M.Sc. PHYSICS

LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE

WITH CHOICE BASED CREDIT SYSTEM (CBCS)

DEPARTMENT OF PHYSICS
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 21st 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	N	XX	NN/NNX
Year of Revision	PG Department Code	Semester number.	Part Category	running number/with choice

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 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.

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

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 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

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level)	Lower Order Thinking			Higher Order Thinking			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 EXAMINATION	
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 SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.							**Max Mark : 100**
K- LEVELS / **SECTIONS**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total 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) Courses having only **K4** levels				3			**30**
Courses having **K4** and **K5** levels **One K5 level question is compulsory**				2	1		
(Courses having **all the 6** cognitive levels **One K5 and K6 level questions can be compulsory**				1	1	1	
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**
	Total	**60**

BLUE PRINT OF QUESTION PAPER FOR MID/END TEST							
DURATION: 2. 00 Hours.							**Max Mark: 60.**
K- LEVELS / **SECTIONS**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
SECTION –A (One Mark, No choice) (7 x 1 = 7)	7						**07**
SECTION-B (2-Marks, No choice) (6 x 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) Courses having only **K4** levels				2			**20**
Courses having **K4** and **K5** levels **One K5 level question is compulsory**				1	1		
Courses having **all the 6** cognitive levels **One K6 level question is compulsory**					1	1	
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)	50 (COE) Specific Question Pattern	100
Assessment Pattern for Courses in Part - 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)		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:

$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$	$WAM\,(\text{Weighted Average Marks}) = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$
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_i 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.

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.

Table-1: Grading of the Courses

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

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	**O**	**Outstanding**
8.00 to 8.99	A+	Excellent
7.00 to 7.99	**A**	**Very Good**
6.00 to 6.99	**B+**	**Good**
5.0 0 to 5.99	**B**	**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%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

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

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.

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Result	**Mean Overall Score**	**< 1.2**	**# Low**
		≥ 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 value-driven 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. Gained the ability to identify and analyse complex Physics problems using the principles of Physics with suitable mathematical tools.
2. Acquired skills which will put the learners at an advantage in careers as drivers to associate with different subjects.
3. Moulded to adopt, absorb and develop innovative ideas
4. Developed skills to communicateeffectively with peers , professionals and society at large and demonstrate professional ethics
5. Exhibited effective individual talent,andengagedthemselves in lifelong learning and dissemination

M.Sc PHYSICS					
PROGRAMME STRUCTURE					
Sem	Specification	No. of Courses	No. of Hours	Credits	Total Credits
I-IV	Core Courses : Theory	8	46	45	45
I-IV	Core Courses : Practicals	04	32	24	24
II	Self-paced learning	1	-	2	02
IV	Comprehensive Examination	1	-	2	02
IV	Project work & Viva Voce	1	06	5	05
I- IV	Discipline Specific Elective	4	21	16	16
I	Ability Enhancement Course	1	4	3	03
II	Skill Enhancement Course (Soft Skills)	1	4	3	03
II	Generic Elective IDC (WS)	1	4	3	03
III	Generic Elective IDC (BS)	1	4	3	03
II-IV	Online courses (MOOC)	3	-	(6)	(06)
I-IV	Outreach Programme	1	-	04	04
I-IV	Total	30	121*	110	110(6)

***One hour outside the regular class time**

M.Sc PHYSICS							
PROGRAMME PATTERN							
Course Details					**Scheme of Exams**		
Sem	**Course Code**	**Course Title**	**Hrs**	**Cr**	**CIA**	**SE**	**Final**
I	21PPH1CC01	Classical Mechanics	6	6	100	100	100
	21PPH1CC02	Mathematical Physics	6	6	100	100	100
	21PPH1CP01	Physics Practical-I	8	6	100	100	100
	21PPH1ES01A	**DSE-1:** Analog and Digital Electronics	6	4	100	100	100
	21PPH1ES01B	**DSE-1:** Physics of Semiconductor Devices					
	21PPH1AE01	**AEC:** Framework for Physics Innovation and Entrepreneurship	4	3	50	50	50
		Total	**30**	**25**			
II	21PPH2CC03	Quantum Mechanics	5	5	100	100	100
	21PPH2CC04	Mathematical Methods of Computational Physics and Python Programming	5	5	100	100	100
	21PPH2CP02	Physics Practical-II	8	6	100	100	100
	21SPS2ES02B	**DSE-2 :** Methods of Spectroscopy	5	4	100	100	100
	21PPH2SP01A	**Self-Paced Learning:** Medical Physics	-	2	50	50	50
	21PPH2 SP01B	**Self-Paced Learning:** Physics of Crystal Growth and Thin films					
	21PPH2SP01C	**Self-Paced Learning:** Ultrasonics					
	21PPH2SP01D	**Self-Paced Learning:** Nanoscience and Technology					
	21PSS2SE01	**SEC:** Soft skills	4	3	100	-	100
	21PPH2EG01A	**GE-1 (WS):**Solar Energy and Utilization	4	3	100	100	100
	21PPH2EG01B	**GE-1(WS):**Renewable Energy Resources					
		Extra Credit Courses (MOOC)-1	-	(2)			
	***One hour out side the regular class time**	**Total**	**31***	**28(2)**			
III	21PPH3CC05	Condensed Matter Physics	6	6	100	100	100
	21PPH3CC06	Electromagnetic Theory	6	6	100	100	100
	21PPH3CP03	Physics Practical-III	8	6	100	100	100
	21PPH3ES03A	**DSE-3:** Materials Science	6	4	100	100	100
	21PPH3ES03B	**DSE-3:** Techniques of Materials Characterisation					
	21PPH3EG02A	**GE-2 (BS):**Physics for Competitive Exams	4	3	100	100	100
	21PPH3EG02B	**GE-2 (BS):** Nano Science					
		Extra Credit Courses (MOOC)-2		(2)			
		Total	**30**	**25(2)**			
IV	21PPH4CC07	Nuclear and Particle Physics	6	6	100	100	100
	21PPH4CC08	Statistical Mechanics and Thermodynamics	6	5	100	100	100
	21PPH4CP04	Physics Practical-IV	8	6	100	100	100
	21PPH4ES04A	**DSE-4:** Microcontroller based Physics Instrumentations	4	4	100	100	100
	21PPH4ES04B	**DSE-4:** Physics of Sensors and Transducers					
	21PPH4PW01	Project work and Viva Voce	6	5	100	100	100
	21PPH4CE01	Comprehensive Exam	-	2	50	50	50
		Extra Credit Courses (MOOC)-3	-	(2)			
		Total	**30**	**28(2)**			
I-IV	21PCW4OR01	Outreach programme (SHEPHERD)		4			
		Total	**120**	**110(6)**			

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

GENERIC ELECTIVE -1: 2nd Semester Within school (WS)- Offered to students belong to other Departments in the School							
Course Details					**Scheme of Exams**		
School	**Course Code**	**Course Title**	**Hrs**	**Cr**	**CIA**	**SE**	**Final**
SBS	21PBI2EG01	Herbal Technology	4	3	100	100	100
	21PBT2EG01	Medical Biotechnology	4	3	100	100	100
	21PBO2EG01	Medicinal Botany	4	3	100	100	100
SCS	21PCA2EG01	Applied Statistics using R	4	3	100	100	100
	21PMA2EG01	Mathematical Foundations	4	3	100	100	100
	21PCS2EG01	Mobile Adhoc Networks (MANET)	4	3	100	100	100
SLAC	21PEN2EG01A	Indian Literature in Translation	4	3	100	100	100
	21PEN2EG01B	English Literature For Competitive Examinations					
SMS	21PCO2EG01	Supply Chain Management	4	3	100	100	100
	21PEC2EG01	Labour Economics	4	3	100	100	100
	21PHR2EG01	Organizational Behaviour	4	3	100	100	100
	21PCC2EG01	Stress Management	4	3	100	100	100
SPS	21PCH2EG01	Industrial Products	4	3	100	100	100
	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)							
Course Details					**Scheme of Exams**		
School	**Course Code**	**Course Title**	**Hrs**	**Cr**	**CIA**	**SE**	**Final**
SBS	21PBI3EG02	First Aid Management	4	3	100	100	100
	21PBT3EG02	Food Technology	4	3	100	100	100
	21PBO3EG02	Horticulture and Landscaping	4	3	100	100	100
SCS	21PCA3EG02	Web Design	4	3	100	100	100
	21PMA3EG02	Operations Research	4	3	100	100	100
	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
SMS	21PCO3EG02	Basics of Taxation	4	3	100	100	100
	21PEC3EG02	Managerial Economics	4	3	100	100	100
	21PHR3EG02	Counselling and Guidance	4	3	100	100	100
	21PCC3EG02	Dynamics of Human Behaviour in Business	4	3	100	100	100
SPS	21PCH3EG02	Health Science	4	3	100	100	100
	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	Credit
I	21PPH1CC01	CORE-1: CLASSICAL MECHANICS	6	6

