparation, and hydrolysis of inter halogen compounds. Pseudo halogens-chemical reactions. Position of noble gases in the periodic table - Isolation from atmosphere - general Characteristics- Structure and shape of xenon compounds – XeF₄, XeF₄, XeF₆, XeO₃ and XeOF₄.

### Textbook

 Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, Shoban Lal, Nagin Chand & Co., (1993).

### References

- Lee, J. D Concise Inorganic Chemistry, 5th Edition, UK, Black Well Science (2006).
- 2. Atkins P, Overton T, Rourke J, Armstrong F and Weller M. Inorganic Chemistry, 5th Edition. Oxford University Press, 2011.

Course Code 17UCH330206	Title of the Paper         Hours         Credits           ESSENTIALS OF P-BLOCK ELEMENTS         5         4
e Outcomes	
(POs)	Mean Score of
PO1 PO2 PO3 PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	5 PSO6 PSO7 PSO8
4 5 2 4 5 2	5 4 3
5 5 2 5 4 3	4 5 4
5 5 2 4 5 2	5 4 3
5 5 3 5 4 3	4 5 4
<b>5 5 3 4 5</b> 2	5 4 3
4 5 2 4 5 2	5 4 3
	Mean Overall Score

Result: The Score for this Course is 3.73 (High Relationship)

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Overall Score for COs

Total No. of POs & PSOs

**Fotal of Values** 

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Mean Score of COs

Scores COs

Mean No. of

tal of Total N

Total

### Semester III 17UCH330403A

### Hours/Week: 4 Credit: 4

### Allied: PHYSICS-I

### **Course Outcomes:**

- 1. Know the Physics behind sound: its properties and applications.
- 2. Learn the physics and properties of liquids.
- 3. Learn the physics and properties of solids
- 4. Know and understand the experimental and principles of thermal physics.
- 5. Learn the basics of electricity and magnetism and the components associated with electric circuits.
- 6. Understand the working of various optical instruments and different image defects.

### **Unit-I: WAVES AND OSCILLATIONS**

(12 Hrs)

Simple harmonic motion and circular motion – composition of two simple harmonic motions at right angles (periods in the ratio1:1) – Lissajou's figures - uses - Laws of transverse vibrations of strings - verification of Melde's string - transverse and longitudinal modes - determination of a.c. frequency using sonometer (steel and brass wires) - Ultrasonics - production application and uses - reverberation - factors for good acoustics of hall and auditoriuim.

### **Unit-II: PROPERTIES OF MATTER** (12 Hrs)

Elasticity: Elastic constants - bending of beams - expression for bending moment - Young's modulus by non-uniform bending - energy stored in a stretched wire - torsion in a wire - determination of rigidity modulus by torsional pendulum.

Viscosity: Coefficient of viscosity - Poissuelle's formula - Comparison of viscosities - burette method - Stoke's law - terminal velocity - viscosity of highly viscous liquids.

Surface tension: Molecular theory of surface tension – excess pressure inside a drop and bubble - variation of surface tension with temperature.

### **Unit-III: THERMAL PHYSICS**

(12 Hrs)

Joule-Kelvin effect - Porous plug experiment - theory of Porous plug experimentLiquefaction of gases - Linde's process - Helium I and II adiabatic demagnetisation. Thermodynamic equilibrium - laws of thermodynamics - entropy - change of entropy in reversible and irreversible processes.

### Unit-IV: ELECTRICITYAND MAGNETISM

(12 Hrs)

Capacitor – energy of charged capacitors – loss of energy due to sharing of charges – Biot–Savart's law – magnetic induction at a point on the axis of a circular coil carrying current – RMS values of a ac current and voltage – Electric circuit – switch and its types – fuses – circuit breaker – Relays.

### **Unit-V: GEICS**

### (12 Hrs)

Refraction – Normal refraction – Refractive index by microscopy – air cell – refraction through a prism and thin prism – Spectrometer– determination of refractive index – combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion – direct vision spectroscope – defects of images – coma, Distortion – spherical and chromatic aberration in lenses.

### **Book for Study**

1. R. Murugesan (2005) Applied Physics, First edition, S Chand and Co., New Delhi.

Unit	Section
I	1.1, 1.3, 1.4, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14,
1	1.15, 1.17
	2.1,2.2,2.4,2.5,2.6,2.7,2.8,2.9,2.12,2.13,2.15,2.17,2.19,2.2
II	0,2.21,2.22,2.24,2.25,
	2.27,2.28,2.30
Ш	3.4,3.5,3.6,3.8,3.9,3.11,3.12,3.13,3.15,3.16,3.17,3.18,3.20,
111	3.21,3.22
IV	4.1,4.2,4.3,4.5,4.6,4.9,4.12,4.16,4.17,4.18,4.19,4.20
V	5.1,5.3,5.5,5.6,5.10,5.13,5.15,5.14,5.16,5.17,5.18,5.22

### **Books for Reference:**

- D. Halliday, R. Resnick, J. Walker. Fundamental of Physics, 9th edition, John Wiley & Sons, 2010.
- 2. M.E. Schaltz, Groh's Basic Electronics, McGraw Hill, 11th edition, 2011.

Cre	0.000	Score	50	3.15	3.15	3.15	3.31	3.31	3.46	3.26		
Hours Cre	Moon	Mean Score		(7)	е) (	с, ,	6,	e,	сı	(*)		
			PSO8	3	e	m	3	4	3	Score		
			PSO7	2	2	2	2	2	2	Mean Overall Score		
	utcomes		PSO6	1	1	-	1	1	2	Mean (		
s-1 S-1	ecific O	(PSOs)	PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	3	4	4	4	3	4			
he Pape HYSIC	nme Sp	ST)	PSO4	3	e	m	3	3	3			
Title of the Paper ALLIED PHYSICS - I	Progran	les Programme Specific Outcomes (PSOs)	Progra	PSO3	8	3	n	3	3	4		
						3	4	4	5	5	5	
				PSO1	2	4	S	5	5	4		
	Sa			5	5	S	5	5	5			
	utcomes		P04	3	2	n	2	3	3			
ode 103A	mme O	Programme Outcomes (POs)	Programme Ou (POs)	Programme O (POs)	P03	2	с	-	2	2	2	
Course Code 17UCH330403A	Progra				r rogra	P02	3	3	n	3	3	3
17U 17U			P01	5	4	4	5	4	5			
Semester III	Course	Outcomes	(COs)	c01	C02	CO3	CO4	CO5	CO6			

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Very High

4.1-5.0

3.1-4.0

2.1-3.0 Moderate

1.1-2.0

Poor

ery poor

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Relation Quality

4

High

5

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Scale

Note:

Total of Mean Scores

Mean Overall Score for COs =

Total of Values Total No. of POs & PSOs

Mean Score of COs

Values Scaling:

Total No. of COs

Semester III	
17UFC340901	
	ENVIRONMENTALSTUDIES

### **Course Outcome**

1. To ensure understanding the significance of environment in which we live.

Hours/Week: 2 Credits: 2

- 2. To ensure imparting knowledge on the recent issues associated with environment.
- 3. To ensure educating the youth the causes and consequences of various types of pollutions.
- 4. To ensure sensitizing the youth the increasing threats to nature and the misery mankind faces.
- 5. To ensure the limitations of the available natural resources and the need to sustain them.
- 6. To ensure imparting the knowledge on the concept of biodiversity and its advantages.

### **Unit-I: Environmental Studies**

Environment - Scope and Importance - Environmental Movements in India -Eco-feminism - Public Awareness.

### Unit-II: Natural Resources

Food Resources - L and Resources - Forest Resources - Mineral Resources - Water Resources - Energy Resources

### Unit-III: Ecosystems, Biodiversity and Conservation

General structure - Functions of ecosystem - Energy flow and ecological pyramids - Biodiversity and conservation - Hot spots of Biodiversity -Endangered and Endemic Species - Value of Biodiversity - Threats to Biodiversity - Conservation of Biodiversity

### **Unit-IV: Environmental Pollution**

Air pollution - Water pollution - Oil pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Radiation pollution

### Unit-V: Environment, Human Population & Social Issues

Human population growth - Urgent steps required for sustainable development - Conserving water - Current Environmental Issues

### **Text Book:**

1. Environmental studies, Department of Foundation course, St. Joseph's College, Tiruchirappalli-2, 2015.

Hours Credits	Mean Score of	80	4.0	4.5	2 4.0	4.2	4.3	1 3.7	re 4.1
		DSI PSO		4	0		4	4	Mean Overall Score
	s	<b>PSC</b>	4	4	4	4	ŝ	2	Overa
S	utcome	PSO6	3	4	б	4	5	3	Mean
TUDIE	Specific O (PSOs)	PSO5	S	4	n	S	4	4	
he Pape (TAL S	nme Sp (PS	PSO4	4	5	5	4	4	3	
Title of the Paper ONMENTAL ST	Programme Specific Outcomes (PSOs)	PSO3	4	5	4	5	5	3	
Title of the Paper ENVIRONMENTAL STUDIES		PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	5	4	4	5	4	
-		PSO1	S	4	5	4	e	4	
			e	4	n	4	4	e	
	utcome	P04	5	5	5	4	5	4	
901	Programme Outcomes (POs)	P03	5	5	5	4	4	4	
Course Code 17UFC340901	Progra	P02	5	4	4	4	5	5	
5 1 1 0		P01	5	5	5	5	5	5	
Semester III	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	C06	

Note:

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Mean Overall Score for

Total No. of POs & PSOs

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Total of

Score of COs

Mean

Values Scaling:

Very Hig

Moderate

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1-2.0 Poor

ery poor 0.0 - 1.0

5.0

4.0

81-100%

61-80%

41-60%

Mapping Relation Quality

### Semester III 17UFC341003A

### Hours/Week: 2 Credits: 2

### FORMATION OF YOUTH-I

### **Course Outcome**

- 1. To expose the students to the presence of unjust structures in society
- 2. To ensure that students to acquire social ethics and social responsibility.
- 3. To ensure the students learn to face the global challenges with determination.
- 4. To ensure living with integrity in personal life and the responsibilities in public life.
- 5. To ensure preparing the students to seek amicable solutions to common problems.
- 6. To ensure training the students to inculcate business ethics.

### Unit-I:

### **Introduction to Social Ethics**

Social ethics, Social ethics and Social responsibility, Social ethics play an important role of the areas, Religion influences social changes and vice versa, Social ethics and corporate dynamics, Forms of social ethics

### Unit-II:

### The Economic and Political Systems of Today

Planned Economy and Communism, Feudalism, Market Economy and Capitalism, Socialism, Mixed Economy, The Emerging Market Economy, Political System, Totalitarian System, Oligarchic System

### Unit-III:

### Characteristics of a New World

Global Challenges, The Future is with the Educated Youth, Cost of the Sacrifice, Crusaders against corruption, Responsibility of the Educated Youth, Positive Global Scenario, The right to education, Eradicating gender inequality, Sustainable human development, Social Integration, Elimination of crime, Integration with global markets

### Unit-IV:

### Integrity in Public Life and National Integration

What is integrity, Public Life, Integrity and Public Life, Integrity in a Democratic State, India as a Democratic State, Behaviour of an Elected Representative of India, Noticeable degradation acts of Elected Representatives, Suggestions to stem this rot, Types of integrity, Transparency can be a guarantee for integrity

### Unit-V:

### **Business Ethics and Cyber Crime**

Business Ethics, Business ethics permeates the whole organisation, Measuring business ethics, The Vital factors highlighting the importance of business ethics, Cyber Crime, Strategies in Committing Cyber Crimes, Factors aiding Cyber Crime, Computer Hacking, Cyber-Bullying, Telecommunications Piracy, Countermeasures to Cyber Crime, Ethical Hacking

### Text Book:

1. **Formation of Youth,** Department of Foundation course, St.Joseph's College, Tiruchirappalli-2, 2016.

	Hours Credits	Mean Score of	COs	4.4	4.2	4.2	0.	4.3	4.2	4.2
E	Hours 2	Mean S	Ũ	4	4	4	4	4	4	4
			PSO8	4	5	2	+	5	4	Score
			PSO7	5	5	5	Э	4	5	Mean Overall Score
		utcome	90Sd	4	4	4	4	5	5	Mean (
	r UTH-II	ceific O ₁ Os)	PSO5	5	4	4	4	5	4	
4	I IIIE 01 THE PAPER ATTON OF YOU	Programme Specific Outcomes (PSOs)	PS04	5	4	4	4	5	5	
	TION	rogran	PSO3	4	m	3	4	4	5	
E	FORMATION OF YOUTH-II	I	PSO2	ю	4	4	4	4	4	
			PO3 P04 P05 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	5	S	4	5	S	С	
			P05	5	4	5	4	5	5	
		Programme Outcomes (POs)	P04	4	4	4	4	4	4	
	ode 04A	mme Ot (POs)	P03	5	4	5	5	4	4	
ς	Course Code 17UFC441004A	Prograi	P02	4	4	3	4	4	e	
ζ	170		P01	4	4	5	3	7	4	
	Semester	Course Outcomes	(COs)	C01	C02	CO3	CO4	CO5	C06	

Note:

Result: The Score for this Course is 4.2 (Very High Relationship)

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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s ocanng:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs	
V aute	Mean Scores of COs = Total of Values	Total No. of POs & PSOs	

s

### Semester-III 17UFC341003B

### Hours/Week: 2 Credits: 2

### **RELIGIOUS DOCTRINE-I**

### **Course Outcome**

- 1. To ensure the understanding of the salvation history and experience the God.
- 2. To ensure enrichment of the young minds with catholic teachings.
- 3. To ensure the understanding the spiritual truth that human hearts depend on God.
- 4. To ensure the knowledge of the person of Jesus and follow his footsteps.
- 5. To ensure the understanding the hand of God in establishing justice and love.
- 6. To ensure the edification of the youth in faith and love to transcend all human barriers.