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire knowledge about conservation laws, constraints, relativistic mechanics, Lagrangian and Hamiltonian dynamics.	K1
CO-2	understand Kepler problem, rigid body dynamics, relativistic mechanics Lagrangian and Hamilton's formulation.	K2
CO-3	analyse the Euler's equations and apply them for rigid body dynamics.	K3 & K4
CO-4	evaluate the concepts of inertial, non-inertial frames of references and rotating coordinate system in relativistic mechanics.	K5
CO-5	apply and formulate the Lagrangian and Hamiltonian to solve problems in mechanics and relativistic mechanics.	K3 & K6

Unit-I: Fundamental Principles and Lagrangian Formulation (18 Hours)

Mechanics of a particle and system of particles - conservation laws - constraints - generalized coordinates - D'Alembert's principle and Lagrange's equation - applications on Lagrangian formulation: Atwood's machine - simple pendulum - compound pendulum- linear harmonic oscillator - Lagrange's equations in presence of non-conservative forces - generalized potential - Lagrangian of a charged particle in the presence of electromagnetic field - Hamilton's principle - Lagrange's equation of motion from Hamilton's principle - conservation theorems and symmetry properties.

Unit-II: Two-Body Central Force Problems (18 Hours)

Reduction to equivalent one - body central force problem - central force and motion in a plane - equation of motion and first integrals - differential equation for an orbit - the equivalent one - dimensional problem and classification of orbits - The Kepler problem: inverse square law of force - The Laplace - Runge - Lenz vector - scattering in a central force field - scattering in laboratory and centre of mass frames.

Unit-III: Hamilton's Formulation (18 Hours)

Hamiltonian - Hamilton's canonical equations of motion - physical significance of H-Cyclic coordinates - Hamilton's equations from variational principle - Applications on Hamilton's formulation: simple pendulum - compound pendulum - linear harmonic oscillator - particle in a central field of force - Δ-variation - principle of least action- statement and its proof - other forms of the action principle (Jacobi's form).

Canonical transformations - Legendre's transformations - generating functions - The Harmonic oscillator - infinitesimal constant transformations - Lagrange Brackets - Poisson brackets - relation between Lagrange's and Poisson brackets - Hamilton - Jacobi method - action angle variables – Kepler problem in action angle variables.

Unit-IV: Rigid Body Dynamics, Non-Inertial Frames and Oscillatory Motion (18 Hours)

Euler angles - Euler's theorem on the motion of the rigid body - infinitesimal rotations-rate of change of vector - moments and products of inertia - Euler's equations - symmetrical top - applications - non inertial frame of reference - pseudo force - centrifugal force - uniform rotating frames - coriolis force - free fall of a body on earth's surface - Foucault's pendulum - theory of small oscillations and normal modes - frequencies of free vibration and normal coordinates - Linear tri-atomic molecule.

Unit-V: Relativistic Mechanics **(18 Hours)**

Algebra of tensors - quotient law - fundamental tensor - Cartesian tensors - basic postulates of special theory of relativity - Lorentz transformations in real four dimensional spaces - covariant four dimensional formulations - force and energy equations in relativistic mechanics - Lagrangian and Hamiltonian formulation of relativistic mechanics - Relativistic Lagrangian and Hamiltonian of a charged particle in an electromagnetic field.

Books for Study

1. Herbert Goldstein, Charles P. Poole, John L. Safko, Classical Mechanics, 3rd Edition, Pearson Education, 2002.
2. Gupta, Kumar, Sharma, Classical Mechanics, Pragathi Prakashan Publications, 27th edition, 2012.
3. J.C. Upadhyaya, Classical Mechanics, Himalaya publishing house, 2nd revised edition (re-print), 2017.

Unit	Book	Chapters	Sections
I	1	1	1.1-1.4, 1.6, 2.1, 2.3, 2.6
	2	2	2.9-1, 2.9-2, 2.9-9
	3	2	2.9, 2.10
II	1	3	3.1, 3.3, 3.5, 3.7, 3.9, 3.10
	3	4	4.2
III	1	8,9,10	8.2, 8.5, 9.1, 9.2, 9.3, 9.5, 9.6, 9.7, 10.1, 10.6, 10.7, 10, 8
	2	3	3.1, 3.3, 3.5, 3.9-1, 3.9-2, 3.9-4, 3.9-6, 3.20
	3	5,7	5.10, 5.11, 5.12, 7.2, 7.3, 7.4
IV	1	4,5,6	4.4, 4.6, 4.8, 4.9, 5.3, 5.5, 5.7, 6.1-6.4
	3	11	11.1-11.6
V	1	5,7	5.2, 7.4, 7.5
	2	7	7.1, 7.2, 7.3-7.6
	3	13	13.12

Books for Reference

1. Rana, N.C. and Joag, P. S.: Classical Mechanics, (New Delhi, Tata McGraw Hill, 1998 (Units I, II & III).
2. Madhumangal Pal, A course on Classical Mechanics, Narosa publishing house, New Delhi, 2009.
3. Matrices & Tensors in physics by AW Joshi - Weiley Eastern, 2001.

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

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1CC01	CORE-1: CLASSICAL MECHANICS	6	6

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	2	3	3	2	1	2.3
CO-2	3	3	3	2	2	2	2	2	2	2	2.3
CO-3	3	2	2	2	2	2	2	3	2	2	2.2
CO-4	2	2	2	2	2	3	2	2	2	2	2.1
CO-5	2	3	3	2	2	3	2	2	2	2	2.3
Mean Overall Score											2.24 (High)

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1CC02	CORE-2: MATHEMATICAL PHYSICS	6	6

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge about different mathematical methods like vector and matrix algebra, partial derivatives, complex functions, special functions, Fourier series and integral transforms for solving different physics problems.	K1 & K2
CO-2	solve partial differential equations, identify complex-differentiable functions, construct Fourier series and integral transforms and special functions.	K3
CO-3	compute Eigen values and Eigen vectors, line integrals using Cauchy's integral theorem for different physics problems, apply method of separation of variable in different coordinate systems	K4
CO-4	apply matrix spaces, partial differential equations, integral transforms, special functions to obtain the solution for complex physics problems.	K4
CO-5	analyse the solutions obtained by various mathematical methods.	K5 & K6

Unit-I: Mathematical Tools of Vector and Matrix Spaces (18 Hours)

The Hilbert space and wave functions: Dirac Notation - Operators: Hermitian, Projection, commutator algebra, uncertainty relation between 2 operators, functions of operators, Eigenvalues and Eigenvectors of an operator, infinitesimal and finite unitary transformations. **Representation in Discrete bases:** Matrix representation of Kets, Bras and operators, change of bases and unitary transformations, Matrix representation of the Eigenvalues problems. **Representation in Continuous bases:** General treatment, position, momentum, connection representations.

Unit-II: Partial Differential Equations (18 Hours)

First-Order equations: general PDEs, more than two independent variables - Second–Order equations: classes of PDEs, more than two independent variables - boundary conditions - Separation of variables: Cartesian coordinates, circular & cylindrical coordinates, spherical & polar coordinates - Laplace and Poisson equations - Wave equations: D'Alembert's solution - Diffusion PDE.

Unit-III: Complex Analysis (18 Hours)

Cauchy - Riemann conditions - Cauchy's integral theorem - applications to multiply connected region - Cauchy's II integral theorem - derivatives of analytic complex function - singular points and their classification - Laurent series - Cauchy's residue theorem - calculation of residue at a point - evolution of definite integrals: (i) around the unit circle, (ii) around a semi-circular contour, and (iii) integral of the form.

Unit-IV: Fourier Series and Integral Transforms **(18 Hours)**

Fourier series: Dirichlet's condition - determination of coefficient - function having arbitrary period - Fourier series for square wave and half wave.
Fourier Transform: FT of a time dependent function - some important theorems: Parseval's, linearity, derivatives, shifting of origin and convolution, use of FT in solving partial differential equation for heat conduction.
Laplace transform: Theorems - inverse transform - solution to ordinary differential equations - solving equations for LCR circuit.