### **Unit: I-Salvation History**

Recognizing God - Human Beings: Their worth & Gifts - The Fall - Hope of Salvation - Prophets' Promises

### Unit: II-The Gospel of Jesus Christ

Introduction - According to: St. Mathew - St. Mark - St.Luke-St. John-Symbols

### Unit: III-The Holy Spirit

Introduction - Holy Spirit in the Old Testament- Holy Spirit in the New Testament- Holy Spirit in Tradition-Biblical Images of the Spirit-Gifts & Fruits of the Holy Spirit

### **Unit: IV- Social Justice in the Prophets**

Introduction-Prophet and Prophecy-Role of Prophets

### **Unit: V-The Catholic Church**

Mystical Body of Christ-Visible Church on Earth-The Marks or Identifying Characteristics of the Church - Hierarchical Constitution of the Church -The Magisterium or Teaching of the Church - The Church and Salvation

### Text Book:

1. Life in the Lord, Department of Foundation course, St. Joseph's College, Tiruchirappalli-2, 2011.

Hours Credits	7	Mean Score of	COS	3.9	3.9	4.2	3.9	3.8	0.	3.9
Hours	7	Mean	5	3	ŝ	4	3	3	4	3
			PSO8	5	5	5	5	5	4	Score
			PSO7	5	5	5	5	4	4	Mean Overall Score
		atcomes	PSO6	5	S	5	5	4	5	Mean C
r INF	II-ani	scific O1 Os)	PSO5	4	4	4	4	4	4	
Title of the Paper	NUCIK	Programme Specific Outcomes (PSOs)	PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	5	S	4	5	5	5	
itle of th	Tenni	Progran	PSO3	4	4	5	4	4	5	
	NELLO		PSO2	4	4	4	4	4	5	
			PSO1	4	4	4	4	4	5	
			P05	3	3	3	3	3	3	
		utcomes	P04	3	ю	4	3	3	3	
ode		Programme Outcomes (POs)	P03	4	4	4	4	4	4	
Course Code		Progra	P02	1	-	3	1	-	-	
C ⁰	1/0		P01	4	4	4	4	4	4	
Semester	IV	Course Outcomes	(COs)	c01	C02	CO3	CO4	CO5	CO6	

Specific Outcomes e m Έ Prooral and Outcom ٩ Outcom for Matrix Relationship

Result: The Score for this Course is 3.9 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

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Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
Val	Total of Values	Total No. of POs & PSOs
	Maan Scara of COs	

### பருவம்: 4 17UGT410004

### மணி நேரம்: 4 புள்ளிகள்: 3

### பொதுத்தமிழ்-IV

### பாடத்தின் விளைவு

- நாடகத்தின் போக்குகள், உத்திகள், பாத்திரப்படைப்பு, உரையாடல் முறை, கற்பனைத்திறம் போன்றவற்றை அறிந்துகொள்ளுதல்.
- புதிய நாடகங்களைப் படைக்கும் திறனைப் பெறுதல்.
- நாடகங்களை நடிக்கும் திறன் பெறுதல்
- கிரேக்க, ஆங்கில நாடகங்களை அடியொற்றி தமிழ்நாடகம் தோன்றிய வரலாறு அறியச் செய்தல்.
- சங்ககாலம் தொட்டு இக்காலம் வரை காதல் பற்றிய உணர்வுகளை எடுத்துரைத்தல்.
- தமிழ் வரலாற்றின் மன்னர்களின் ஆட்சியின் சிறப்புகளையும் வீழ்ச்சிகளையும் எடுத்துக்காட்டுதல்.

### (12 மணி நேரம்)

மனோன்மணீயம், பாயிரம், அங்கம் - 1, களம் 1 - 5 வரை

### அலகு-2

அலகு-1

(12 மணி நேரம்) மனோன்மணீயம், அங்கம் - 2, களம் 1 - 3 வரை.

இலக்கிய வரலாறு நான்காம் பாகம் - தமிழும் பிற துறைகளும் பக்கம் (365-387).

### அலகு-3

(12 மணி நேரம்)

(12 மணி நேரம்)

மனோன்மணீயம், அங்கம் - 3, களம் 1 - 4 வரை.

### உரைநடை நாடகம் (கௌதம புத்தர்)

அலகு-4

### மனோன்மணீயம், அங்கம் - 4, களம் 1 - 5 வரை.

இலக்கிய வரலாறு நான்காம் பாகம் - சமயத்தவரின் தமிழ்ப்பணி (பக்கம் 391-402)

### அலகு-5

(12 மணி நேரம்)

மனோன்மணீயம், அங்கம் - 5, களம் 1 - 3 வரை.

இலக்கிய வரலாறு நான்காம் பாகம் - வெளிநாடுகள் தந்த தமிழ் இலக்கியம் (பக்கம் 410-435)

### பாடநூல்கள் :

- 1. சுந்தரனார், மனோன்மணீயம், தமிழாய்வுத்துறை (பதிப்பு), தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2. (அங்கம் : 3 களம் : 4 நீங்கலாக)
- 2. பாலசுப்பிரமணியம். கு.வெ, கௌதம புத்தர், அய்யா நிலையம், தஞ்சாவூர்
- 3. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, 2014.

Hours Credits	e	Mean Score of	COS	4.5	4.3	3.7	4.8	.1	4.	1.
Hours	4	Mean	5	4	4	3	4	4	3	4
			PSO8	5	5	5	5	4	3	Score
			PSO7	5	5	5	5	4	2	Mean Overall Score
		atcomes	PSO6	5	4	4	5	4	2	Mean (
-		Specific Ot (PSOs)	PSO5	4	e	3	4	4	3	
Title of the Paper	VI-ຊູ່ເຝີເ	Programme Specific Outcomes (PSOs)	P04 P05 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	4	3	5	5	4	
itle of tl	பொதுத்தமிழ்-IV	rogran	PSO3	5	4	4	5	4	3	
L	J	-	PSO2	5	5	3	5	4	3	
			PSO1	5	5	3	5	4	4	
			P05	5	4	4	2	5	5	
		Programme Outcomes (POs)	P04	5	5	5	5	5	5	
ode	004	(POs)	PO3	4	с	3	4	4	4	
<b>Course Code</b>	17UGT410004	Progra	P02	3	4	3	5	4	3	
రి	17		P01	4	5	4	5	3	4	
Semester	N	Course Outcomes	(COs)	c01	C02	CO3	CO4	CO5	CO6	

Note:

Result: The Score for this Course is 4.1 (Very High Relationship)

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

	Total of Mean Scores	Total No. of COs
Values Scaling:	Mean Overall Score for COs =	
Valu		Ő

Total No. of POs & PSOs

Values

Total of

Mean Score of COs

### Semestre: IV 17UGH410004

### Hours/Week: 4 Credits: 3

### **Course Outcomes**

At the end of the course, a student should be able to demonstrate...

* the ability to empower the students with globally employable soft skills

HINDI-IV

- * the ability to translate Hindi passages to English
- * the ideas on human values
- * the ability to instruct the moral values given by the Bhakthi Saints
- * the knowledge of Indian festivals.
- * the knowledge of culture and tradition

### Unit-I

### 8 hours

Vidyarthi, Banking Shabda, Anuvad, Anuvad Lesson - 1, Adhikal, Premchand

### Unit-II

### 12 hours

12 hours

Pusthakalaya, Nemikaryalaya Tippaniyan, Anuvadak, Anuvad lesson-2, Bakthikal-Gyan Marg, Mahadevivarma

### Unit-III

Thyohar, Anuvad Ke Gun, Anuvad lesson - 3, Bakthi, Tippaniyaan, Prem Marg, Pant

### Unit-IV

### 14 hours

Yugpuresh Gandhi, Anuvadak Ke Gun, Anuvad Lesson - 4 Bakthikal, Bakthikal - Ram Bakthi Kal - Krishna Bakthi, Dinkar

### Unit-V

14 hours

Braman, Anuvad ek kala, Swarnayug Bakthikal, Anuvad Lesson - 5, Reetikal, Chayavad

### **Books Recommended**

- 1. Kendriya Sachivalaya, Hindi Parishad New Delhi, Karyalaya Sahayika, 2016.
- 2. Dakshin Bharat Hindi Prachar Sabha Chennai-17, Niband Radhana, Hindi, 2016.
- 3. DBHP Sabha, Chennai-17, Anuvad Abyas-3, Hindi, 2016
- 4. Rajnath Sharma, Hindi Sahitya ka Itihas, Vinkod Pustak Mandir, Agra-2, 2016.

Semester	Cours	<b>Course Code</b>				Title	<b>Title of the Paper</b>	aper				Hours Credits	Credits
^	17UGH	7UGH410004				-	Hindi-IV					4	3
Course		Progra	Programme Outcomes (POs)	tcomes			Progra	Programme Specific Outcomes (PSOs)	Specific Ou (PSOs)	tcomes			
Outcomes (COs)	P01	P02	PO3	P04	P05	PSOI	PSO2		PSO3 PSO4 PSO5	PSO5	PSO6	Mean Score of COs	core of )s
C01	4	4	4	ю	4	3	3	4	5	4	4	3.	5
C02	ε	m	2	С	n	ε	5	ε	4	n	б	З.	
CO3	ю	e	ю	ю	4	3	ю	e	4	е	3	3.	_
C04	3	7	2	3	2	3	3	3	3	3	3	2.7	-
CO5	3	3	3	3	3	3	5	3	3	4	4	3.3	3
CO6	4	4	4	4	3	5	3	5	4	4	3	3.9	6
									Меа	Mean Overall Score	Score	33	~

### Outcomes Snecific Prooramme and OUTEP for Matrix Relationshin

Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High
	•	-			
			:		
		Values Scaling:	cating:		

Total of Mean Scores Total No. of COs

П

Mean Overall Score for COs

Total No. of POs & PSOs

Mean Score of COs =

Total of Values

### Semestre: IV 17UGF410004

### Heures /Semaine: 4 Points: 3

### FRANÇAIS-IV

### **Course Outcomes**

- * Comparer la culture de l'Inde et de la France
- * Familiariser l'étudiant avec le vocabulaire, la grammaire et les conversations
- Connaître les auteurs français (20 auteurs) et leurs œuvres *
- Dire qu'on aime quelqu'un/ quelque chose *
- * Demander des informations
- * Exprimer une opinion personnelle et Justifier son opinion.

### Unit-I: Prières du Nouvel An

### (10 heures)

(10 heures)

Exprimer l'inquiétude, le regret, le souhait, l'obligation, la sympathie. Grammaire : Le subjonctif, verbe craindre

Unit-II : Retrouvailles

Marquer la surprise

Grammaire : Le subjonctif, pronoms possessifs.

### Unit-III : C'est lui le meilleur ! (10 heures)

Dire qu'on aime quelqu'un/ quelque chose, donner son opinion, insister. Grammaire : Le superlatif, les pronoms démonstratif.

### **Unit-IV Sauvons notre Terre !** (15 heures)

Enchaînement de cause et d'effet, demander à quelqu'un de tenir compté de quelque chose.

Grammaire : Le plus-que-parfait, il y a.

### Unit-V : Le jour des élections s'approche et les auteurs français (20 auteurs) et leurs œuvres (15 heures)

Demander des informations, dire qu'une action n'est pas utile, exprimer une opinion personnelle, Justifier son opinion.

Grammaire : Le participe présent – le gérondif, la voix passive.

### Manuel:

1. K.Madanagobalane, Synchronie-II, Samhitâ Publication, 2011.

### Livre de référence:

- 1. Annie Berthet /B atrix Sampsonis/ Catherine Hugot /V ronnique M Kizirian / Monique Waendendries, Alter Ego A1, Hachette, 2006.
- 2. Yves Loiseau/R gineM rieux, Connexions 1, Didier, 2011.

Semester IV	Cours	Course Code				Title	Title of the Paper Erench-IV	aper				Hours Credits	Credits
Course		Progra	Programme Outcomes (POs)	tcomes			Progra	nme	Specific Out (PSOs)	tcomes		•	<b>.</b>
Outcomes (COs)	P01	P02	P03	P04	P05	PSO1	PSO2 PSO3 PSO4 PSO5 PSO6	PSO3	PSO4	PSO5	PSO6	Mean Score of COs	core of )s
C01	4	4	2	3	4	4	2	3	2	2	3	3	3.0
C02	3	<del>س</del>	3	3	4	4	2	4	3	2	Э		.1
C03	3	2	3	2	4	3	4	3	3	e	4		1.3
C04	3	3	4	3	4	1	2	2	4	e	3	2	2.9
CO5	e	m	4	ю	4	3	2	2	4	4	5	ŝ	3.4
CO6	3	4	3	3	3	4	4	2	4	3	4	3	3.4
									Mee	Maan Overall Score	Control	~	37

Outcom	
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and Pro	
<b>Outcomes</b>	
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Result: The Score for this Course is 3.2 (High Relationship)

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		calino:	Values Scaling:		
Very High	High	Moderate	Poor	Very poor	Quality
4.1-5.0	3.1-4.0	2.1-3.0	1.1-2.0	0.0-1.0	Relation
5	4	3	2	1	Scale
81-100%	61-80%	41-60%	21-40%	1-20%	Mapping

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total of Values Total No. of POs & PSOs

Ш

Mean Score of COs

### Semester: IV 17UGS410004

### Hours/Week: 4 Credits: 3

### SANSKRIT-IV

### **Course Outcomes**

At the end of the course, a student should be able to demonstrate...

- * knowledge and understanding of the history of Sanskrit Drama.
- * knowledge and understanding of the Nataka vivaranam.
- * the introduction of Functional Sanskrit conversation Letter writing.
- * the ability to apply relevant theoretical perspectives to topics within the field of study
- * the competence in academic writing and oral presentation skills.
- * the ability to work both independently and in groups on presentations and/or development of Projects.

U <b>nit-I</b> Paataah – Asta, Nava Dasha, Sankhya prayogah.	8 hours
U <b>nit-II</b> Lot lakaarah. Prqayaogah. Kartari Vaakyaani	12 hours
U <b>nit-III</b> Naatakasya Itihaasah.	12 hours
U <b>nit-IV</b> Karnabhaaram. Naatakam.	14 hours
Unit-V	14 hours

Kathaapaatra Vailaksharnyam.