Unit-V: Special Functions **(18 Hours)**

Gamma and Beta functions - properties and their basic relations - DE and series solution of Legendre and Hermite - their polynomial – Rodrigues' formula - generating function - recurrent relation - orthogonality relations.

Books for Study

1. Nouredine Zettile, "Quantum Mechanics: Concepts and Applications", 2nd Edition, John Wiley & Sons, UK, 2009.
2. Arfken, Weber and Harris, "Mathematical Methods for Physicists", 7th Edition, Academic Press, 2013.
3. AK Mukhopadhyay, "Mathematical Methods for Engineers and Physicists", Wheeler Pub, New Delhi, 1998.
4. H.K Dass and Rama Verma, "Mathematical Physics", S. Chand publications, India 2011.

Unit	Book	Chapters	Sections
I	1	2	2.1-2.10
II	2	9	9.1, 9.2, 9.3, 9.4,9.5, 9.6, 9.7
III	3	14	14.2-14.5
IV	4	11, 45, 46 & 47	11.1-11.4, 11.6, 11.7, 11.10-11.13, 45.6-45.12, 46.1-46.12, 44.14, 47.1-47.6, 47.8, 47.9, 47.12, 47.13
V	4	9, 28 & 30	9.1, 9.8, 28.1-28.9, 30.1-30.5

Books for Reference

1. M. l. Boas, "Mathematical Methods in the Physical Sciences", 3rd Edition. John Wiley & Sons, 2006.
2. E. Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley, 2015.
3. E. M. Stein and R. Shakarchi, "Complex Analysis", Princeton University Press, 2003.
4. A. Pinkus and S. Zafrany, "Fourier Series and Integral Transforms", Cambridge University Press, 2012.
5. W.W. Bell, "Special Functions for Scientists and Engineers", Dover Pub, 2004.
6. P.K. Chattopadhyay, Mathematical Physics, Wiley Eastern Pub, 1990.

Web Resources*

1. https://mathworld.wolfram.com/
2. http://people.math.gatech.edu/~cain/textbooks/onlinebooks.html
3. https://ocw.mit.edu/courses/mathematics/
4. https://nptel.ac.in/courses/115/105/115105097/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1CC02	CORE-2: MATHEMATICAL PHYSICS	6	6

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	3	3	2	2	2.6
CO-2	3	3	2	3	2	3	3	3	2	2	2.6
CO-3	3	3	2	3	2	3	3	3	2	2	2.6
CO-4	3	3	2	3	2	3	3	3	2	2	2.6
CO-5	3	3	2	3	2	3	3	3	2	3	2.7
Mean Overall Score											2.62 (High)

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1CP01	PHYSICS PRACTICAL – I	8	6

Any 15 Experiments

1. Absorption Spectrum of Iodine – spectral parameters
2. Susceptibility - Quincke's method and Guoy's method
3. e/m Magnetron and Thermionic Work function
4. Dielectric Constant Study and determination of Curie temperature - Solid, Liquid (kit)
5. Hall effect in semiconductor
6. Elastic Constants – Elliptic fringes
7. Laser – I: numerical aperture, spot size, absorption coefficient and wavelength
8. Planck's constant - determination
9. Study of Photo sensitive devices
10. Ultrasonic interferometer – velocity and compressibility
11. Electro optic modulation – depth of modulation, frequency range, voltage range
12. Determination of Stefan's constant
13. Characteristics of torque transducer
14. Calibration of thermistor – different range
15. Verification of Norton's, Thevenin's and Max power theorem
16. MOSFET characteristics, amplifier design and switching application
17. UJT – Characteristics and Applications
18. K-map simplification – implementation of logic functions using basic and universal gates by SOP & POS
19. Design and Study of ALU and Scalar
20. Op-amp: I to V, V to I and Square wave
21. Op-amp – Design of Instrumentation amplifier
22. 555 – Monostable, Bistable, Astable multi vibrators and its applications
23. Temperature coefficient using 555 timer
24. Op-amp applications: Phase shift and Wien's Bridge Oscillator:
25. Computational experiment: Experimental statistics, error analysis – Iodine absorption spectrum
26. Computational experiment: Lagrange interpolation and extrapolation
27. Computational experiment: Binding energy calculation for different mass numbers.
28. Computational experiment: Two body central force problem
29. Study of Transistor biasing and stability
30. Design of BJT voltage/power amplifier

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1ES01A	DSE - 1: ANALOG AND DIGITAL ELECTRONICS	6	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe and discuss functional blocks of Analog and Digital Electronics.	K1 & K2
CO-2	outline semiconductor devices, examine the Analog and digital circuits and identify the states and working characteristics of circuits.	K2, K3 & K4
CO-3	list and use the methods to examine Analog and digital circuit problems.	K1, K3 & K4
CO-4	assess the limitations of Analog and Digital circuits and recommend the solutions.	K5
CO-5	design and construct Analog and Digital circuits for demand.	K6

Unit-I: Semiconductor Devices (18 Hours)

Semiconductor diode: IMPATT - PNPN diodes characteristics and applications - Gunn diode - device operation - negative differential resistance - construction, characteristics and applications of SCR and UJT. Optoelectronic devices: Photo diode - photo transistor - solar cells - photo detectors, LED: Surface and Edge emitting LED - OLED structure and working principle.

Unit-II: Applications of Semiconductor Devices (18 Hours)

Transistor CE Amplifier: Transistor as a two-port network - h-parameter equivalent circuit- Small signal analysis of single stage CE amplifier at low and High Frequencies - Miller's theorems - BJT transistor modelling and parameters - Hybrid-pi CE transistor model at high frequencies - conductance and capacitance - cascaded CE transistor amplifier high frequency analysis - early effect - Gummel plots - transistor switching circuit - JFET, MOSFET -applications.

Unit-III: Op-Amp and its Applications (18 Hours)

Operational amplifiers - analog computation - design of Op-Amp active filters (first order only): low pass - high pass - band pass – comparators - sample and hold circuits - log and antilog amplifiers - signal conditioning - instrumentation amplifier - Phase shift - Wien's Bridge Oscillator - Schmitt trigger - V to I and I to V converter - precision AC/DC converters; DAC: design of Binary weighted - R-2R ladder - ADC: dual slope - SAR method, timing circuits: 555 Timer and applications.

Unit-IV: Combinational Logic Design and Memories (18 Hours)

Standard representation of logic functions (SOP and POS) - minimization Techniques - analysis of combinational logic circuits - synthesis of combinational logic circuits - Quine -McCluskey minimization method - Petrick's algorithm - encoder and decoder design - multiplexer and

demultiplexer design - adder and subtractor design - digital comparator - design of ALU - design of counters - design of synchronous MOD counters - design of random sequence counters.

Unit - V: Sequential Circuit Design **(18 Hours)**

Models for sequential Circuits - synchronous sequential circuit models - sequential circuit Analysis - synchronous sequential circuit synthesis - state assignment and circuit realization - redundant states - state reduction in completely and incompletely specified circuits - types of asynchronous circuits - analysis and synthesis of pulse-mode asynchronous circuits - analysis and synthesis of fundamental-mode asynchronous circuits - sequential circuits with Programmable Logic Devices.

Books for Study

1. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall New Jersey, 7th edition.
2. Jacob Millman and Christos C. Halkias, "Microelectronics", 2nd edition, McGraw Hill, New Delhi, 2009.
3. Victor P. Nelson, "Digital logic circuit analysis and design", Prentice Hall, 1995.

Unit	Book	Chapters	Sections
I	1	5, 20, 21	5.7, 5.8, 21.13, 21.3, 21.4, 20.10
II	2	5, 8, 11 & 12	5.3, 8.11, 11.1, 11.2, 11.3, 12.10,
III	2	15 & 16	15.1, 16.5, 16.6, 16.7, 16.11, 16.12, 16.14, 16.15, 16.16
IV	3	2, 3, 4 & 5	2.4, 2.5, 3.9, 3.10, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.4
V	3	6, 8, 9 & 10	6.1, 8.1, 8.2, 8.3, 8.4, 9.1, 9.2, 9.3, 10.1, 10.2, 10.3, 10.4, 10.5

Books for Reference

1. Anant Agarwal, Jeffrey H. Lang, "Foundation of analog and digital circuits", Elsevier, 2005.
2. Daniel Adam Steck, "Analog and Digital Electronics", 2017.
3. Hubert Kaeslin, "Digital Integrated Circuit Design", Cambridge University Press, 2003.
4. Thomas L. Floyd, "Digital Fundamental", 11th Edition, Pearson Education. Ltd., 2015.
5. S.M. Sze. "Physics of Semiconductor Devices", Wiley-Interscience, 2007.

Web Resources*

1. https://www.electronicshub.org/analog-circuits-and-digital-circuits/#:~:text=Analog%20Circuits%20and%20Digital%20Circuits%20is%20a%20classic%20way%20of,deals%20with%20discrete%20digital%20signals.
2. https://www.allaboutcircuits.com/video-tutorials/analog-and-digital-electronics/
3. https://www.ece.utoronto.ca/prospective-students/curriculum-streams/digital-analog/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1ES01A	DSE - 1: ANALOG AND DIGITAL ELECTRONICS	6	4

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	2	2	3	2	2.5
CO-2	3	3	2	3	2	3	3	3	3	2	2.7
CO-3	3	3	3	3	2	3	3	3	3	2	2.8
CO-4	3	3	3	2	2	3	3	3	2	2	2.6
CO-5	3	3	3	3	2	3	3	2	3	2	2.7
Mean Overall Score											2.66 (High)

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1ES01B	DSE - 1: PHYSICS OF SEMICONDUCTOR DEVICES	6	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe and outline structure of Semiconducting materials.	K1 & K2
CO-2	explain and illustrate the semiconductor junction.	K2 & K3
CO-3	examine the semiconducting devices and circuits, explain the working characteristics and use these principles in the complex circuits.	K3 & K4
CO-4	assess the electronic device problems and recommend the solutions.	K5
CO-5	synthesis new materials for semiconductor devices	K6

Unit-I: Electronic Levels in Semiconductors (18 Hours)

Particles in an attractive potential bound state - electrons in crystalline solids - occupation of states - band structure of semiconductor - mobile carriers - doping - doping in polar materials - Tailoring electronic properties - defect states.

Unit-II: Charge Transport in Materials (18 Hours)

Transport under an electric field - carrier transport by transport - carrier transport by diffusion - charge injection and quasi-Fermi levels - PN Junction in equilibrium - PN Diode under bias - solar cell and photo detector – LED.

Unit-III: Semiconductor Junction (18 Hours)

Metal semiconductor junctions - insulator semiconductor junctions - semiconductor hetero junctions - BJT design and device performance parameters - Kirk effect - thermal effect - early effect - avalanche breakdown - design problems.

Unit-IV: Temporal Response of Diodes and Bipolar Transistors (18 Hours)

Small-Signal equivalent circuit of a *p-n* diode - switching characteristics of diodes - high-frequency behaviour of BJT - BJT charge control analysis - bipolar transistor Small-Signal equivalent circuit - Small Signal figures of merit.

Unit-V: Field Effect Transistors and MOSFET (18 Hours)

FET: Current-Voltage characteristics - modulation efficiency - polar materials - n+ Cap layers - small signal characteristics - power-frequency limit.
MOSFET: Capacitance-Voltage characteristics of the MOS structure - operation - depletion and Enhancement MOSFETs - Complementary MOSFETs.

Book for Study

1. Umesh K. Mishra, Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.

Unit	Book	Chapters	Sections
I	1	2	2.1-2.4, 2.6, 2.7, 2.9, 2.10, 2.12
II	1	3, 4	3.1, 3.4, 3.6, 3.7, 4.2, 4.3, 4.8.2, 4.9
III	1	5, 6	5.3-5.6, 6.4, 6.6.1-6.6.3, 6.6.5, 6.8
IV	1	7	7.2, 7.5, 7.4
V	1	8, 9	8.1-8.3, 8.5, 8.6.1, 8.7.1, 8.8.1, 8.8.2, 9.1, 9.4, 9.5

Books for Reference

1. Simon M. Sze & Ming-Kwei Lee, "Semiconductor Devices: Physics and Technology", third edition, JOHN WILEY & SONS, INC., 2010.
2. S. M. Sze and Kwok K. Ng, "Physics of Semiconductor Devices", A JOHN WILEY & SONS, JNC., PUBLICATION, 2007.
3. Marius Grundmann, "The Physics of Semiconductors", third edition, Springer International Publishing, 2016.

Web Resources*

1. https://www.electronics-tutorials.ws/diode/diode_1.html
2. https://physics.info/semiconductors/
3. http://www.fulviofrisone.com/attachments/article/403/The%20Physics%20of%20Semiconductors.pdf

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1ES01B	DSE - 1: PHYSICS OF SEMICONDUCTOR DEVICES	6	4

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	3	3	2	2	2.6
CO-2	3	3	2	3	2	3	3	3	2	2	2.6
CO-3	3	3	3	3	2	3	2	3	2	2	2.6
CO-4	3	3	3	2	2	3	3	3	2	2	2.6
CO-5	3	3	3	2	2	3	3	2	3	2	2.6
Mean Overall Score											2.6 (High)

Semester	Course Code	Title of the Course	Hours	Credit
I	21PPH1AE01	ABILITY ENHANCEMENT COURSE: Framework for Physics Innovation and Entrepreneurship Education	4	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	Know the basics of research methodology, information communication technologies, cyber security and the future of physics.	K1
CO-2	understand the fundamentals of intellectual property rights and the role of incubators and public policies.	K2
CO-3	identify and classify various types of reports, ICT tools, ICT services, intellectual properties, agencies, treaties and public policies.	K3
CO-4	utilize search engines for finding research articles, patents, designs, incubator policies and current research topics in physics.	K4
CO-5	evaluate and create new ideas in the situation in cyber security, intellectual property and innovation-incubator system in India.	K5 & K6

Unit-I: Research Methodology **(12 Hours)**

What makes people to do research - importance - research methods and research methodology - types - various stages of research - presenting a scientific seminar - oral report - art of writing a research paper – layout of a research report.

Unit-II: ICT Support and Cyber Security **(12 Hours)**

Technology in teaching Physics: benefits, challenges and solutions.

Information and communications technology, tools and services: Search engines & research papers – shared datasets & codes – connect and communicate with experts and researchers – free digital library – simulation/lab & project management – write and publish research papers.

Cyber space – security challenges – evolution & threats – Indian cyber situation – cyber disruptions - challenges in cyber space domain – 10 steps to cyber security.

Unit-III: The Future Physics **(12 Hours)**

A brief history of Physics – Predicting the next 100 years: Mind over Matter – rise of machines – everything from nothing – perfection and beyond – energy from stars.

Examination skills in Physics - competitive exams towards research - preparation strategy.

Unit-IV: The Role of Incubators and Public Policy **(12 Hours)**

Introducing a framework for Physics Innovation and Entrepreneurship (PIE) education - Examining students' perceptions of innovation and entrepreneurship in physics –National

Innovation & Start-up Policy 2019 for Students and Faculty by MHRD –Tamil Nadu Start-up & Innovation policy 2023.

Concept note on business incubator - Incubation and S&T Innovation-based Entrepreneurship in India - insights from Case Studies: Factors for Favourable Incubator Outcomes

Unit-V: Intellectual Property Rights (12 Hours)

Project concept – project design - Intellectual Property Law Basics - Types of Intellectual Property: Patents, Copyright Trademarks, Industrial Designs and Integrated Circuits, Geographical indications - Agencies Responsible for Intellectual Property Registration - International Organizations, Agencies, and Treaties - Search engines for IPR -The Indian patent act 1970.

Books for Study

Text by department

Books for Reference

1. C. R. Kothari, Research Methodology, 2nd ed. New Age International (P) Ltd. 2004.
2. Deborah E. Bouchoux, Intellectual Property, 4th ed. Cengage Learning, 2013

Web Resources*

1. https://ipindia.gov.in/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course							Hours	Credit
I	21PPH1AE01	ABILITY ENHANCEMENT COURSE: Framework for Physics Innovation and Entrepreneurship (PIE) Education							4	3
Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	1	3	3	2	3	2.5
CO-2	3	3	3	2	2	1	3	3	3	3	2.6
CO-3	3	3	3	2	2	1	3	3	3	3	2.6
CO-4	3	3	3	2	2	1	3	3	3	3	2.6
CO-5	3	3	3	2	2	1	3	3	3	3	2.6
Mean Overall Score											2.58 (High)

Semester	Course Code	Title of the Course	Hours	Credits
II	**21PPH2CC03**	**CORE-3: QUANTUM MECHANICS**	**5**	**5**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe the principles and methods of wave mechanics and matrix mechanics based on Dirac notation.	**K1**
CO-2	explain quantum mechanical methods to study angular momentum and various perturbed systems.	**K2**
CO-3	apply the quantum theory to 1D potentials, 3D potentials, rotation & addition of angular momenta, stationary states and time-dependent systems.	**K3**
CO-4	analyse various properties using the quantum theory and compare it with the results of classical physics.	**K4**
CO-5	evaluate and summarize the methods and properties of various quantum mechanical systems.	**K5 & K6**

Unit-I: Basic Postulates and Quantum Systems (15 Hours)

Introduction - The basic postulates of Quantum Mechanics (QM) – The state of a system – observables and operators – Measurement in QM: how measurements disturb systems – expectation values – CSCO – measurement and the uncertainty relation; Time Evolution of the system's state: time evolution operator – stationary states – Schrodinger equation and wave packets – conservation of probability – time evaluation of expectation values; Connecting Quantum Mechanics to Classical Mechanics. Properties of 1D motions: Bound, unbound states, mixed spectrum - The free particle continuous states – the potential step.