### **Books recommended:**

- 1. R.S.Vadhyar & Sons, Book-Sellers and Publishers, Kalpathi, Palghat 678003, Kerala, South India, History of Sanskrit Literature, 2014.
- 2. Samskritha Bharathi, Aksharam 8th Cross, 2nd Phase, Giri Nagar, Bangalore. Vadatu Sanskritam - Samskara Binduhu, 2014.
- 3. R.S. Vadhyar & Sons, Book-Sellers and Publishers, Kalpathi, Palghat 678003, Kerala, Soth India. Karnabharam, 2014.
- 4. Kulapathy, K.M., Saral Sanskrit Balabodh, Bharathiya vidya Bhavan, Munshimarg, Mumbai 400007, 2014.

aper Hours Credits IV 4 3	Programme Specific Outcomes (PSOa)	PSO3 PSO4 PSO5 PSO6 Mean Score of COs	3 3 3 4 3.1	4 3 4 3 3.1	4 4 4 4 3.2	4 4 4 4 3.1	3 4 4 4 3.0	3 3 3 4 3.2
Title of the Paper Sanskrit-IV	Programn	PSO2 PS	n	3	4	3	4	3
Title ( San		PSOI	с	3	ю	3	3	3
		P05	4	4	4	3	4	4
	tcomes	P04	4	4	4	4	3	4
	Programme Outcomes (POs)	PO3	5	4	ы	3	4	4
Course Code 7UGS410004	Progra	P02	m	m	e	ю	4	4
Course 17UGS ²		P01	5	4	4	4	4	5
Semester IV	Course	(COs)	C01	C02	CO3	C04	CO5	C06

### **Programme Specific Outcomes Outcomes and** Programme **Relationship Matrix for Course Outcomes**,

Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-00%	01-20%	81-100%
Scale	-	2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

### Values Scaling:

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total No. of POs & PSOs

**Total of Values** 

Ш

Mean Score of COs

### Semester: IV 17UGE420104

Hours/Week: 5 Credits: 3

### GENERAL ENGLISH-IV

### **Course Outcome**

- * Comprehend the local and global issues through the lessons
- * Do the tasks centering on skill development and enhance their Grammar Using and Writing Skills
- * Use interactive skills
- * Train and develop the Listening and Reading Skills of the learners through teacher-led reading practice
- * Improve their General Writing Skills such as Note-Taking, Note-Making, Précis Writing, Paragraph Writing, and Writing Short Essays on Current Issues/General Topics
- * Understanding the social background and human character of the period

### Unit-VII:

### *Women through the Eyes of Media

- 7.0 Introduction
- 7.1 Objectives
- 7.2 Listening and Reading Skills through Teacher-led Reading Practice
- 7.3 Glossary
- 7.3.1 Words
- 7.3.2 Phrases
- 7.4 Reading Comprehension
- 7.5 Critical Analysis
- 7.6 Creative Task
- 7.7 General Writing Skill: Writing Minutes of a Meeting
- 7.8 Grammar: Present Perfect Tense
- 7.9 Non -Detailed Poem: Thomas Hood (1799–1845): "Silence"

### Unit-VIII:

### *Effects of Tobacco Smoking

- 8.0 Introduction
- 8.1 Objectives
- 8.2 Listening and Reading Skills through Teacher-led Reading Practice
- 8.3 Glossary
- 8.3.1 Words
- 8.3.2 Phrases

- 8.4 Reading Comprehension
- 8.5 Critical Analysis
- 8.6 Creative Task
- 8.7 General Writing Skill: Note-Taking
- 8.8 Grammar: Present Perfect Continuous Tense
- 8.9 Non Detailed Poem: Coventry Patmore (1823-1896): "The Toys"

### Unit-IX:

### * Short Message Service (SMS)

- 9.0 Introduction
- 9.1 Objectives
- 9.2 Listening and Reading Skills through Teacher-led Reading Practice
- 9.3 Glossary
- 9.3.1 Words
- 9.3.2 Phrases
- 9.4 Reading Comprehension
- 9.5 Critical Analysis
- 9.6 Creative Task
- 9.7 General Writing Skill: Note-Making
- 9.8 Grammar: Past Perfect Tense
- 9.9 Non -Detailed Poem: Stephen Spender (1909-1995): "Daybreak"

### Unit-X:

### *An Engineer Kills Self as Crow Sat on his Head: A News Paper Report

- 10.0 Introduction
- 10.1 Objectives
- 10.2 Listening and Reading Skills through Teacher-led Reading Practice
- 10.3 Glossary
- 10.3.1 Words
- 10.3.2 Phrases
- 10.4 Reading Comprehension
- 10.5. Critical Analysis
- 10.6. Creative Task
- 10.7 General Writing Skill: Précis Writing
- 10.8 Grammar: Past Perfect Continuous Tense
- 10.9 Non -Detailed Poem: Gabriel Imomotimi Okara (1921): "Once Upon a Time"

### Unit-XI:

### ***Traffic Rules**

- 11.0 Introduction
- 11.1 Objectives
- 11.2 Listening and Reading Skills through Teacher-led Reading Practice
- 11.3 Glossary
- 11.3.1 Words
- 11.3.2 Phrases
- 11.4 Reading Comprehension
- 11.5 Critical Analysis
- 11.6 Creative Task
- 11.7 General Writing Skill: Paragraph Writing
- 11.8 Grammar: Future Perfect Tense
- 11.9 Non Detailed Poem: Robert Winner (1930-1986): "Opportunity"

### Unit-XII:

### *A Handful of Answers: A Zen Tale

- 12.0 Introduction
- 12.1 Objectives
- 12.2 Listening and Reading Skills through Teacher-led Reading Practice
- 12.3 Glossary
- 12.3.1 Words
- 12.3.2 Phrases
- 12.4 Reading Comprehension
- 12.5 Critical Analysis
- 12.6 Creative Task
- 12.7 General Writing Skill: Writing Short Essays on Current Issues/General Topics
- 12.8 Grammar: Future Perfect Continuous Tense
- 12.9 Non -Detailed Poem: Ted Hughes (1930–1998): "The Harvest Moon"

### Textbook

1. Jayraj, S. Joseph Arul et al. *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*. New Delhi: Trinity, 2016. Print.

Hours Credits 3	Mean Score of	500	4.61	4.69	4.23	4.30	4.38	4.61	4.47
Hours 5	Mean		4	4	4	4	4	4	4
		PSO8	5	S	5	5	5	5	Score
		PSO7	5	5	4	4	4	4	Verall (
	utcomes	90Sd	4	5	4	4	4	4	Mean Overall Score
r V	Specific Ot (PSOs)	PSO5	5	5	5	5	5	5	
Title of the Paper General English-IV	Programme Specific Outcomes (PSOs)	PO3 PO4 PO5 PSO1 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8	5	5	5	5	5	5	
itle of t eneral E	Progran	<b>PSO3</b>	5	5	4	5	4	5	
гğ		PSO2	4	5	4	4	4	4	
		<b>PSO1</b>	4	4	3	3	4	4	
		P05	4	Э	4	4	4	4	
	utcomes	P04	5	5	4	4	4	5	
ode 104	Programme Outcomes (POs)	P03	5	5	5	5	5	5	
Course Code 17UGE420104	Progra	P02	4	4	4	4	4	5	
D 11 C		P01	5	5	4	4	5	5	
Semester IV	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

Result: The Score for this Course is 4.47 (Very High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	2
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Duality	Very poor	Poor	Moderate	High	Verv High

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### Semester IV 17UCH430207

Hours/Week: 6 Credit: 5

### GENERAL CHEMISTRY-IV

### **Course Outcomes**

- 1. Students learn industrial sources of aromatic compounds and petroleum refining.
- 2. Students understand the possible chemical modification of Aromatic compounds.
- 3. Students know the chemical processes involved in the preparation of alcohols and alkyl halides.
- 4. Students get to know the chemical conversions and applications of alcohols and alkyl halides.
- 5. Students learn chemical and physical states of various systems and their coexistence in equilibrium.
- 6. Students understand the chemical aspects of metallic mixturescomposition and properties through phase diagrams.
- 7. Students get to know the chemical aspects of binary mixtures and their uses through phase diagrams.
- 8. Students understand the chemical aspects of ternary mixtures and their uses.

### Unit 1: Benzene

(18 hrs)

General methods of preparation of benzene - molecular orbital picture aromatic character - Huckel's rule of aromaticity (Benzenoid and nonbenzenoid compounds)-Aromatic Electrophilic substitution Reactions of benzene: General Mechanism - Mechanism of Nitration, sulphonation, halogenations, Friedel-Craft's Alkylation and Acylations- Orientation and reactivity of mono- and di-substituted benzenes

### Unit 2: Alcohols, thiols, Phenols and ethers

(18 hrs)

Nomenclature - Laboratory preparation of alcohols - Industrial source of alcohols - Physical properties - Chemical properties - Uses - Chemistry of glycols and glycerols - Uses - Pinacol - Pinacolone rearrangementpreparation and properties of thiols- Preparation of phenols - Physical and Chemical properties - Uses - Aromatic electrophilic substitution mechanism - Theory of orientation and reactivity - Preparation- properties and uses of ethers and thioethers- Introduction to Crown ethers - Structure -Applications as PTC

#### Unit 3: Alkyl and Aryl Halides

#### (18 hrs)

Nomenclature – General methods of preparation of haloalkanes – Physical properties – Chemical properties – Uses – Nucleophilic substitution mechanisms ( $S_N 1$ ,  $S_N 2$  and  $S_N i$ ) – Evidences – Stereochemical aspects of Nucleophilic substitution mechanisms – General methods of preparation of halobenzenes - Physical properties – Chemical properties – Uses – Mechanisms of electrophilic and nucleophilic substitution reactions – Theory of orientation and reactivity

#### Unit 4: Phase Rule I

#### (18 hrs)

Phase rule – Meaning of the terms: phase, Component, degrees of freedom – Derivation of Gibbs phase rule – Phase diagrams of one component systems (Water,  $CO_2$ , and sulphur systems)- polymorphism- application of Clapeyron-Clausius equation to water system-liquid helium system-high pressure phase diagram of water and carbon systems.

#### Unit 5: Phase Rule II

#### (18 hrs)

Phase diagrams of two component systems solid-liquid equilibrium – simple eutectic-thermal analysis - Bi-Cd system – Pb-Ag systems – KI- water system – Phase diagram of system with compound formation with congruent melting point – Mg-Zn System – incongruent melting point – Na-K system – NaCl-Water system – FeCl₃-Water system – Freezing mixture – gas-solid equilibrium – CuSO₄ – water system – Efflorescence – Deliquescence- three component system(Acetic acid-Chloroform-Water) only.

#### **Textbook:**

- Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997)
- 2. Puri B.R., Sharma L.R., PathaniaM.S., Principles of Physical Chemistry, (40th edition), New Delhi, ShobanLal, Nagin Chand & Co., (2000)

## **Reference:**

- 1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976
- 2. Peter Atkins and Julio De Paula, Atkins' Physical Chemistry, (2006), Oxford University Press, New Delhi.

Title of the Paper GENERAL CHEMISTRY - IV	3	GENEI				
Programme Specific Outcomes (PSOs)				itcomes	nme Outcomes (POs)	Programme Outcomes (POs)
PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8	<b>302</b>	PSO1 PSO2	PO5 PS01 PS02	PS01	PO5 PS01	PO4 PO5 PS01
3 3	4	3 4	5 3 4	e	5 3	4 5 3
3 5	4	3 4	4 3 4	3	3	3 4 3
3	4	3 4	5 3 4	3	5 3	4 5 3
3 4	4	3 4	4 3 4	3	4 3	3 4 3
3 4	4	3 4	4 3 4	3	4 3	4 4 3
3 5	4	3 4	5 3 4	4 5 3 4	4 4 5 3 4	
3	4	3 4	5 3 4	4 5 3 4	4 4 5 3 4	4 4 4 5 3 4
3	4	3 4		3	3 3	4 3 3

Note:

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Very High

4.1-5.0

3.1-4.0

2.1-3.0 Moderate

<u>1.1-2.0</u> Poor

Very poor

0.0 - 1.0

Scale Relation Quality

High

Total of Mean Scores

Mean Overall Score for COs =

Total No. of POs & PSOs

H

Mean Score of COs

Total of Values

Values Scaling:

Total No. of COs

## Semester III & IV 17UCH430208

Hours/Week: 3 Credit: 3

## CHEMISTRY PRACTICAL-III (PHYICAL CHEMISTRY)

#### **Course Outcomes**

- 1. Students shall learn the fundamentals of conductometric and potentiometric titrations
- 2. Students shall understand the method of determination of critical solution temperature, transition temperature and rate constant

#### Unit I:

Introduction to Physical Chemistry Practical– Theory of the practical – Critical solution temperature – Transition temperature – Heat of neutralization – Kinetics of ester hydrolysis and persulphate oxidation – Viscosity – Phase Diagram (simple eutectic) – polarimetry of inversion of sugar – potentiometry – Conductometry – Partition coefficient and Equilibrium constant – Calculation of parameters with units – Drawing Graphs – Handling of various equipment used in physical chemistry practical.

## Unit II:

Two Cycles of Experiments

## Cycle 1

1.Critical Solution Temperature 2.Heat of Neutralization 3.Transition Temperature 4.Kinetics of Ester Hydrolysis 5.Conductometric Acid-Base Titration 6. Potentiometric Acid-Base Titration

## Cycle2

1. Rast Method 2. Simple Eutectic 3. Critical Solution Temperature 4. Persulphate kinetics 5. Conductometric Precipitation Titration 6. Potentiometric Redox Titration

## **Reference:**

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, New Delhi, Second edition, Sultan Chand & sons, (1997).

## Semester IV 17UCH430301A

#### Hours/Week: 4 Credit: 4

## Core Elective-I: CHEMISTRY OF MATERIALS

#### **Course Outcomes**

- 1. Students learn the types of bonds.
- 2. Students understand and correlate the chemical luminescence and bioluminescence.
- 3. Students understand the properties and application of ceramics and metallic glasses.
- 4. Students understand the formation of polymers and to know their uses in everyday life.
- 5. Students learn the application of biomaterials in various fields.
- 6. Students learn the biomechanism and processing of biometerials.