Unit-II: One and Three - Dimensional Problems (15 Hours)

The potential barrier & well: E>Vo, E < Vo: Tunelling, tunnelling effect - the infinite square well potential: Asymmetric square – symmetric; the finite square well potential: Scattering solutions (E > Vo), Bound state solution (0 < E < Vo) - Harmonic oscillator: Energy Eigenvalues, Energy Eigen states - 3D problems in Cartesian coordinates: General treatment, free particle- 3D problems in spherical coordinates: central potential, the free particle, the hydrogen atom.

Unit-III: Angular Momentum (15 Hours)

General formalism –Geometrical representation – Spin angular momentum: Experimental evidence of spin, general theory of spin, spin ½ and Pauli Matrices – Eigen functions of orbital angular momentum: Eigen functions and Eigenvalues of L_z, Eigen functions of L^2–Rotations in QM: Infinitesimal, finite, properties, Euler rotations - Addition of Angular Momenta: General formalism, calculation of CG Coefficient, coupling of orbital and spin angular momenta - Isospin.

Unit-IV: Approximation Methods for Stationary States (15 Hours)

Time independent Perturbation Theory: Non-degenerate, Degenerate, Fine structure and the Anomalous Zeeman effect - Variational method - JWKB method: General formalism, bound states for potential wells with NO and ONE rigid walls, tunnelling through potential barrier.

Unit-V: Time Dependent Perturbation Theory (15 Hours)

The different pictures: The Schrodinger, The Heisenberg, The Interaction - Transition probability: Constant and Harmonic perturbation - adiabatic and sudden approximation - interaction of atoms with radiations: classical treatment, Quantization of Electro Magnetic field - Transition rates: Absorption and Emission radiation, within the dipole approximation.

Books for Study

1. Nouredine Zettile, "Quantum Mechanics: Concepts and Applications", 2nd Edition, John Wiley & Sons, 2009.

Unit	Book	Chapters	Sections
I	1	3 & 4	3.1, 3.2, 3.3**,** 3.3.1, 3.3.2,3.4, 3.5, 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.6, 3.6.1, 3.6.2, 3.6.3, 3.6.4, 3.6.5, 3.8, 3.8.1, 3.8.2, 3.8.3, 4.3, 4.4,
II	1	4 & 6	4.5, 4.5.1, 4.5.2, 4.5.3, 4.6.1, 4.6.2, 4.7, 4.7.1, 4.7.2, 4.8, 4.8.1, 4.8.2, 4.8.3, 6.2.1, 6.2.2, 6.3.1, 6.3.2, 6.3.5
III	1	5 & 7	5.1, 5.2, 5.3, 5.5, 5.6.1, 5.6.2, 5.6.3, 5.7, 5.7.1, 5.7.2, 7.2, 7.2.1, 7.2.2, 7.2.3, 7.2.4, 7.3, 7.3.1, 7.3.2, 7.3.3, 7.3.6 (no subsections)
IV	1	9	9.1, 9.2, 9.2.1, 9.2.3 (all), 9.3, 9.4, 9.4.1, 9.4.2, 9.4.3, 9.4.4, 9.4.5
V	1	10	10.1, 10.2, 10.2.1, 10.2.2, 10.2.3, 10.3, 10.3.1, 10.3.2, 10.3.3, 10.4, 10.4, 10.4.1, 10.4.2, 10.5, 1. 10.5.2, 10.5.3, 10.5.4

Books for Reference

1. R. Shankar, "Principles of Quantum Mechanics", 2nd Edition, Springer, 2014
2. R. Feynman, "Feynman lectures on Physics- Vol 3", new millennium edition, Pearson, 2012
3. E. Merzbacher, "Quantum Mechanics", 3rd Edition, Wiley, 2011.
4. B. Bransden, C. Joachain, "Quantum Mechanics", 2nd Edition, Pearson, 2004
5. M.S. Rogalski and S. B. Palmer, "Quantum Physics", CRC Press, 1999.
6. Leonard I. Schiff, Quantum Mechanics, McGraw Hill, 1968.

Web Resources*

1. Visual quantum mechanics: https://vqm.uni-graz.at/
2. https://ocw.mit.edu/courses/physics/
3. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=28
4. https://nptel.ac.in/courses/115/106/115106066/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credits
II	21PPH2CC03	CORE-3: Quantum Mechanics	5	5

Course Outcomes↓ (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	3	3	2	2	2	2.3
CO-2	3	3	2	2	1	3	3	2	2	2	2.3
CO-3	3	3	2	2	1	3	3	2	2	2	2.3
CO-4	3	3	2	2	1	3	3	2	2	2	2.3
CO-5	3	3	2	2	2	3	3	2	2	2	2.4
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credit
II	**21PPH2CC04**	**CORE-4: MATHEMATICAL METHODS OF COMPUTATIONAL PHYSICS AND PYTHON PROGRAMMING**	**5**	**5**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	gain knowledge on the mathematical methods in Tensors, Group Theory and programming Language and comprehend the same for the problems in physics at ease	**K1& K2**
CO-2	apply the knowledge gained in computational and numerical methods to solve problems in physics.	**K3**
CO-3	analyse computationally the given problems in physics by various theoretical models.	**K4**
CO-4	evaluate the complex problems in physics based on specific theories, procedures and tools.	**K5**
CO-5	synthesis the computational methods adapted to produce precise and accurate results on select problems	**K6**

Unit-I: Tensors **(15 Hours)**

Introductory ideas on scalars, vectors and tensors - Co-ordinate transformation: Rotation of the axes and vectors - fundamental ideas and representations - algebra of tensors - curvature of space - time manifold: Metric tensor of the space, Einstein's field equations, Geodesics, curvature of space, Schwarzschild metric -Christoffel's 3-index symbols.

Unit-II: Group Theory **(15 Hours)**

Definition and nomenclature - rearrangement theorem - cyclic groups - subgroups - conjugate elements and class structure - identification of symmetry element and operations - molecular point groups -The Great Orthogonality theorem (Qualitative treatments) - character of representation. Character table - generating symmetry operators - construction of character tables - irreducible representation for C_{2v} and C_{3v}.

Unit-III: Numerical Methods Applied to Physics Problems **(15 Hours)**

Numerical integration: Trapezoidal, Simpson's 1/3 rules - Truncation error - composite trapezoidal and Simpson's 1/3 rules. **ODE:** Fourth-order Runge-Kutta methods for first order ODE.
Interpolation: Newton's interpolation - Linear interpolation - Higher-order polynomials - Divided differences - Gregory - Newton forward and backward interpolation formulae - error in interpolation *(no theory and derivation of formulae in the entire unit)*

Unit-IV: Basics of Python **(15 Hours)**

Installing Python - Launch Python - Python modules - Python expression - objects and their methods - Lists - Tuples - Strings - Loops - Development Tools

Unit-V: Python Structure and Control **(15 Hours)**

SciPy and NumPy - arrays - array operations - scripts - contingent behavior - nesting - importing data - exporting data - visualizing data - Functions - random numbers and simulation - histograms and bar graphs -contour plots and surfaces - matrix library - Interpolation - Fourier Transform - Sparse eigenvalue problem

Books for Study

1. Matrix and Tensors in Physics, A.W. Joshi, New Age, 2010.
2. Group Theory and Quantum Mechanics, Tinkham M, McGraw Hill, 1974.
3. Numerical Methods in Science & Engineering, M.K. Venkataraman, National Pub. Co. Madras, 2013.
4. Jesse M Knder, Philip Nelson, "Python for Physical modelling", Princeton University Press Princeton and Oxford, 2015.
5. https://docs.python.org/3/library/tk.html

Unit	Book	Chapters	Sections
I	1	1 & 2	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 16.1, 16.2, 16.3, 16.4, 16.5, 16.6, 16.7, 16.8
II	2	1 & 2, 3, 5	1.1, 1.2, 2.1, 2.3, 2.4, 3.2, 3.3, 3.4, 5.2, 5.3, 5.4
III	3	1,3,7	All sections
IV	4	1, 2	1.2-1.4, 2.1, 2.2.1, 2.3, 2.4
V	4,5	2, 3, 5	2.2.2-2.2.10, 2.5-2.8, 3.1-3.3, 5.1-5.4

Books for Reference

1. Pipes, L.A. &Harvill, L.R., Applied Mathematics for Engineers and Physicists. Dover Publications, Inc., 2014.
2. Arfken, Weber, Harris, Mathematical Methods for Physicists, 7 ed. Academic Press, 2013.
3. M. l. Boas, Mathematical Methods in the Physical Sciences, 3rd ed. John Wiley & Sons, 2006.
4. E. Kreyszig, Advanced Engineering Mathematics, 10th ed. Wiley, 2015.
5. R. L. Burden and J. D. Faires, Numerical Analysis, 9th ed. Brooks/Cole, Cengage Learning, 2011.
6. Jamie Chan, "Python for Beginners", 2014.
7. Adam Stewart, "Python Programming", 2016.
8. NumPy-1.17 and SciPy-1.6.1 reference manual.

Web Resources*

1. https://ocw.mit.edu/courses/mathematics/
2. https://nptel.ac.in/courses/115/103/115103036/
3. https://epgp.inflibnet.ac.in/Home
4. https://swayam.gov.in/explorer
5. http://www.learncodingfast.com/python
6. https://www.tutorialspoint.com/python/index.htm
7. https://www.python.org/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
II	21PPH2CC04	CORE-4: MATHEMATICAL METHODS OF COMPUTATIONAL PHYSICS AND PYTHON PROGRAMMING	5	5

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	2	2	3	2	3	2	2	2.3
CO-2	3	3	2	2	2	3	3	2	2	2	2.4
CO-3	3	2	2	2	3	2	2	2	3	3	2.4
CO-4	3	3	2	2	2	3	3	2	1	2	2.3
CO-5	3	3	2	2	2	2	2	2	1	1	2.0
Mean Overall Score											2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credit
II	21PPH2CP02	PHYSICS PRACTICAL – II	8	6

Any 15 Experiments

1. Michelson Interferometer – wavelength, separation and thickness of thin sheet
2. Biprism – Optic bench - wavelength, separation and thickness of thin sheet
3. Energy Gap study of a semiconductor
4. Elastic Constants – Hyperbolic fringes
5. Laser: Magneto-striction, Faraday effect and Verdert constant of a given material
6. e-Millikan's oil drop method
7. Ultrasonic diffraction – velocity and compressibility in liquids
8. Determination of e/k using Ge and Si transistors
9. Permittivity of a liquid using RFO
10. Determination of phase transition temperatures of a binary liquid mixture at different concentrations
11. Polarizability of liquids
12. Fermi-Curie plot of the X-ray/ Gamma ray spectrum and determination of end-point energy
13. Determination of transition temperature in liquid crystalline materials
14. Characteristics of laser and tunnel diode
15. Characteristics of LVDT
16. Characteristics of load cell
17. SCR – Characteristics and Applications
18. Study of regulated power supply – monolithic IC
19. Transmission Line Characteristics
20. Shift Registers using Flip-Flop & ICs
21. Design of ROM and RAM using diode / OR gate and flip flop
22. Design of Encoder and Decoder
23. Op-amp: Low, High and band pass Filters
24. Computational experiment: Curve fitting – Least square fitting
25. Computational experiment: Solving Schrodinger equation for hydrogen / LHO
26. Computational experiment: Op-Amp parameter study – Circuit simulation using Proteus
27. Computational experiment: Linear Harmonic Oscillator problem using Hamilton's equation
28. Determination of the wavelength of an unknown light source and the distance between the grooves of a compact disk.
29. Determination of band gap of a semiconductor sample using UV-VIS spectroscopy
30. Study of magnetic hysteresis in ferromagnetic materials

Semester	Course Code	Title of the Course	Hours	Credits
II	21SPS2ES02A	DSE-2: METHODS OF SPECTROSCOPY	5	4

CO No.	CO - Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire knowledge and understand the aspects of various spectroscopic methods like rotational spectroscopy and its techniques.	K1 & K2
CO-2	explain the theory and principles of vibrational spectroscopy and its techniques.	K1 & K2
CO-3	perceive the theory and principles of electronic and X-ray spectroscopy and apply them to describe fluorescence and phosphorescence	K3, K4 & K5
CO-4	comprehend the basics of Raman spectroscopy and evaluate and examine the molecular and atomic structure of different advanced materials.	K4 & K5
CO-5	understand the physics behind NMR and ESR spectroscopy, Mossbauer spectroscopic techniques and apply it examine new materials and to make novel drugs in the field of medicine.	K2, K3 & K6

Unit - I: Microwave Spectroscopy **(15 Hours)**

Characterization of Electromagnetic Radiation - Regions of the Electromagnetic spectrum, Intensity of spectral lines - Rotation of Molecules, Rotational Spectra - A Diatomic Rigid Rotator - Intensity of Spectral lines - Effect of isotopic substitution, the non-rigid rotator, spectrum of a non-rigid rotator - Poly atomic molecules - Linear molecules - symmetry top molecules - asymmetry top molecules.

Unit - II: Infra-Red Spectroscopy **(15 Hours)**

The vibrating diatomic molecule - Simple Harmonic Oscillator - the anharmonic oscillator, the diatomic vibrating rotator, the vibrations of polyatomic molecules - fundamental vibrations and their symmetry - overtones and combination frequencies, Influence of rotation on the spectra of linear polyatomic molecules - parallel vibrations, perpendicular vibrations, influence of nuclear spin.

Unit - III: Raman Spectroscopy **(15 Hours)**

Introduction - Quantum theory of Raman effect - Classical theory of Raman effect - Pure rotational Raman spectra - Linear molecules, symmetry top molecules, asymmetry top molecules - vibrational Raman spectra - Raman activity of vibrations - rule of Mutual Exclusion - Rotational fine structure - Structure determination from Raman and Infra-red spectroscopy Near Infra-red FT-Raman spectroscopy.

Unit - IV: Electronic Spectroscopy of Molecules **(15 Hours)**

Electronic spectra of Diatomic molecules - Born Oppenheimer approximation - vibrational coarse structure, Frank-Condon Principle - Intensity of vibrational - electronic spectra - dissociation

energy and dissociation products - Rotational Fine Structure of Electronic -Vibration Transitions - Molecular photo-electron spectroscopy - X-ray photoelectron spectroscopy.

Unit - V: Spin Resonance Spectroscopy and Mossbauer Spectroscopy (15 Hours)

Spin and an applied field - nature of spinning particles - interaction between spin and a magnetic field - population of energy levels - the Larmor Precession - NMR spectroscopy for Hydrogen Nuclei - Chemical shift - the coupling constant - coupling between several nuclei.
Electron-spin Resonance Spectroscopy - g factor - hyperfine structure due to electron - nucleus coupling - double resonance - fine structure due to electron - electron coupling.
Principles of Mossbauer Spectroscopy - Applications of Mossbauer spectroscopy - chemical shift - quadrupole effect - effect of a Magnetic field.

Book for Study

1. Colin N. Banwell and Elaine M. Mccash, Fundamentals of molecular spectroscopy, 4th edition, Tata mcgraw-hill ltd, 2014.

Unit	Chapters	Sections
I	1,2	1.1, 1.3, 1.7, 2.1, 2.2, 2.3-2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4-2.4.1, 2.4.2, 2.4.3
II	3,6	3.1-3.1.1, 3.1.3, 3.1.3, 3.2, 3.5-3.5.1, 3.5.2, 3.6-3.6.1, 3.6.2
III	4	4.1- 4.1.1, 4.1.2, 4.2-4.2.1, 4.2.2, 4.2.3, 4.2.3, 4.3-4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.5, 4.7
IV	5,6	5.2-5.2.1, 5.2.2, 5.2.3, 5.2.4, 6.1-6.1.1, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 6.5-6.5.1, 6.5.2
V	7,9	7.1- 7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.2-7.2.1, 7.2.2, 7.2.3, 7.5-7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.5.5, 9.1, 9.2-9.2.1, 9.2.2, 9.2.3

Books for Reference

1. G. Aruldhas, Molecular Structure and Spectroscopy, (2nd Edition), PHI Learning Private Ltd. 2014.
2. Straughan and Walker, Spectroscopy Volume 1-3 Chaman & Hall Publishers, E-Book, 2nd Jan.2019.
3. Gurdeep R Chatwal and Sham K Anand, Spectroscopy, Himalaya Publishing House, 2009.