Unit I: Properties-and Requirements of Materials and Chemical Bonding: Introduction-Classification of engineering materials; Introduction-Crystalline and Amorphous solids-Classification of bonds-Ionic bond-Covalent bonds-Metallic bonds-Molecular bonds- Hydrogen bond. (12 hr)

Unit II: Luminescence: Introduction-Principle-Classification of luminescence-Photoluminescence-Phosphorescence-Cathodoluminescence Electroluminescence-Applications. (12 hr)

**Unit III: Advanced Ceramics and Metallic Glasses**: Introduction-Classification of ceramics-Structure of the ceramics-Manufacture of ceramics-Processing of ceramics- Properties and applications of ceramics.Introduction-Principle and preparation of glasses-Properties and applications of glasses. (12 hr)

**Unit IV: Polymer Materials**: Introduction-Polymerisation mechanism-Degree of polymerisation-Classification of polymers-Structure of polymer-Fabrication process-Properties of the polymers-Applications. **(12 hr)** 

Unit V: Biomaterials:Introduction-Biomechanism-Classification of biomaterials - Metals and Alloys-Bioactive glasses-Polymers-Composites-Processing and properties-Applications. (12 hr)

## References

 Materials Science, V. Rajendran and A. Marikani, Tata McGraw Hill, New Delhi, 11th reprint, 2010. Unit I: 1.1, 4.1-4.8; Unit II: 14.1 - 14.8; Unit III: 20.1-20.6, 24.1-24.5; Unit IV: 21.1-21.8; Unit V: 22.1-22.9

	Hours Credits 4 2	Mean Score of	COS	4.2	3.7	S	4.0	4.0	4.0	1
mes	Hours 4	Mean	5	4	ς Γ	4	4	Δ	4	4
ie Outeo			PSO8	с	1	2	3	1	1	Score
specif			PSO7	2	3	n	3	3	3	<b>)verall</b>
gramme	rs	tcomes	PSO6	n	Э	m	2	3	3	<b>Mean Overall Score</b>
gord brog	r	Specific Ot (PSOs)	PSO5	n	1	m	3	2	2	
comes a	he Pape F MAT	nme Spe (PS	PSO4	n	3	4	3	3	3	
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes	Title of the Paper CHEMISTRY OF MATERIALS	Programme Specific Outcomes (PSOs)	PO3 P04 P05 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	3	3	с	2	3	3	
rogram	T		PSO2	3	2	2	3	2	2	
omes, P	CH		PSO1	2	2	ŝ	2	3	3	
se Outco			P05	e	3	m	3	3	3	
r Cours		utcome	P04	n	з	б	3	3	3	
atrix fo	ode 301A	Programme Outcomes (POs)	P03	2	2	5	2	3	3	
M dihsı	Course Code 17UCH430301A	Progra	P02	e	3	e	2	2	2	
Relatior	17U 17U		P01	1	1	7	1	1	1	
ļ	Semester IV	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

Result: The Score for this Course is 4.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:	Mean Over-	
Valu	Total of Values	Total No. of POs & PSOs

Scores COs

Total of Mean S Total No. of C

Mean Overall Score for COs

Mean Score of COs

## Semester IV 17UCH430301B

## Hours/Week: 4 Credit: 4

## **Core Elective-I** HEALTH AND HYGIENE

## **Course Outcome**

- 1. Students pursue about health and hygiene for successful living.
- 2. Students learn about physical health care.
- 3. Students understand about mental health, health destroying habits and addictions.
- 4. Students learn about common diseases.
- 5. Students understand the treatments for various diseases.
- 6. Students acquire the knowledge and skill for First Aid and casualty handling.

## (12 hours)

Maintenance of Health Concept of health and Hygiene and their relation to successful living. Food pyramid, Determinants of health, building of good health habits, immunization, correction of defects, maintenance of health records.

## Unit-II:

Unit-I:

#### (12 hours)

(12 hours)

Physical Health Care of skin, hair, teeth, eyes, ears, hand and feet, Rest and sleep, exercise, activity, recreation, posture, Food and nutrition, elimination, Hygiene of eating and drinking, menstrual hygiene.

## Unit-III:

Mental Health. Characteristics of mentally healthy person, Mental hygiene in intrauterine, infancy, childhood, adolescence, adulthood and old age. Health destroying habits and addictions - Pan, Supari, Ganja, Drinking, Smoking.

## Unit-IV:

## (12 hours)

Common diseases and their treatment Cancer - types, causes and their treatment, Water borne diseases-Jaundice, Malaria, Typhoid, Dysentry and their treatment. Fever, Headache, Vomiting and Ulcer- causes and their treatment.

## Unit-V:

## (12 hours) First Aid Introduction to First Aid, First Aid Equipment, the Unconscious, Casualty, Blood Loss and Shock, Burns, Fractures Head Injury, Sports

Injuries, Moving, Handling & Transporting Casualties.

## **References:**

- 1. Cherilyn Tillman, Principles of Occupational Health and Hygiene an introduction, Allen & Unwin, Sydney, 2007
- 2. Fryer, Jane Eavre, Fist Aid Book, The John C. Winston Company.

	Hours Credits 4 2	Mean Score of	SO	3.54	3.31	3.69	3.38	3.85	3.85	3.60
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Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

	Mean Overall Score for COs = Total of Mean S	J JIN 1-7- L
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	Total of Values	0000 0000

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No. of

Total

Total No. of POs & PSOs

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Mean Score of COs

## Semester IV 17UCH430404A

Hours/Week: 4 Credit: 4

Allied: PHYSICS-II

#### **Course Outcomes**

- 1. Understand the theoretical and experimental concepts of interference, diffraction and propagation of light.
- 2. Know the structure, behavior and properties of atoms based on vibrational modes.
- 3. Learn different nuclear models, nuclear properties and its applications.
- 4. Know and understand the fundamental concepts of relativity.
- 5. Remember and understand the principles of quantum mechanics.
- 6. Understand the working of logic gates for application in digital electronics.

## **Unit-I: PHYSICAL OPTICS**

(12 Hrs) Velocity of light - Michelson's method - Interference: colours of thin films - air wedge - determination of diameter of a thin wire by air wedge - test for optical flatness. Diffraction - Fresnel's explanation of rectilinear propagation of light - theory of diffraction and specific rotating power of transmission grating - Normal incidence - polarization - Brewster's law -double refraction,-optical activity-polarimeter.

## Unit-II: ATOMIC PHYSICS

(12 Hrs)

Atom model - vector Atom model - quantum numbers associated with vector atom model - coupling schemes - Pauli's exclusive principle - magnetic dipole moment of electron due to orbital and spin motion - Bohr magneton - spatial quantisation - Stern Gerlach experiment.

## **Unit-III: NUCLEAR PHYSICS**

(12 Hrs)

Nuclear model - liquid drop model - magic numbers, shell model - nuclear energy - mass defect - binding energy Radiation detectors - ionization chambers - GM counter - nuclear fission - Bohr and wheeler theory - chain reaction – atom bombs –nuclear fusion – nuclear reactor.

## **Unit-IV: ELEMENTS OF RELATIVITY AND QUANTUM MECHANICS** (12 Hrs)

Frame of reference - Galilean transformation - Postulates of theory of relativity - Lorentz transformation equations - derivation - length contraction - time dilation - Michelson Morley experiment - mass energy equivalence - uncertainty principle – postulates of wave mechanics –wave nature of matter– types of operators – Schrodinger's time dependent and time independent equation

## **Unit-V: ELECTRONICS**

#### (12 Hrs)

**Basic Electronics:** LED – Zener diode and characteristics – voltage regulator – Transistor RC coupled amplifier – condition for oscillation – phase shift oscillator .

**Digital electronics:** Logic gates – Nand and NOR gates – Universal building blocks – Boolean algebra – Demorgan's theorem – verification – Half adder, full adder, Half subtractor and Full subtractor.

## **BOOK FOR STUDY:**

1. R.Murugesan (2005), Applied Physics, First edition, S. Chand and Co., New Delhi – 110005.

## **BOOKS FOR REFERENCES:**

- D.Halliday, R. Resnick, J. Walker, Fundamental of Physics, 9th edition, John Wiley & Sons, 2010
- 2. M.E. Schaltz, Groh's Basic Electronics, McGrawhill, 11th edition, 2011.

Hours Credits 4 4	Mean Score of	PSO1 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8 CO8	2 2 3.23	2 2 3.31	2 2 3.38	2 3 3.38		2 3 3.46
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ode 404A	mme O (POs)	P03	5	-	2		1	
Course Code 17UCH430404A	Progra	P02	4	4	4	4	4	
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Semester IV	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	

Very High

4.1-5.0

3.1-4.0 High

2.1-3.0 Moderate

1.1-2.0 Poor

0.0-1.0 Very poor

Relation Quality

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping Scale

Note:

Total of Mean Scores Total No. of COs

11

Mean Overall Score for COs

Total of Values Total No. of POs & PSOs

Mean Score of COs =

Values Scaling:

### Semester IV 17UPH430405A

#### Hours/Week: 2 Credit: 2

#### Allied: PHYSICS PRACTICALS

#### **Course Outcome**

1. Understand the experimental concepts of interference, diffraction and propagation of light.

#### **Any 16 Experiments**

- 1. Young's modulus Non uniform bending cantilever
- 2. Young's modulus Cantilever
- 3. S.T. Method of drops
- 4. S.T. Capillary rise.
- 5. Viscosity variable pressure head
- 6. Concave lens f, R,  $\hat{i}$ .
- 7. Air wedge Thickness of wire.
- 8. Newton' Rings R
- 9. Spectrometer Solid prism
- 10. Spectrometer Grating (Normal Incidence)
- 11. M1/M2 Tan A and Tan B simultaneous method
- 12. Absolute determination of M and H.
- 13. P.O. Box Temp. Coefficient
- 14. Potentiometer Ammeter calibration
- 15. Potentiometer R and  $\tilde{n}$
- 16. Field along the axis of the coil
- 17. Sonometer Frequency of turning fork
- 18. Junction diode characteristics
- 19. Zener diode characteristics.
- 20. Logic gates IC's
- 21. Jolly's bulb

## Semester IV 17UFC441004A

## Hours/Week: 2 Credits: 2

## FORMATION OF YOUTH-II

#### **Course Outcome**

- 1. To ensure preparing the students to live in harmony with nature.
- 2. To ensure the youth the significance of public health and the related issues.
- 3. To ensure sensitizing the youth about addictions and their consequences.
- 4. To ensure educating the youth on disaster management and First-Aid.
- 5. To ensure enlightening on the developmental issues and challenges of youth today.
- 6. To ensure the value of counselling for attaining positive mental health.

#### Unit-I: Harmony with Nature

What is environment, Why should we think of harmony, Longing for human well-being, Principles to conserve environmental resources, Causes of disharmony, The fruits of harmony with nature, Forest resources, Water resources, Mineral resources, Food resources, Fruits of dishormony, Economic values and growth, Environmental Ethics, Guidelines to live in harmony with nature, Towards life-centered system for better quality of life

#### **Unit-II: Public Health**

Health related issues, Health Care in India vs Developed Countries, Health and Heredity, Public Health - The Indian Scenario, Objectives of public health in India, Public Health System in India, Failure on the public health front, Role of the central government, Hospitals Services in India, Health and Abortion, Health and Drug Addiction, Drug abuse

#### Unit-III: Disaster Management and First-Aid

Disaster Management, Types of disaster, Plans of disaster management, Technology to manage natural disasters and catastrophes, Disaster Management, Rehabilitation and Reconstruction, Human-induced disaster, First Aid, The importance of First-aid, Disaster Declaration and Response

#### **Unit-IV: Issues Dealing with Science**

What is Science, Science and Religion, Social Relevance of Science and Technology, Science and technology for social justice, Difference caused by Science and Technology, Need for indigenous technology, Science, Technology and Innovation Policy of India, Harnessing the forces of science and technology for the future

## Unit-V: Counselling for the Adolescents

High Risk Behaviours, Developmental Changes in Adolescents, Key Issues of the Adolescents, Need for Counselling, Nature of Counselling, Counselling Goals, Does helping help? The Good and the Bad news.

## **Text Book:**

**1. Formation of Youth,** Department of Foundation course, St.Joseph's College, Tiruchirappalli-2, 2016.

I LUC OL LUC F APER ATTON OF YOU B. C.	Tit ORMA	Title of the Paper FORMATION OF YOUTH-II	FORM	FORM	FORM	FORM
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Very High

3.1-4.0 High

3 2.1-3.0 Moderate

> 1.1-2.0 Poor

0.0-1.0 Very poor

Scale Relation Quality

4.1-5.0

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Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

Total of Values Total No. of POs & PSOs

Mean Score of COs =

Values Scaling:

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Note:

4

#### Semester IV Hours/Week: 2 17UFC441004B Credits: 2

## **RELIGIOUS DOCTRINE-II**

## **Course Outcome**

- 1. To ensure appreciation of the harmony of religion.
- 2. To ensure training the youth in the power of prayer.
- 3. To ensure the understanding of Mary's role in salvation history and Marian Dogmas.
- 4. To ensure enlightening the graces and invisible effects of the sacraments.
- 5. To ensure the youth with the promise that God forgives failings on repentance.
- 6. To ensure understanding the concept of salvation and the promise of eternal life.

## **Unit: I Harmony of Religions**

Introduction - Religions of India - Buddhism - Jainism - Sikhism - Judaism -Confucianism - Christianity - Zoroastrianism - Islam

## Unit: II The Christian Prayer

Prayer Defined - Reasons to pray - The Way to Pray - Types of Prayer -Obstacles for Prayer - Prayer in Old - The Lord's Prayer

## Unit: III Mary, the Blessed Virgin, Mother of God

Introduction - Marian Dogmas - Mary in need of Redemption - Mary in the New Testament - Apparitions of Mary - Devotion to Mary

#### **Unit: IV Sacraments of Initiation**

Introduction - An Overview - Baptism - Confirmation - Holy Eucharist Unit: V Sacraments of Healing & at the Service of the Community Reconciliation - Anointing of the Sick - Holy Orders - Matrimony

## Text Book:

1. Life in the Lord, Department of Foundation course, St. Joseph's College, Tiruchirappalli-2, 2011.

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Mean Overall Score for COs

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Values Scaling:

ery High

4.1-5.0

-4.0 High

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Moderate

Very poor 0.0-1.0

Quality

2.1-3.0

81-100%

61-80%

41-60%

21-40% 2 1.1-2.0 Poor

1-20%

Mapping Scale Relation

Semester V		Hours/Week: 5
17UCH530210		Credit: 4
	INORGANIC CHEMISTRY-I	

#### **Course Outcomes**

- 1. Students learn about the compounds of d block elements and *f* block elements.
- 2. Students learn about extraction of lanthanides and actinides.
- 3. Students learn production of radioactive actinide elements.
- 4. Students understand the concept of isomerism in coordination compounds, their structural and magnetic properties.
- 5. Students study about the theories of coordination compounds.
- 6. Students learn about types of reactions of complexes and their mechanism and learn about Jahn Teller effect and chelate effect.

#### Unit I: Transition metals (*d* – block elements)

(15 Hours)

General characteristics of first, second and third transition series – Metallic character, atomic and ionic radii – oxidation states, colour, complex formation, catalytic and magnetic properties-Non-stoichiometric compounds- Important compounds of transition metals: Ziegler – Natta catalyst. prussian blue, sodium nitro prusside, Turnbull's blue, nickel-DMG complex, Wilkinson's Catalyst-KMnO₄ and K₂Cr₂O₇.

# Unit II: Inner transition metals (f - block elements)(15 Hours)Lanthanides

Electronic configuration – oxidation states – ionic radii, lanthanide contraction. Colour and magnetic properties. Extraction of mixture of lanthanides from monazite sand and separation of lanthanides. Uses of lanthanides.