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

Semester	Course Code	Title of the Course	Hours	Credits
II	21SPS2ES02A	DSE-2: METHODS OF SPECTROSCOPY	5	4

Course Outcomes (Cos)	Programme Outcomes (PO)					Programme Specific Outcomes (PCO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	3	2	3	2	1	2.3
CO-2	3	3	2	2	3	3	2	2	2	1	2.3
CO-3	3	2	2	3	3	2	2	3	2	1	2.3
CO-4	3	2	2	3	3	2	3	3	2	1	2.4
CO-5	3	3	2	3	3	2	2	3	2	1	2.3
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credit
II	21PPH2SP01A	SELF PACED LEARNING: MEDICAL PHYSICS	-	2

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire knowledge about the mechanics of human body, the energy transfer in metabolism, the fluid dynamics of blood flow through vessels, the mechanisms for speaking, hearing, vision and neural communications.	K1
CO-2	measure the temperature, pressure and other physical variables associated with the human body and to diagnose the medical imaging data in clinical use and be aware of the medical treatment and medicine use.	K2
CO-3	understand physics principles, instrumental design, data acquisition strategies and imaging modalities in biomedical imaging.	K2,K3
CO-4	apply physics concepts to human body and physiology.	K4
CO-5	integrate the physics, biology, technology and medicine for sustainable life.	K5, K6

Unit - I: Biomechanics

Motion in the Human machine - the standard human - material components of the body - bone - ligaments and tendons - cartilage - bone shortening - energy storage in tendons and long bones, muscles: skeletal muscles - the structure of muscles - passive muscles - activating muscles - the effect of exercise - levers - the elbow - the hip - the back - elasticity of bone, tissue, visco elasticity. pressures in the body: pressure in the cardiovascular system - hydrostatic pressure - bladder pressure - respiratory pressures - foot pressures - eye and ear pressures - biomechanical measurement - X-ray imaging technique.

Unit - II: Cardiovascular and Respiratory System

Cardiovascular System: circulatory system and cardiac cycle - physics of the circulation system: properties of blood - blood pressure and flow in vessels - capillaries and osmotic pressure - blood flow rates and speeds - consequences of clogged arteries - work done by the heart and the metabolic needs of the heart - blood velocity measurement - The Doppler effect – ECG, lungs and breathing: lungs - alveoli - breathing - volume of the lungs - breathing under usual and unusual conditions - work needed to breathe.

Unit - III: Heat and Energy Transfer in Human Body

Metabolism: energy, heat, work, and power of the body - conservation of energy and heat flow - energy content of body fuel - energy storage molecules - loss of body heat - body temperature - energy requirement - energy from food - regulation of body temperature -resistance to cold - diffusion through membranes thin-film flowmeters - thermistor flowmeters - thermal dilution - thermal conductivity methods - thermography.

Unit - IV: Bio-Acoustics and Bio-Optics

Acoustic Buzzer - voice filtering theory - parameters of voice - energetic speaking. auditory sensitivity - connections to hearing perceptions. structure of the eye - imaging and detection by the eye - transmission of light in the eye - the eye as a compound lens - accommodation ultrasonic imaging - theory and instrumentation.

Unit - V: Electrophysiology and Nuclear Medicine

Biological potentials - the nervous system - neural communication, the interface between ionic conductors: Nernst equation - membranes and nerve conduction - muscle action potentials - neural stimulation - tissue as a leaky dielectric - low-frequency effects: (0.1 Hz-100 kHz)- higher frequencies (>100 kHz) - physiological effects of electricity - electricity in bone. nuclear medicine - MRI - general principles - slice selection - phase encoding - frequency encoding - K space formalism, instrumentation: magnet design - magnetic field gradient coils - RF coils imaging sequences - imaging characteristics - contrast agents functional MRI, applications: brain, liver, skeletal and cardiac systems

Books for Study

1. Irving P. Herman, "Physics of Human Body", 1st Edition, Springer, 2007.
2. Paul Davidovits, "Physics in Biology and Medicine", 3rd Edition, Elsevier, 2008.
3. B.H. Brown, "Medical Physics and Biomedical Engineering", 1st Edition, IOP Publishing, 1999.
4. A.G. Webb, "An Introduction to Biomedical Imaging", 1st Edition, Wiley, 2003.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	1, 4	1.2, 1.3, 4.1, 4.2.3, 4.2.4, 4.6, 4.7
	2	1, 3, 8, 18	1.1, 3.2, 3.8, 8.5, 8.11, 18.4
	3	1, 2	1.2, 2.2
	4	1	1.3-1.9
II	1	8	8.1, 8.2.1-8.2.6, 9.6
	3	19	19.7.1
III	1	6	6.1-6.6
	2	9, 11	9.6, 11.1, 11.2, 11.9,
	3	19	19.4
IV	1	10, 11	10.2, 10.3, 11.3.1-11.3.3
	2	15	15.7
	4	3	3.1, 3.4-3.8
V	3	8, 16	8.2, 8.5, 8.6, 8.8.1, 16.1.1-16.1.5, 16.5
	2	13	13.3
	4	4	4.1, 4.7, 4.10

Books for Reference

1. M. Maqbool, "An Introduction to Medical Physics", Springer, 2017.
2. H. Jelinkova, "Lasers for Medical applications, diagnostics, therapy and surgery", 1st Edition, Elsevier, 2013.
3. R.S. Khandpur, "Handbook of Biomedical Instrumentation", 3rd Edition, McGraw Hill, 2014.

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

Semester	Course Code			Title of the Course				Hours	Credit
II	21PPH2SP01A			Self-Paced Learning: MEDICAL PHYSICS				-	2
Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	2	2	2	2	3	2.3
CO-2	3	2	2	2	3	2	2	3	2	2	2.3
CO-3	2	2	2	2	2	3	2	2	2	2	2.1
CO-4	3	3	3	2	3	2	2	2	2	3	2.5
CO-5	2	2	3	2	3	3	2	2	2	2	2.3
Mean Overall Score											2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credit
II	**21PPH2SP01B**	**Self-Paced Learning: PHYSICS OF CRYSTAL GROWTH AND THIN FILM**	**-**	**2**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge about the fundamentals of nucleation and various crystallization theories.	**K1**
CO-2	understant various crystallization theories, various crystal growth methods and thin film deposition techniques.	**K2**
CO-3	apply the essential processing prarameters for different crystal growth and thin film deposition techniques.	**K3**
CO-4	analyze the different growth techniques and choose an appropriate technique to grow crystals and thin films.	**K4**
CO-5	evaluate the merits and demerits of different growth techniques and design a new growth approach to overcome the existing demerits.	**K5 & K6**

Unit-I: Nucleation

Primary nucleation - Secondary nucleation - Solubility, super solubility and metastable zone - Crystal growth theories: surface energy theories, adsorption layer theories, kinematic theories, and diffusion reaction theories

Unit–II: Crystal Growth from Melt and Vapour

Czochralski method - Bridgmann - Stockbarger method - Zone Melting Method -Vapour growth: direct vapour transport method, Chemical transport method

Unit - III: Crystal Growth from Solution

Solution and Solubility - Choice of Solvent - Additives - Nucleation - Achievement of Supersaturation - Mason-Jar Method - Holden's Rotary Crystallizer - Temperature Differential Method - growth from silica gel - High temperature solution growth - Flux growth - Top seeded solution growth -Hydrothermal growth

Unit - IV: Thin Film Deposition: Physical Vapour Deposition

Evaporation method: Vacuum evaporation, Electron beam evaporation - DC diode sputtering, Magnetron sputtering, Reactive ion sputtering, RF sputtering - Pulsed Laser Deposition - Molecular Beam Epitaxy

Unit - V: Thin Film: Deposition Chemical Vapour Deposition and Liquid Phase Deposition

Chemical vapour deposition - typical chemical reactions - reaction kinetics - transport phenomena - CVD methods – Metal Organic Chemical Vapour Deposition - Plasma enhanced chemical vapour deposition - Langmuir-Blodgett films - Electrochemical deposition - Sol-gel films.