#### Actinides

Sources of actinides – preparation of transuranic elements - electronic configuration – oxidation states – ionic radii – colour of ions – comparison with lanthanides. Extraction of thorium from monazite sand.Production and uses of plutonium.

#### Unit III: Coordination chemistry I

#### (15 Hours)

Coordination compounds – coordinate bond, coordination number, oxidation number – ligands-types of ligands– coordination numbers and geometriesoxidation numbers-coordination sphere – IUPAC nomenclature of coordination compounds – isomerism in complexes (structural, geometrical and optical) - Werner's theory of complexes. EAN rule –VB theoryapplications (prediction of geometry and magnetic behaviours of complexes) and limitations – Factors affecting stability of complexes

#### Unit IV: Coordination chemistry II

#### (15 Hours)

Crystal Field theory. Crystal field splitting in octahedral, tetrahedral and square planar fields – factors influencing the magnitude of crystal field splitting – CFSE calculations- magnetic properties and colour. Labile and inert complexes- stepwise and overall stability constants – Reaction mechanism – substitution reactions in octahedral complexes – Acid hydrolysis:  $S_N 1$  and  $S_N 2$  mechanisms – mechanism of electron transfer reactions – inner sphere and outer sphere mechanisms – Two electron transfer reactions – Complementary and non- complementary reactions.

#### **Unit V:Coordination chemistry III**

#### (15 Hours)

Chelate effect, Jahn-Teller Effect – Substitution reactions in square planar complexes – Trans effect – theories of trans effect – applications of trans effect. Introduction to organometallic chemistry and metal complexes of CO, NO and alkenes (Zeise's salt) [Bonding only]

#### Textbook

- 1 Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, ShobanLal, Nagin Chand & Co., (1993).
- 2. Gopalan R and Ramalingam V, Concise Coordination Chemistry, 1e, Vikas Publishing, New Delhi(2001)

## References

- 1. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
- 2. Huheey J E, Keiter E A, Keiter R L and Medhi O K. Inorganic Chemistry: Principles of Structure and Reactivity, Fourth Edition, Pearson Education, New Delhi, 2006.
- Atkins P, Overton T, Rourke J, Armstrong F and Weller M. Inorganic Chemistry, 5th Edition. Oxford University Press, 2011.

Hours Credits 6 5	Mean Score of	COS	3.07	2.84	3.15	3.23	2.92	3.15	3.06
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		PSO7	e	3	4	3	2	3	Mean Overall Score
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r ISTRY	Specific Or (PSOs)	PSO5	2	4	2	2	3	3	
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Result: The Score for this Course is 3.0 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

tes Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
Valu	Total of Values	Total No. of POs & PSOs
	Mean Score of COs = .	

## Semester V 17UCH530211

## Hours/Week: 5 Credit: 4

## **ORGANIC CHEMISTRY-I**

## **Course Outcomes**

- 1. A comprehensive knowledge and understanding on the carbonyl compounds, organo nitrogen compounds and synthetic polymers and qualitative analytical methods to identify the functional groups.
- 2. Strong foundation in the mechanistic aspects of reactions and applications and entrepreneurial skills in the manufacturing and processing of the synthetic reagents and polymers.
- 3. Skilled employable chemists with theoretical bases on dealing with synthetically important chemicals and polymers.
- 4. Competent organic chemists with adequate knowledge in carbonyl compounds and polymers.
- 5. Specialized students with in depth knowledge in functional group inter conversions.
- 6. Responsible and green synthetic organic chemistry graduates with environmental concern.

#### **Unit I: Aldehvdes and Ketones**

#### (15 Hours)

Structure, nomenclature - physical properties, preparation of aliphatic Nucleophilic addition reactions, oxidation and reduction - aldol condensation, Cannizzarro reaction, addition of Grignard reagent, Wittig reaction, Perkin, Knovenagel reactions and benzylic acid rearrangement.

#### UnitII: Carboxylic Acids and their Derivatives (15 Hours)

Carboxylic acids, nomenclature, physical properties, preparation, chemical reactions, structure and acidity. Functional derivatives of carboxylic acidsnucleophilic acyl substitution-acyl chlorides, acid anhydrides, amides imides and esters, dicarboxylic acids, preparation and properties.

#### Unit III: Active Methylene Compounds & α, β-unsaturated carbonyl compounds (15 Hours)

 $\alpha$ ,  $\beta$ -unsaturated carbonyl compounds –Structure and properties, preparation, Electrophilic and Nucleophilic additions, Michael addition-Diels Alder reaction, Quinones.

Malonic ester synthetic applications. Ethyl acetoacetate-preparation, and synthetic applications.

## **Unit IV: Organo Nitrogen Compounds**

Amines -Nomenclature-Preparation and structure of amines, basicity, Reactions of amines, Hoffmann elimination, conversion of amines to substituted amides and electrophilic substitution reactions. Diazonium salts-Preparations, reactions and synthetic applications

## **Unit V: Synthetic polymers**

#### (15 Hours)

Polymers and polymerization, Free radical vinyl polymerization reactions, copolymerization, ionic polymerisation, Coordination polymerization, step reaction polymerization, structure and properties of macromolecules, Applications of common polymers and dendrimers.

#### **Text Book**

1. Morrison R.T and Boyd R.N., Organic Chemistry (7th edition) NewYork, Allyn & Bacon Ltd., (2011).

#### References

- 1. Pine S.H, Organic Chemistry (4th edition) New Delhi, McGraw-Hill International Book Company (1986).
- 2. Finar I.L, Organic Chemistry, Vol 1&2, (6thedition) England, Addison Wesley Longman Ltd. (1996).
- 3. Paula Yurkanis Bruice, Organic Chemistry, (8th edition) University of California, Santa Barbara, Pearson Ltd. (2011).

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Scores COs

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of Total

Total

Mean Overall Score for COs =

Total No. of POs & PSOs Fotal of Values

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Mean Score of COs

Values Scaling:

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Note:

3.1-4.0 High

2.1-3.0 Moderate

1.1-2.0

Poor

Very poor

0.0-1.0

Scale Relation Quality

Very High 4.1-5.0

Semester V		Hours/Week: 4
17UCH530212		Credit: 3
	PHYSICAL CHEMISTRY-I	

#### **Course Outcomes**

- 1. Students understand the effect of radiation on humans, and they learn the basics of spectroscopy.
- 2. Students learn the use of ultra violet spectroscopy and the effect of light.
- 3. Students understand and apply the infrared spectroscopy to chemical compounds.
- 4. Students learn the basics of electrochemistry and the y understand the practical use of electricity and their laws.
- 5. Students understand the nature of electrolytes and their theories and the concept of emf and its application.
- 6. Students learn the concept of electrochemical cell and its applications and the concept of ionic mobility and its practical applications.

#### Unit I: Spectroscopy I

(12 Hours)

Electromagnetic radiation, quantisation of energies in molecules (Translational, rotational, vibrational and electronic) – Microwave spectroscopy – condition – molecular rotation – theory of microwave spectroscopy – selection rule – effect of isotopic substitution – Calculation of  $\mu$  and bond length of diatomic molecules. UV visible spectroscopy – conditions – theory of electronic spectroscopy -types of electronic transitions – Frank-Condon principle – Predissociation – Dissociation energy – Applications.

#### Unit II: Spectroscopy II

## (12 Hours)

Infrared spectroscopy – condition – molecular vibration – modes of vibration of linear and Non-linear molecules – Diatomic  $CO_2$ ,  $H_2O$  – stretching and bending vibrations – selection rules – calculation of force constant – isotope effect – Applications of IR spectra – (Group frequencies, finger printing and Hydrogen bonding only) Raman spectroscopy – condition – Raleigh and Raman scattering – Stokes and Anti-stokes lines – Difference between Raman and IR spectroscopy – Rotational Raman spectra– Application to covalent compounds – Mutual exclusion principle.

**Unit III: Ionic Conductance in solution and its applications** (12 Hours) Ohm's law – conductance in metals and electrolytic solution – Specific conductance – equivalent conductance - Measurement of equivalent conductance using Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and its limitations – Weak and strong electrolytes according to Arrhenius theory - Ostwald's dilution law, its uses and its limitations - the elementary treatment of Debye Huckel theory of strong electrolytes - Transport number – Determination of transport number, Hittorf's method and moving boundary method.

#### Unit IV: Conduction measurement and Electromotive force (12 Hours)

Applications of conductance measurements: Determination of degree of dissociation – determination of Ka of acid – Determination of solubility of sparingly soluble salt – common ion effect – conductometric titrations (acid –base and precipitation). Electro chemical cells – electrolytic cell – Reversible and irreversible cells – Conventional representation of electrochemical cells – EMF and its measurements – Weston- Cd standard cell – computation of cell EMF - Relation between free energy and EMF – Gibbs Helmholtz equation and DH,DG, DEMF – Calculations of thermodynamic quantities of cell reaction (S and K)

#### Unit V: Nernst equation and EMF measurements (12 Hours)

Nernst equation – Types of reversible electrodes – Gas/Metal ion – metal / metal ion – metal/insoluble/anion - redox electrodes – Electrode reaction – Nernst equation of electrode reaction – Derivation of cell EMF – single electrode potential –reference electrodes – standard hydrogen electrode – Standard electrode potential - sign conventions - Electrochemical series and its significance – concentration cell with and without transport number – Liquid Junction Potential – Application of EMF measurements – valency of ions, solubility product, activity coefficient, Potentiometric titration – Determination of pH using hydrogen, Quinhydrone and glass electrodes – Determination of pKa of acids by potentiometry.

#### Text Book:

 Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLal, Nagin Chand & Co. (1993)

#### Reference

1. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press, London (1994).

rs Credits	Mean Score of	COS	3.54	3.31	3.23	3.23	3.15	3.31	3.29
Hours 4	Mea								
		PSO8	3	4	ю	3	4	3	Score
		PSO7	4	4	n	4	3	4	Mean Overall Score
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r TRY-I	cific Ot Os)	PSO5	4	4	ю	3	4	4	
Title of the Paper PHVSICAL CHEMISTRY-I	Programme Specific Outcomes (PSOs)	PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	e	e	4	3	3	3	
itle of tl ZAL, Cl	rogran	PSO3	e	2	m	3	2	3	
T		PSO2	4	ω	5	3	4	4	
9		PSO1	e	4	n	3	2	3	
		P05	e	n	4	3	3	4	
	itcomes	P04	4	ю	с	3	4	3	
ode 212	Programme Outcomes (POs)	P03	4	ю	e	3	3	2	
Course Code 7UCH530212	Progra	P02	4	ε	4	4	3	4	
5 E		P01	e	4	n	3	4	3	
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Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	e	4	v
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

ues Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
Vah	Total of Values	Total No. of DOc & DSOc
	Mean Score of COs =	

## Semester V 17UCH530302A

Hours/Week: 4 Credit: 3

## **Core Elective-II** SELECTED TOPICS IN CHEMISTRY-I

## **Course Outcomes**

- 1. Students learn about thermo chemistry and its applications.
- 2. Students learn about acids bases, pH scale and common ion effect and learn about buffer solution, acid base indicators.
- 3. Students learn about Colloids their preparation-purification-properties and the concept of solubilisation and the role of micellar catalysis.
- 4. Students study about radiolysis and industrial application of radiation chemistry.
- 5. Students learn about chemistry of nano particles.
- 6. Students learn about types and applications of catenanes -carbon nanotubes.

## **Unit-I: Thermochemistry**

(12 Hours)

Change of internal energy and enthalpy in chemical reactions-exothermic and endothermic reactions-relation between enthalpy of a reaction at constant volume and constant pressure-standard enthalpies of reactions, combustion, neutralization, solution, formation-determination of enthalpies of reactions-Kirchhoff equation-Hess'slaw-bomb calorimeterbond energy and its applications.

## Unit-II: Acids and bases

Dissociation of weak acids and bases-pH scale-common ion effect-buffer solution-buffer action- Henderson equation-hydrolysis of salts and its determination-acid base indicators-theories of acid base indicators-solubility product and its applications.

## Unit-III: Colloids

(12 Hours)

(12 Hours)

Classification-preparation-purification-properties-determination of size of particles-surfactants-micelle formation-solubilization- micellar catalysisemulsification-microemulsion-gels and their applications.

## **Unit-IV: Radiation chemistry**

## (12 Hours)

Introduction to radiation chemistry - Primary and secondary process radiolysis of water - hydrated electrons - Radiolysis of Fricke dosimeter solution - radiation dosimetry-industrial application-processing of polymerssterilisation of medical products-conservation of environment-applications of radio isotopes in health care.

## Unit-V: Nano chemistry

#### (12 Hours)

Basics of nanoscience and nanotechnology – chemistry of nanoparticles – nanotechnology –Methods of synthesis of nano materials –plasma arching , sol gels –applications of nano chemistry –catenanes –carbon nanotubes – types- synthetic methods-fullerene-its properties

#### **Text Book:**

- Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLal, Nagin Chand & Co. (1993).
- 2. Sood, D. P, Reddy A V R, Ramamoorthy N, Fundamentals of radiochemistry, Indian Association of nuclear chemists and Allied scientist, Mumbai (2000)
- 3. Pradeep T, Nano: The Essentials, Tata McGraw Hill Pub.co.Ltd., NewDelhi (2009).

#### Reference

1. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press, London (1994).

-I Hours Credits	Mear	PSO1 PSO2 PSO3 PSO4 PSO5 PSO6 PSO7 PSO8 CUS	2 3 3.1	4 5 3.3	4 3 3.5	3 5 4.0	4 5 3.6	
Title of the Paper SELECTED TOPICS IN CHEMISTRY-I	Programme Specific Outcomes (PSOs)	SO5 PSO6	2 3	3 4	4	5 4	5 3	
Title of the Paper TOPICS IN CHI	mme Specifi (PSOs)	PS04 P	4	4		5	4	_
litle of 1 FOPIC	Progra	PS03	4	m	4	4	4	
TED		PS02	2	e	4	5	4	•
SELEC		PS01	3		2	3	2	V
•		P05	4	3	4	4	4	τ
	Programme Outcomes (POs)	P04	3	4	4	4	2	C
de 02A	nme Ot (POs)	P03	3	2	2	2	1	1
Course Code 17UCH530302A	Prograi	P02	5	4	3	3	4	4
17UG		P01	3	3	4	5	5	5
Semester V	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6

Very High

4.1-5.0

3.1-4.0 High

Moderate

2.1-3.0

1.1-2.0 Poor

0.0-1.0 Very poor

4

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Scale Relation Quality

Note:

Total of Mean Scores Total No. of COs

Mean Overall Score for COs =

POs & PSOs

Total No. of F

Mean Score of COs =

Total of Values

Values Scaling:

Semester V 17UCH530302B

#### Hours/Week: 4 Credit: 3

## Core Elective-II SELECTED TOPICS IN CHEMISTRY-II

#### **Course Outcomes**

- 1. Students learn and categorize the concepts of green chemistry.
- 2. Students get to know the steps in photo chemistry and the direct and indirect uses of photo chemistry.
- 3. Students learn about concepts of NMR spectroscopy.
- 4. Students learn about ESR and its applications.
- 5. Students learn about NQR and its applications.
- 6. Students learn about Statistical thermodynamics.

## Unit I: Green chemistry

## (12 Hours)

Need- principle-planning of green synthesis-examples of green reactions from condensation, oxidation, reduction, rearrangement and addition reactions- microwave and sonication reactions.

## Unit II: Photochemistry

## (12 Hours)

Photochemical reaction – Laws of photochemistry – quantum yield – primary and secondary process – HI decomposition – HBr decomposition – kinetics of hydrogen- bromine reaction - kinetics of hydrogen- chlorine reaction – Photochemical equilibrium – photodimerisation of Anthracene – Photosensitisations – Chemiluminescence – Phosphorescence.

## Unit III: NMR

Magnetically active nuclei – simple instrumentation – signals in NMR spectrum – Chemical shift – characteristic chemical shift values of various protons and carbons – number splitting and area of the peaks – coupling constants –introduction to  $C^{13}NMR$  spectroscopy- types of carbons and their signals and splitting only-

## Unit IV: ESR and NQR

## (12 Hours)

(12 Hours)

ESR Principle-hyperfine structure-EPR for hydrogen atom, methyl radical, p-benzosemiquinone, naphthalene negative ion, anthracene negative ion and triphenyl methyl radical-g-factor- NQR principle-NQR for ⁴N, ¹¹B, ³⁶Cl, ²⁷Al, ¹³³Cs -Zeeman effect

## Unit V: Statistical thermodynamics

## (12 Hours)

Permutation and combination-combinatory rule-probability theorems-micro and macrostates-phase space-thermodynamic probability-stasticial equilibrium-Maxwell-Boltzmann statistics and its derivation-relation between entropy and probability.

## **Text Book:**

- 1. Ahluwali V K, Green chemistry, Ane books ltd, Chennai (2009)
- 2. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLal, Nagin Chand & Co., (1993)
- 3. Kuriakose J C and Rajaram J C, Thermodynamics, Shobanlal co, Jalandar, New Delhi. (1996)

## Reference

1. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press, London (1994).

Hours Credits 4 3	Mean Score of	COS	3.3	3.1	3.4	3.8	3.4	3.4	3.4
Hour 4	Mea								
		PSO8	2	2	4	5	4	2	0.000
_		PSO7	2	ю	4	4	4	2	S II or or o
<b>FRY-II</b>	itcomes	PSO6	4	ю	2	2	2	4	Mean Overall Score
r IEMIS'	cific Ou Ds)	PSO5	3	4	ю	4	4	4	
Title of the Paper TOPICS IN CHI	Programme Specific Outcomes (PSOs)	PSO4	4	ю	4	3	2	2	
itle of th OPICS	rogran	PSO3	2	ю	2	2	4	2	
T TED T		PSO2	4	2	3	4	4	3	
Title of the Paper SELECTED TOPICS IN CHEMISTRY-II		PO3 PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	4	4	4	2	4	
S		P05	2	2	3	4	3	3	
	Programme Outcomes (POs)	P04	4	3	4	4	2	4	
ode 802B	nme Ot (POs)		2	4	4	5	2	5	
Course Code 7UCH530302B	Progra	P02	4	3	3	4	4	2	
17UC		P01	3	4	4	5	4	4	
Semester V	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

Result: The Score for this Course is 3.4 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Ouality	Very poor	Poor	Moderate	High	Very High

'alues Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
Va	Total of Values	Total No. of POs & PSOs
	Score of COs =	

Mean

## Semester V 17UCH530213

Hours/Week: -Credit: 2

## Self-Paced Learning ESSENTIALS OF CHEMISTRY

#### **Course Outcomes**

- 1. Students learn and understand the various theories if acids, bases, solvents and their use in day to day life.
- 2. Students understand the bioactivity of proteins, enzymes, metals, vitamins, hemoglobin and myoglobin.
- 3. Students study the synthetic uses of synthetic reagents.
- 4. Students learn about redox reagents and their application in industry.
- 5. Students understand about polymers, fibers, cements preparation, uses and their applications.
- 6. Students understand about glass and alloys preparation, uses and their applications.

#### Unit-I: Acids-Bases and non-aqueous solvents

Theories of acids and bases – Arrhenius, Bronsted-Lowry, Lewis, Lux Flood and Usanovich and Solvent system concept. HSAB principle-Non-aqueous solvents classification-water and liquid ammonia as solvents.

## Unit-II: Bioinorganic chemistry

Metal ion in biology and their vital role in the active site, Structure and functions of Metallo proteins and enzymes. Ion transport mechanism in cell membrane – Na and K pumps- Ionophores – Structures and characteristic features of Haemoglobin and myoglobin – Vitamin B₁₂.

## Unit-III: Organic synthetic reagents

Synthesis and applications of – BuLi, B₂H₆, CH₂Cl₂, DCC, Grignard reagent, NBS, Ph₃P, PCl₅, NaN₃, NaNO₂, SOCl₂, Me₂S and Me₂CuLi.

## **Unit-IV: Organic redox reagents**

Structures and applications of the following Oxidants- PCC,  $H_2O_2$ , m-Cpba, OsO₄, KMnO₄, HIO₄, and SeO₂. Reductants- LiAlH₄, NaBH₄, Raney nickel, Wilkinson catalyst, Lindlar's Catalyst, MPV, Clemmensen and Wolf-Kishner reductions and Birch reduction.

## Unit-V: Polymers, alloys, cement, glass

Rubber as a natural polymer – Types of polymers – homopolymerscopolymers – addition and condensation polymers - polymerization reactions – Chemistry of Vulcanization of rubber – Manufacture of Film sheets, Rayon and Polyacrylic fibers – important alloys of iron, copper, aluminium and nickelmanufacture and setting of cement- types of glass and manufacture.

## **Text Book:**

- 1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, ShobanLal, Nagin Chand & Co., (1993).
- 2. Morrison and Boyd , Organic Chemistry, (7th edition) New York, Allyn & Bacon Ltd.,(2011).
- 3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLal, Nagin Chand & Co., (1993)

## Reference

- Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press, London (1994).
- Finar I.L, Organic Chemistry, Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd.(1996).
- 3. Organic Reaction Mechanisms, (4th edition), Ahluwalia V.K., Rakesh Kumar Prashar, Alpha science international (2011)

		ode )213	Course Code 17UCH530213
	utcomes	mme Outcomes (POs)	Programme Outcomes (POs)
P05	PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	PO3 PO4	PO2 PO3 PO4 PO5
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3	3	3 3 3	3 3 3 3 3
4	4 4	3 4 4	3 3 4 4
4	4 4	3 4 4	3 3 4 4
4	4 4	3 4 4	3 3 4 4

Scores COs

Total of Mean S Total No. of C

Mean Overall Score for COs =

Total of Values Total No. of POs & PSOs

Mean Score of COs =

Values Scaling:

81-100%

61-80%

41-60%

21-40% 2 1.1-2.0 Poor

1-20%

Mapping Scale Relation Quality

Note:

3.1-4.0 High

2.1-3.0 Moderate

0.0-1.0 Very poor

4.1-5.0 Very High

#### Semester V 17UCH540601

## Hours/Week: 2

Credit: 2

## **Interdisciplinary Skill Based Course** FOOD AND NUTRITION

## **Course Outcomes**

- 1. Students learn and identify the functions of nutrition and design of various aspects of protein energy metabolism.
- 2. Students know about the steps in nutrition care process.
- 3. Students acquire knowledge about importance of iodised food.
- 4. Students improve the awareness of the iodine deficiency disease.
- 5. Students improve the direct and indirect remedies of nutrition problems.
- 6. Students develop the social thinking and ability in context of food and its nutrition contents.

## Unit I: Aims of Food Science and Technology

## (6 Hours)

World Food Requirement - Food Safety for the Consumer nutrition - Basic chemical constituents of food - Food borne diseases.

## Unit II: Water

(6 Hours)

Role and Function of water in Biological Systems - Dietary requirements and sources - Physical properties of water - Solute-water interactions.

## **Unit III: Food Conversion Operations**

## (6 Hours)

(6 Hours)

(6 Hours)

Size Reduction - Screening - Mixing - Emulsification - Filtration -Centrifugation – Extraction – Crystallization

## **Unit IV: Food adulteration testing**

Common adulterants in food-testing methods of all food adulterants.

Unit V: Health problems of food adulteration

Principal adulterants and their health effects.

## References

- 1. Alex Ramani, V., Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009.
- 2. Sivasankar, B., Food Processing and Preservation, PHI Learning Private Limited, Delhi, 2013

# Note:

81-100%

61-80%

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21-40%

1-20%

Mapping

Scale Relation Quality

4.0

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Very poor 0.0 - 1.0

Scores COs

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Mean Overall Score for COs

Total No. of POs & PSOs

Total of Values

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Mean Score of COs

Values Scaling:

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Semester V	L	Р	С
17USS540701A	2	-	2

## Inter Departmental Courses (IDC): SOFT SKILLS

## **Course Outcomes**

- 1. To augment the level of confidence in articulation oif the students in their communication.
- 2. To ensure that the students learn to speak and interact with one another as social beings
- 3. To equip them and train to present the best of themselves as job seekers.
- 4. To equip with conversation techniques, presentation skills and grooming
- 5. To prepare them write their own resume and enhance their interview skills required by employers
- 6. To ensure that the students learn the parameters of group dynamics a key component of conversation

## Module I

**Basics of Communication: D**efinition of communication, Barriers of Communication, Grooming, Presentations & Practicum.

## Module II

**Resume Writing & Interview Skills:** Resume Writing: What is resume? Types of Resume - Chronological, Functional and Mixed Resume, Steps in preparation of Resume. **Interview Skills:** Preparation

## Module III

**Group Discussion: Basics of G**roup Discussion, Parameters of GD, Essential Points for GD preparation, and GD Topics and Practicum.

## Module IV

**Personal Effectiveness:** Self Discovery; and Goal Setting; Questioneers & Presentations for interview, Common interview questions, Attitude, Body Language, The mock interviews and Practicum

## Module V

**Numerical Ability:** Calendar, Average, Percentage; Profit and Loss, Simple Interest, Compound Interest; Time and Work, Pipes and Cisterns; Time and Distance, Problems on Trains, Boats and Streams; Ratios and Proportions.

## Module VI

**Test of Reasoning - Verbal Reasoning:** Series Completion, Analogy; Data Sufficiency, Assertion and Reasoning; and Logical Deduction. **Non-Verbal Reasoning:** Series; and Classification

## Textbook

1. JASS, 2016. *Straight from the traits: Securing the soft skills*. St.Joseph's College, Trichy

## References

- 1. Aggarwal, R.S. 2010. A Modern Approach to Verbal and Non Verbal Reasoning. S.Chand, New Delhi.
- 2. Aggarwal, R.S. 2001. Quantitative Aptitude. S.Chand. New Delhi
- Covey, Stephen. 2004. 7 Habits of Highly effective people, Free Press. Egan, Gerard. (1994). The Skilled Helper (5th Ed). Pacific Grove, Brooks/ Cole.
- 4. Khera , Shiv 2003. You Can Win. Macmillan Books , Revised Edition.
- Murphy, Raymond. 1998. Essential English Grammar. 2nd ed., Cambridge University Press. Sankaran, K., & Kumar, M. Group Discussion and Public Speaking. M.I. Pub, Agra, 5th ed., Adams, Media.
- 6. Trishna's 2006. *How to do well in GDs & Interviews*, Trishna Knowledge Systems.
- 7. Yate, Martin. 2005. Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting*

Modules	Tranka	Examinat	tion Pattern
Modules	Торіс	CIA	Online
Ι	Basics of Communication	15	5
II	Resume Writing & Interview Skills	15	5
III	Group Discussion	10	10
IV	Personal Effectiveness	10	10
V	Numerical Ability (Common Session)	-	10
VI	Test of Reasoning (Common Session)	-	10
	Total	50	50

#### **Evaluation Pattern**

Semester V 17USS540701B

## Hours/Week: 2 Credits: 2

## Inter Departmental Courses (IDC): NATIONAL CADET CORPS

#### **Course Outcomes**

- 1. NCC 'C' and 'B" certificates are very much useful and increase credit marks in UPSC and SSB examinations..
- 2. They learnt discipline punctual and leadership quality.
- 3. They got physical fitness for Army and Police selection.
- 4. They learnt general knowledge find political issue.
- 5. They got trained for social service and volunteers for disaster.
- 6. They will be the best citizens of India.

**Unit-I: About NCC - Personality Developmet - Self Awareness** (6 hours) NCC Aims and objectives of NCC - Organization and training and NCC song Incentives for cadets in NCC - NCC ranks Religion, culture, traditions and customs of India.- National integration – importance and necessity -Freedom struggle and nationalist movement in India - Personality development - Introduction to personality development - Factors influencing / shaping personality – Physical, social, psychological and philosophical Self awareness – know yourself / insight. - Change your mindset.

**Unit-II: Interpersonal Relationship and Communication - NDMA** (6 hours) Interpersonal relationship and communication - Communication skills Leadership traits - Types of leadership Attitude – assertiveness and negotiation - Time management - Effects of leadership with historical examples - Stress management skills - Interview skills - Conflict motives.-Importance of group – team work - Disaster Management - Civil defence organization and its duties – NDMA Types of emergencies / natural disasters- Assistance during natural / other calamities / floods / cyclone / earth quake / accident - Setting up of relief camp during disaster Management - Collection and distribution of aid material.

## Unit-III: Social Awareness and Community Development - Hygiene and Sanitation (6 hours)

Social awareness and community development - Basics of social serviceweaker sections of our society and their needs - Health and Hygiene Structure and functioning of the human body - Hygiene and sanitation- Physical and mental health - Infectious and contagious diseases and its prevention - Basic of home nursing and first aid in common medical emergencies - Wounds and fractures - Introduction to yoga and exercises

## Unit-IV: AIR-WING

(6 hours)

Principles of flight – Elementary Mechanics – Atmosphere - Venturi effect and Bernauli's theorem - Glossary of terms; Aero engines – Aero-engine components; Aircraft components – Airframe structure; Metereology – Importance of Metereology in Aviation; Air Navigation – Why a pilot should study Navigation; Airmanship – Airmanship; Aeromodelling – History of Aeromodelling – Materials used in Aeromodelling – Types of Aeromodels.

## Unit-V: NAVAL

#### (6 hours)

Naval orientation - history of Indian Navy – Navy head quarters commands fleets- ships shore establishment war ships and their role - induction to Anti submarine warfare.- Types of war ships - types anchor parts of anchor - GPS RACON RADAR - types of firewater making in the ships- NBCD organization and structure - Damage flooding.

## Text Book

1. Cadet's hand book published by the Directorate General, National Cadet Corps, Ministry of Defence, R. K. Puram, New Delhi 110022, 2008.

Semester VI		Hours/Week: 5
17UCH630214		Credits: 4
	INORGANIC CHEMISTRY-II	

#### **Course Outcome**

- 1. Students learn about the octet rule and VSEPR theory and are able to predict the structures of simple inorganic compounds.
- 2. Students learn about properties of ionic compounds; lattice energy, Born-Haber cycle and its applications.
- 3. Students understand the various theories of metallic bonding, different types of semiconductors and superconductors.
- 4. Students learn about thermogravimetric analysis, differential thermal analysis and its applications.
- 5. Students learn about colorimetric analysis and its applications.
- 6. Students learn about chromatographic techniques such as TLC, GLC, HPLC and their applications industries, research fields and in day to day life.

#### Unit I: Covalent Bond

#### (15 Hours)

(15 Hours)

Lewis theory – octet rule and its exceptions, electron dot structural formula – Sidgwig – Powell theory- prediction of the molecular shapes – Valence Bond theory – Hybridization and geometry of molecules. VSEPR theory – Structres of  $CH_4$ ,  $H_2O$ ,  $NH_3$ ,  $SF_4$ ,  $XeF_2$ ,  $XeF_6$ . MO theory: LCAO method, criteria of orbital overlap, types of molecular orbitals (sigma and pi). Qualitative MO energy level diagram of homo and hetero diatomic molecules  $H_2$ ,  $He_2$ ,  $N_2$ ,  $O_2$ , and CO, bond order and stability of molecules.

#### Unit II: Ionic Bond

Properties of ionic compounds – Factors favouring the formation of ionic compounds (Ionization energy, Electron affinity, Electro negativity and Lattice energy) - Lattice energy – definition, Born – Lande equation (Derivation not required), factors affecting lattice energy- Born – Haber cycle – Illustration and calculation only for MX (NaCl) and  $MX_2$  (CaCl₂) Fajan's rules with illustrations.

#### Unit III: Metallic Bond

(15 Hours)

Properties of metals, free electron theory, band theory explaining the properties of metals, semiconductors and insulators- Stoichiometric and non-stoichiometric defects and their applications. Superconductors –BCS theory – applications of superconductors.

Unit IV: Gravimetry and Thermal Analysis

(15 Hours)

Gravimetric analysis: mechanism of precipitation – solubility products – common ion effect – Types of precipitation – co-precipitation and post precipitation – homogeneous precipitation.

Thermal Analysis: Principle, Instrumentation and applications of TGA, DTA and DSC

## Unit V: Colorimetry and Chromatography

(15 Hours)

Colorimetric analysis: Beer-Lambert law applications and limitations. Principle and instrumentation of spectrophotometry – Chromatography – chromatogram – classification of chromatographic techniques – Principle, instrumentation and applications of TLC and HPLC.

#### Textbook

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition) New Delhi, ShobanLal, Nagin Chand & Co., (1993).

#### References

- Mendham J, Denny R C, Barnes J D and Thomas M J K, Vogel's Text book of quantitative Chemical Analysis, 6th Edition, Prentice Hall, London (2000).
- 2. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
- 3. Huheey J E, Keiter E A, Keiter R L and Medhi O K. Inorganic Chemistry: Principles of Structure and Reactivity, Fourth Edition, Pearson Education, New Delhi, 2006.
- 4. Atkins P, Overton T, Rourke J, Armstrong F and Weller M. Inorganic Chemistry, 5th Edition. Oxford University Press, 2011.

	Hours Credits 5 4	Mean Score of	COS	3.54	3.62	3.69	3.92	3.54	3.92	3.70
mes	Hours 5	Mean	5	ŝ	3	3	3.	3.	3.	3.
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me Out	Title of the Paper INORGANIC CHEMISTRY-II	Programme Specific Outcomes (PSOs)	PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	2	2	2	3	2	3	
rogram			PSO2	4	4	4	3	4	4	
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se Outc			P05	5	5	5	4	5	4	
or Cours		utcome	P04	4	4	4	5	4	5	
atrix fo	Course Code 7UCH630214	Programme Outcomes (POs)	P03	2	2	3	3	2	2	
nship M		Course Co 17UCH630 Progra	P02	5	5	5	5	5	5	
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes	ЗĘ		P01	4	5	5	4	4	4	
	Semester VI	Course Outcomes	(COs)	C01	C02	CO3	CO4	CO5	CO6	

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Result: The Score for this Course is 3.7 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:	Mean Overall Score for COs = Total of Mean Scores	Total No. of COs
Value	Total of Values	Total No. of POs & PSOs
	Mean Score of COs	

## Semester VI 17UCH630215

## Hours/Week: 5 Credits: 4

## **ORGANIC CHEMISTRY-II**

## **Course Outcome**

- 1. Students learn the chemistry of organometallic compounds.
- 2. Students learn the basic concepts of UV-Visible, IR, NMR Spectroscopy.
- 3. Students learn the basic concepts of mass spectrometry.
- 4. Students learn to assign the structure of the organic molecules using spectral data.
- 5. Students learn how to use organometallic compounds to make C-C bond.
- 6. Students learn the application of some named reactions.

**Unit I: Organometallic Reagents and Rearrangements** (15 Hours) Organometallic reagents in organic synthesis- Grignard, organo lithium, organo copper, organo zinc and organocadmium compounds. Rearrangements - Pinacol-Pinacolone, Dienone-Phenol, Baeyer-Villiger, Hoffmann, Curtius, Lossen Beekmann and Schmidt rearrangements.

## **Unit II: Pericyclic Reactions**

(15 Hours)

MO theory, LCAO method, Bonding and antibonding orbitals, Electronic configuration, orbital symmetry and chemical reactions, correlation diagram and FMO, Electrocyclic reactions and cycloaddition reactions, sigmatropic rearrangements, eve reactions and cheretropic reactions.

## Unit III: UV-Visible and IR Spectroscopy

(15 Hours)

Electromagnetic spectrum - Energy wavelength relationship. UV-Visible spectroscopy - principle, simple instrumentation, electronic transitions, chromophores, auxochrome, solvent corrections, Wood Word Fisher method to calculate ëmax of dienes and enones. IR spectroscopy-Hooke's Lawsimple instrumentation, molecules-modes of vibrational in organic molecules - IR spectra of functional groups - HC, alcohols, ethers, halogen, aldehydes, ketones, amines and esters-Identification of hydrogen bonding by IR spectroscopy.

## Unit IV: NMR and ESR Spectroscopy

(15 Hours)

NMR-principle, simple instrumentation, Number of signals, Chemical shift, peak area and proton counting, spin-spin coupling and coupling constants, Deuteriated solvents, interpreting the NMR spectra of some organic molecules. ¹³C NMR spectroscopy – types of carbon, splitting and chemical

shift. ESR spectroscopy: Principle and applications to methyl and naphthyl radicals.

## **Unit V: Mass Spectrometry**

#### (15 Hours)

Mass spectrometry - Principle, simple instrumentation, types of ion peaks, Fragmentation pattern, m/z values, Nitrogen rule, McLafferty rearrangement. Interpreting the mass spectra of some organic molecules. Combined approach to identify the structure of organic molecules.

## **Text Book**

- 1. Morrison and Boyd, Organic Chemistry, (7th edition) New York, Allyn & Bacon Ltd.,(2011).
- 2. Y R Sharma, Elementary Organic Spectroscopy, (5th Revised Edition) S. Chand & Company Pvt. Ltd, 2013.
- 3. Silver Stein, M.R. and Webster, F.X., Spectral Identification of ORganic compounds 6th ed., John Willy& Sons, Inc. NY, 1998.

## References

- 1. Pine S.H, Organic Chemistry, (4thedition) New Delhi, McGraw-Hill International Book Company (1986).
- 2. Finar I.L,Organic Chemistry, Vol:1 & 2, (6th edition) England, Addison Wesley Longman Ltd.(1996).
- 3. Paula Yurkanis Bruice, Organic Chemistry, (8th edition) University of California, Santa Barbara, Pearson Ltd, (2011).

Title of the Paper ORGANIC CHEMISTRY-II	-		de 215	Course Code 7UCH630215
Programme Specific Outcomes (PSOs)		tcomes	nme Outcomes (POs)	Programme Outcomes (POs)
PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	05 PSO	PO4 PO5 PS0	PO3 PO4 PO5 PS0	PO2 PO3 PO4 PO5 PS0
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Total No. of POs & PSOs

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Mean Score of COs

Values Scaling:

Very High

4.1-5.0

3.1-4.0 High

Moderate

2.1-3.0

1.1-2.0 Poor

Very poor

0.0-1.0

Scale Relation Quality

81-100%

61-80%

41-60%

21-40%

1-20%

Mapping

Note:

# Semester VIHours/Week: 617UCH630216Credits: 4

#### PHYSICAL CHEMISTRY-II

## **Course Outcomes**

- 1. Students learn about solutions, their types, colligative properties, effect of added salt and molecular weight determination.
- 2. Students learn about solids, their properties, close packing in crystals, and use of X-rays in crystal structure determination.
- 3. Students understand the concept of polarization, dipole moment and their importance in structure determination.
- 4. Students study about rate and mechanism of chemical reactions.
- 5. Students learn about theories of reaction rate.
- 6. Students learn about types and mechanism of catalysis and adsorption reactions.

#### **Unit I: Properties of Solutions**

## (18 Hours)

Ideal binary liquid mixtures – Raoult's law and Henry's law – Fractional distillation of binary miscible liquid – Non-ideal systems – Azeotropes – HCl and water system – Ethanol and water system. Partially miscible binary liquid systems: Phenol and water – Triehtylamine and water – Nicotine and water – lower and upper CST's – Immiscible liquid – Nernst distribution – Principle and applications of steam distillation. Dilute solutions and colligative properties: Determination of molecular weight – relative lowering of vapour pressure – Elevation of boiling point – Depression of freezing point – Thermodynamic derivation – Abnormal molecular mass – Van't Hoff factor – Degree of dissociation and degree of association of solutes.

#### Unit II: Solid state and polarization in solids

(18 Hours)

Isotropic and anisotropic solids – Interfacial angle – symmetry elements in crystal systems – Bravais lattices - Unit cell – law of rational indices (Weiss indices), Miller indices – unit cell dimension – density – number of atoms per unit cell – X-ray diffraction by crystals – derivation of Bragg's equation – Experimental methods of X-ray study- rotating crystal method – X-ray pattern by powder method - crystal structure of NaCl, ZnS, CsCl – Radius ratio and packing in crystal – Determination of Avogadro number – Vitreous state. Polarization of molecules in an electric field – Polarizability and dipole moment – Induced and orientation polarization – Clausius Mosotti equation – Applications of dipolemoment measurement of molar polarization

## Unit III: Chemical Kinetics I

#### (18 Hours)

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – Factors influencing the rate of a reaction – Derivations of rate constants for Zero, first and second order reactions – Fractional order reactions – Half-life period – Pseudo first order reactions and examples – Methods of determination of order of a reaction (Integration, graphical, half-life, Ostwald's dilution method, experimental).

## Unit IV: Chemical Kinetics II

(18 Hours)

Steady state approximation - Chain reactions and explosion reaction -Temperature dependence of reaction rates – Arrhenius parameters. Theories of reaction rates – simple collision theory – limitations - Lindmann's hypothesis of unimolecular reactions – Theory of absolute reaction rates – influence of ionic strength on reaction rate.

## **Unit V: Chemical Kinetics III**

(18 Hours)

Homogeneous and Heterogeneous catalysis – Acid-base catalysis, enzyme catalysis – MichaelisMenten equation – Adsorption - heat of adsorption – factors influencing adsorption-physical adsorption and chemical adsorption – Adsorption of Gas by solids – Langmuir theory of adsorption – unimolecular surface reaction – Bimolecular surface reaction. Freundlich adsorption isotherm – Gibbs adsorption isotherm, for adsorption of solutions. Note: Numerical problems wherever possible.

## **Text Book:**

 Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLal, Nagin Chand & Co., (1993)

## References

- 1. Atkins P.W., Physical Chemistry, (7th edition) Oxford University Press, London (2009).
- 2. Castellan G.W., Physical Chemistry, Third Edition, New Delhi, Orient Longmann (1987).

Credits 5	Mean Score of	COS	3.07	2.84	3.23	2.92	3.15	3.31	2 00
Hours 6	Mean		с. Г	0	e.	2	e	e.	
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r TRY-I	cific Ot Os)	PSO5	2	4	2	3	3	3	
Title of the Paper PHYSICAL CHEMISTRY-II	Programme Specific Outcomes (PSOs)	PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	ω	m	3	3	3	
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d		PSO1	4	2	4	4	3	3	
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ode 216	mme Ot (POs)	P03	3	ю	e	3	3	3	
Course Code 17UCH630216	Progra	P02	4	ę	б	3	4	4	
5 5 1		P01	e	ε	n	3	4	3	
Semester VI	Course Outcomes	(COS)	c01	C02	CO3	CO4	CO5	CO6	

Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale		2	e	4	v
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

	= Total of Mean Scores	Total No. of COs
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Valu	Total of Values	Total No. of POs & PSOs

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Score of COs

Mean

Semester V & VI 17UCH630217

Hours/Week: 4 Credits: 3

## **Chemistry Practical-IV GRAVIMETRY & ORGANIC PREPARATION**

#### **Course Outcomes**

1. Students learn the techniques of gravimetric analysis.

2. Students learn the methods of preparing organic compounds.

## Unit-I: Theory of Gravimetry

Principles of quantitative precipitation - Conditions for precipitation -Methods of Digestion - Quantitative filtrations - Techniques of drying -Theory of weighing - Handling of chemical balance - Scientific Reporting.

## **Unit-II: Theory of Organic Preparations**

Principles of chemical conversions - Handling of organic chemicals and glassware - Filtration techniques - Drying techniques - Distillation techniques - Recrystallization techniques - Scientific Reporting

## **Unit-III: Gravimetric Analysis**

- 1. Estimation of Lead Chromate
- 2. Estimation of Barium as Barium chromate
- 3. Estimation of Nickel as Nickel-DMG complex
- 4. Estimation of Copper as Copper (I) thiocyanate
- 5. Estimation of Magnesium as Magnesium oxinate
- 6. Estimation of Calcium as Calcium oxalate
- 7. Estimation of Barium as Barium sulfate
- 8. Estimation of Iron as Iron (III) oxide

## **Unit-IV: Organic Preparation**

Preparation of Organic compounds involving the following chemical conversions:

- 1. Hydrolysis
- 2. Esterification
- 3. Nitration
- 4. Bromination
- 5. Oxidation
- 6. Diazotization
- 7. Osazone formation

## **References**:

- 1. Venkateswaran, V., Veeraswamy, R., Kulandaivelu, A.R., Basic Principles of Practical Chemistry, (2nd ed), New Delhi, Sultan Chand & Sons, (1997).
- 2. Furniss, B.S. et al., Vogel's Textbook of Practical Organic Chemistry, (7th ed), London, ELBS Longman (1984).

2. Students learn the determination of physical constants of organic compounds.

Semester V & VI

**Course Outcomes** 

17UCH630218

## Unit I: Theory of Organic Analysis

Principles of qualitative analysis – Handling of apparatus and hazardous chemicals like bromine, sodium,  $NaNO_2$ , concentrated acids and bases, etc., Theory of the various chemical reactions / tests – Micro level Techniques of analysis and derivatization - Scientific Reporting

CHEMISTRY PRACTICAL-V

**Organic Analysis & Physical constants** 

1. Students learn the techniques of organic qualitative analysis.

Hours/Week: 4

Credits: 3

#### Unit II: Theory of measurement of physical parameters

Principles of physical measurements – Handling of chemicals and the apparatus –Scientific Reporting.

#### Unit III: Organic Analysis

Analysis of simple organic compounds

- a. Characterization of functional groups
- b. Confirmation by preparation of solid derivatives / characteristic colour reactions

#### Note:

- Mono-functional compounds are given for analysis. In case of bifunctional compounds, students are required to report any one of the functional groups
- 2. Each student is expected to do the analysis of at least 15 different organic substances

## Unit IV: Determination of Physical constants

Determination of boiling and melting points by semi micro method.

#### **Reference:**

- Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., *Basic Principles of Practical Chemistry*, (2nd edition), New Delhi, Sultan Chand & sons, (1997).
- 2. Furniss, B.S., *et al.*, *Vogel's Textbook of Practical Organic Chemistry*, (7th edition), London, ELBS Longman (1984).

## Semester VI 17UCH630303A

Hours/Week: 4 Credits: 4

## Core Elective: CHEMISTRY OF BIOMOLECULES

#### **Course Outcomes**

- 1. Students learn the chemistry of sugars.
- 2. Students learn the chemistry of amino acids, proteins, nucleic acids, vitamins and antibiotics.
- 3. Students learn the chemistry of alkaloids and terpenoids.
- 4. Students learn how to name the biomolecules.
- 5. Students learn to draw the structures of complicated molecules.
- 6. Students learn the name reactions in the above specified biomolecules.

#### Unit 1: Sugars

#### (12 hours)

Introduction – Classification – Nomenclature –Physical properties- Glucose-Cyclic structures – Chemical properties – Mutarotation – Anomerism – Epimerization –Kiliani-Fischer Synthesis – Ruff Degradation – Fructose – cyclic structures-Interconversion of ketose to aldose – Conversion of glucose into ascorbic acid– only structures of disaccharides: lactose, maltose, cellobiose, sucrose – Structural differences between starch and cellulose -Uses of Cellulose and its derivatives

#### Unit 2: Amino acids and Proteins

#### (12 hours)

List of amino acids – Structures - Preparation of amino acids – Reactions of amino acids -synthesis of dipeptides: Protection, Activation and deprotection - Merrifield solid phase synthesis– Classification of proteins - Terminal Residue analysis: N-terminal (Edman Pehr method) – C-terminal analysis (Enzymatic and Chemical) – Sanger method of identification of amino acid sequence in a polypeptide - Structure of proteins – primary, secondary and tertiary structures of proteins

#### **Unit 3: Heterocyclics**

Introduction – Nomenclature –Synhesis of Pyrrole, Furan and Thiophene – Molecular orbital pictures – Reactions of pyrrole, furan and thiophene Synthesis and reactions of Indole, Pyridine, Quinoline

#### Unit IV: Nucleic acids

#### (12 hours)

(12 hours)

Types of bases – Types of sugars – Nucleosides and Nucleotides – Types of nucleic acids - Structure and functions of DNA and RNA. Vitamins and Antibiotics-Vitamins – Types – Sources and deficiency disorders – Antibiotics – structure and functions of chloramphenicol, penicillins,

streptomycein, tetracyclins – only definition of disinfectants, antiseptics, antipyretics, analgesics and antimalarials.

## Unit V: Alkaloids, Steroids and Terpenoids

#### (12 hours)

Introduction to Alkaloids – Classification – Occurrence and Isolation – Structural elucidation of papaverine and nicotine only – Only Structures of alkaloids: Quinine, Morphine, Atropine, Nicotine, Coniine, Piperine and Papaverine – Only Structure and functions of steroids-Androgen, Esterogen and cholesterol- Classification and definition of terpenoids – isoprene rule - Structure and uses of some essential oils - Structural elucidation of geraniol only.

## **Text Book:**

1. Finar I.L, Organic Chemistry, Vol 1 and 2 (6th edition) England, Addison Wesley Longman Ltd. (1996).

#### References

- 1. Morrison R.T, Boyd R.N., Organic Chemistry (4th edition) New York, Allyn& Bacon Ltd., (1976).
- 2. Paula Yurkanis Bruice, Organic Chemistry (3rd edition) New Delhi, Pearson Education (2001).

Hours Credits 4 4	Mean Score of	203	3.54	3.31	3.23	3.46	3.31	3.77	3.43
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		PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	4	4	4	4	4	3	Mean Overall Score
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DLECU	cific Ou Os)	PSO5	4	4	3	3	4	3	
Title of the Paper CHEMISTRY OF BIOMOLECULES	Programme Specific Outcomes (PSOs)	PSO4	3	e	3	4	3	5	
itle of tl XY OF ]	Program	<b>PSO3</b>	3	2	3	3	3	4	
T MISTR		PSO2	4	3	3	3	4	3	
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Course Code 17UCH630303A	Progra	P02	4	ω	4	4	4	4	
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Semester VI	Course Outcomes	(COs)	C01	C02	CO3	C04	CO5	CO6	

Very High

4.1-5.0

3.1-4.0 High

Moderate

Very poor

0.0-1.0

Values Scaling:

2.1-3.0

5

81-100%

61-80%

41-60%

21-40% 2 1.1-2.0 Poor

1-20%

Mapping Scale Relation Quality

Note:

Mean Overall Score for  $COs = \frac{Total of Mean Scores}{Total No. of COs}$ 

Total of Values Total No. of POs & PSOs

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Mean Score of COs

## drugs are.2. Students learn the selective and non selective CNS depressants.

Semester VI

17UCH630303B

**Course Outcomes** 

3. Students learn to differentiate between pharmacokinetics and pharmacodynamics.

**Core Elective:** 

**PHARMACEUTICAL CHEMISTRY** 

1. Students learn how the drugs act on CNS and what cardiovascular

- 4. Students learn the medicinal terms of drugs.
- 5. Students learn the use of alkaloids in medicine.
- 6. Students learn the medicinal terms of diseases.

## Unit-1: CNS drugs-I

#### (12 hours)

Hours/Week: 4

Credits: 4

General Anaesthetics: Intravenous anaesthetics, mechanism of anaesthetic action. Hypnotics and Sedatives: Classification, chemistry, pharmacological actions, pharmacokinetics and adverse affects of barbiturates, benzodiazepines, BZD antagonist.

#### Unit -2: Analgesics and Antiseptics

### (12 hours)

Opioid Analgesics: Morphine and codeine and their synthetic modifications, opioid antagonists. Antiepileptics: Epilepsises, Classification, chemistry, treatment of epilepsises.

## Unit-3: CNS drugs-II

Antiparkinsonism drugs: Dopamine replacements, dopamine releasers, dopamine agonists.

Anticonvulsant Drugs: Barbiturates, hydantoins, oxazolidinediones, succinimides.

## Unit-4: Psychotropic and pharmacological Agents (12 hours)

Antipsychotic Drugs: Psychoses, classification, mechanism of actions, adverse effects.

Antianxiety Drugs: Anxiety, classification, treatment of anxiety. Antidepressants: MAO inhibitors, classification, mechanism of action of tricyclic and related Antidepressants. Antamanic Drugs: Mechanism, pharmacokinetics and control of therapy.

Hallucinogens: Introduction of indoleamines and cannabinoids.

Unit-5: Cardiovascular Agents-I

(12 hours)

CNS–Stimulants: Classification and introductory ideas of different classes, cognition enhancers. Antianginal Agents and Vasodilators: Intermediary myocardial metabolism, nitrovasodilators metabolism and antianginal action, calcium antagonists.

## Textbook:

- 1. Jeyashre Ghosh, A Text book of Pharmaceutical Chemistry, Tata McGraw Hill Publishing, New Delhi (1993).
- 2. Finar I.L, Organic Chemistry, Vol 1 and 2 (6th edition) England, Addison Wesley Longman Ltd. (1996).

## References

- 1. Morrison R.T, Boyd R.N., Organic Chemistry (4th edition) New York, Allyn& Bacon Ltd.,(1976).
- 2. Paula YurkanisBruice, Organic Chemistry (3rd edition) New Delhi, Pearson Education (2001).

(12 hours)

Hours Credits 4 4	Mean Score of	COS	3.54	3.23	3.23	3.46	3.31	3.77	3.42
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r EMIST	cific O1 Os)	PSO5	4	ю	3	3	4	3	
ne Pape CL CH	nme Specific (PSOs)	PSO4	n	4	3	4	3	5	
Title of the Paper PHARMACEUTICL CHEMISTRY	Programme Specific Outcomes (PSOs)	PSO3	e	ω	3	3	3	4	
T		PSO2	4	2	3	3	4	3	
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	Programme Outcomes (POs)	P04	4	3	3	3	3	4	
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Course Code 7UCH630303B	Progra	P02	4	4	4	4	4	4	
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Semester VI	Course Outcomes	(COs)	C01	C02	CO3	CO4	CO5	CO6	

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Result: The Score for this Course is 3.4 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	-	2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Scores

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of

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**Mean Overall** 

PSOs

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Mean Score of COs

Total of Values

Values Scaling:

Semester VI
17UCH640602

#### Hours/Week: 2 Credits: 2

## **Skill Based Elective: EVERYDAY CHEMISTRY**

**Course Outcomes** 

1. Students understand the chemistry of water.

2. Students study the manufacture of the cements.

3. Students learn about properties of rubber and rocket propellant.

4. Students learn about different types of fuels.

5. Students understand the importance of drugs.

6. Students understand the need of biologically useful chemicals.

Unit I: Chemistry of water: Importance of water - Sources of water -Impurities of water - Hardness of water and its types - Effect of Hardness -Methods of removing hardness of water (Softening of Hard water) -Practically calculating Total Hardness, Temporary Hardness and Permanent hardness of water sample. (6 hr)

Unit II: Industrial Chemistry: Cement - Raw materials - Manufacture of Portland cement and Setting of cement. Rubber - Vulcanization and Uses of rubber. Rocket Propellant – Solid, liquid and gas propellants. (6 hr)

Unit III: Fuels: Coal - Stages of Carbonization and classification of coal -Estimation of moisture, volatile matter and ash content of a given sample of coal. Petroleum - Refining - Fractional distillation of crude oil - Gasoline -Octane number - Knocking - Cracking - Leaded Petrol. Natural Gas -Liquefied Petroleum Gas (LPG). (6 hr)

Unit IV: Pharmaceutical Chemistry: Drugs: Classification based on chemical nature, source and target organ. Anaesthesia: types, examples of Anaesthetics - Antiseptics & Disinfectants - Antibiotics: Uses and examples. Preservatives, Antioxidants, Semi-micro qualitative analysis of tablets (6 hr) Unit V: Biological Chemistry: Vitamins - Fat and Water soluble vitamins and their functions. Chemistry of Soaps and Detergents - Cleansing action of soap - Difference between soaps and detergents - Laboratory preparation of soaps, shampoos & detergents. Clinical Chemistry - Diabetes - Diagnosis, Cholesterol levels, anemia, – causes & prevention – Blood pressure. (6 hr) **Text Book:** 

1. Krishnamurthy N., Jayasubramanian K and Vallinayagam, Applied Chemistry, Prentice Hall of India, New Delhi (1990).

**References:** 

- 1. Jeyashre Ghosh, A text book of Pharmaceutical Chemistry, Tata McGraw Hill Publishing, New Delhi (1993).
- 2. Gem Mathew G D., Chemistry in Everyday Life, Vishal Publishing (2014).
- 3. Chemistry in Everyday Life: Gem Mathew G.D., Vishal (2011)

Hours Credits	7	Mean Score of	SOJ	3.1	3.2	3.2	3.2	3.2	2.9	
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<b>Title of the Paper</b>	Skill Based Elective: EVERYDAY CHEMISTRY	Programme Specific Outcomes (PSOs)	PO3 PO4 PO5 PS01 PS02 PS03 PS04 PS05 PS06 PS07 PS08	2	5	5	4	e	5	
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Ξ	Electiv	Γ	PSO2	e	с,	S	-	5	2	
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	Skill		P05	5	3	m	2	2	2	
		itcomes	P04	ю	2	7	S	e	-	
de	602	nme Ot (POs)	P03	4	1	4	4	1	2	
<b>Course Code</b>	17UCH640602	Programme Outcomes (POs)	P01 P02	3	4	2	2	4	2	
Co	170		P01	5	3	-	-	ы	5	
Semester	ΝI	Course Outcomes	(COs)	C01	C02	CO3	CO4	CO5	C06	

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	-	2	e	4	S
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very poor	Poor	Moderate	High	Very High

Values Scaling:

Mean Overall Score for COs = Total of Mean Scores	Total
Total of Values	Total No. of POs & PSOs
Moan Soore of COs =	