Books for Study

1. W Mullin, Butterworth-Heinemann, Crystallization, 4th edition, Oxford, 2001.
2. H. L. Bhat, Introduction to crystal growth principles and practice, CRC Press Taylor & Francis Group, New York, 2015.
3. Hartmut Frey, Hamid R. Khan,Handbookof Thin-FilmTechnology, Springer-Verlag Berlin Heidelberg, 2015.
4. Guozhong Cao, Nanostructures and nanomaterials: synthesis, properties and applications, Imperial college press, London, Reprinted 2006

Unit	Book	Chapters	Sections
I	1	3, 5, 6	3.11, 3.12, 5.1, 5.2, 5.3, 6.1
II	2	8, 10	(P. No.) 124, 140, 155, 162, 242, 252
III	2	9	183, 198, 207, 215
IV	3 2	3, 6, 9 11	3.5, 6.4, 6.6, 6.8, 6.9, 9.4 (P.No.) 262, 268
V	4 3	5 9	5.5, 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.9, 5.10, 5.11 9.4

Books for Reference

1. Crystal growth processes and methods, P. Santhana Raghavan, P. Ramasamy, Kru Publications, Kumbakonam, India, 2000.
2. Handbook of thin film deposition, processes and techniques, Krishna Seshan, Noyes Publication, USA, 2nd edition 2002.
3. Handbook of Thin Film Technology, Leon I. Maissel, Reinhard Glang, McGraw Hill Higher Education, New York, 1970.

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

Semester	Course Code	Title of the Course	Hours	Credit
II	21PPH2SP01B	Self Paced Learning: PHYSICS OF CRYSTAL GROWTH AND THIN FILM	-	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO 3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	2	2	2	3	2.5
CO-2	3	3	2	2	2	3	2	2	2	2	2.2
CO-3	3	3	3	2	2	3	1	2	2	2	2.3
CO-4	3	3	3	2	2	3	1	2	3	2	2.4
CO-5	3	3	3	2	2	3	2	2	2	2	2.4
Mean Overall Score											2.36 (High)

Semester	Course Code	Title of the Course	Hours	Credit
II	**21PPH2SP01C**	**Self-Paced Learning: ULTRASONICS**	**-**	**2**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of ultrasound.	**K1**
CO-2	understand the concepts of transducer and its working.	**K2**
CO-3	identify and apply different measurement techniques of ultrasound.	**K3**
CO-4	analyze and discuss the applications of ultrasound.	**K4**
CO-5	evaluate the ultrasound based NDT and design the ultrasonic devices by applying the principles of ultrasound.	**K5 & K6**

Unit-I: Fundamentals of Ultrasound

Introduction - Brief Early History - Underwater Sound (SONAR) - Medical and Biological Ultrasonics - Industrial Ultrasonics - Nondestructive Testing/Evaluation - Ultrasonics in Electronics - Physical Acoustics - Ultrasonic Systems: Transmitters and Receivers - Low-Intensity Applications - High-Intensity Applications - Modern Ultrasonics: An Interdisciplinary Field - Velocity of Sound in Solids - Velocity of Sound in Liquids - Velocity of Sound in Gases - Wave Incident on a Liquid - Solid Plane Interface, Semi-Infinite Media - Reflection, Refraction.

Unit-II: Basics of Ultrasonic Transducers

Piezoelectric Transducers - equivalent circuit of a simple piezoelectric transducer - efficiency of a simple piezoelectric transducer - maximum power transfer between Electronic Power Source and Simple Piezoelectric Transducers - Determining Transformation Factor (α) for the Piezoelectric Transducer Material - Quality Factor (Q) of Piezoelectric Transducers - Piezoelectric Transducers for High-Intensity Applications - Pulse-Type Transducers for Low-Intensity Applications Sensing - Piezoelectric Polymers for Transducers.

Unit-III: Measurement Techniques of Ultrasound

Measurement of Velocity and Attenuation in Isotropic Solids - Measurement of Velocity and Attenuation in Fluids - Methods of Measuring Velocity of Sound - Interferometer Method - Resonance Method - "Sing-Around" Method - Pulse-Superposition Method - Pulse-Echo-Overlap Method - Measurements in Materials of High Attenuation - Measurements at High Temperatures - Measurements at High Pressures - Measuring Torsional Resonant Frequencies of Isotropic Bars.

Unit-IV: Applications of Ultrasound

Electron Acoustic Image Converter - Schlieren Imaging - Liquid Levitation Imaging - Ultrasonic Imaging with Liquid Crystals - Photographic Methods of Imaging by Ultrasonics - Ultrasonic Holography - Acoustic Microscopy - Ultrasonic Arrays - Ultrasound in Process Industries - Monitoring Solidification (Interface Sensing) - Acoustic Time Domain Reflectometry - Three-Phase Reactors - Process Tomography Using Ultrasonic Methods - Ultrasonic Transducers:

Process Industry Applications - Sonochemistry - Depolymerization - Polymerization - Precipitation - Metallurgical Effects.

Unit-V: Ultrasonic Non-Destructive Testing

Resonance Methods - Pulse Methods - Acoustic Emission Technique - Factors Affecting Resolution and Sensitivity - Near-Field Effects - Properties of the Materials - Eddy Sonic Inspection Method - Sonic Analysis - Acoustic Impact Technique - Ultrasonic Spectroscopy - Critical Angle Analysis - Instrumentation - Resonance Methods - Pulse Methods - Acoustic Emission Methods - Phased Arrays Systems - Methods Used to Determine Flaw Size.

Books for Study

1. Dale Ensminger and Leonard J. Bond, Ultrasonics Fundamentals, Technologies and Applications, CRC Press, Taylor & Francis Group, Third Edition ,2011.

Unit	Book	Chapters	Sections
I	1	1,2	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 2.3.1, 2.3.2, 2.3.3
II	1	5	5.3, 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.7, 5.3.8, 5.3.9, 5.4.2
III	1	6	6.2.1, 6.2.2, 6.3, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.6, 6.3.7
IV	1	10,11	10.2.2, 10.2.3, 10.2.4, 10.2.5, 10.2.6, 10.2.7, 10.2.8, 10.2.9, 10.3.1, 10.3.4, 10.3.5, 10.3.6, 10.3.7, 10.3.8, 11.4, 11.4.1, 11.4.2, 11.4.4, 11.5
V	1	7	7.2.1, 7.2.2, 7.2.3, 7.3, 7.3.1, 7.3.2, 7.4.1, 7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.5, 7.5.2, 7.5.3, 7.5.4, 7.5.5, 7.5.7.2,

Books for Reference

1. J. David N. Cheeke, Fundamentals and Applications of Ultrasonic Waves, CRC Press, 2002.

Web Resources *

1. http://hyperphysics.phy-astr.gsu.edu/hbase/Sound/usound.html
2. https://www.sonotec.com/en/column/ultrasonic.html

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course							Hours	Credit
II	21PPH2SP01C	Self-Paced Learning – 1: ULTRASONICS							-	2
Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	3	2	3	2	1	2.3
CO-2	3	3	2	2	3	3	2	2	2	1	2.3
CO-3	3	2	2	3	2	2	3	3	2	1	2.3
CO-4	3	2	2	3	3	2	2	3	2	1	2.3
CO-5	3	3	2	2	2	2	2	3	3	1	2.3
Mean Overall Score											2.3 (High)

Semester	Course code	Title of the Course	Hours	Credit
II	21PPH2SP1D	Self-Paced Learning: NANOSCIENCE AND NANOTECHNOLOGY	-	2

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	know the fundamental principles of nanoscience and technology and their applications in field of energy and storage, medical, agriculture, space and defense.	K1
CO-2	understand the methods of fabrication of nanostructures and characterization tools for study the properties of nanostructures.	K2
CO-3	apply physics concepts to the nano-scale materials and discuss the applications of nanomaterials.	K3
CO-4	analyze the unique properties of nanomaterials to the reduce dimensionality of the material and evaluate its impact on energy harvesting and storage, medical, agriculture and defense.	K4 & K5
CO-5	design new printed circuits by applying the nanofabrication methods like lithography, micro contact printing and Replica molding.	K6

Unit - I: Introduction to Nanoscience and Nanotechnology

Introduction - History and scope - Nanosize and properties - Classification of nanostructured materials - Fascinating nanostructures - Nanotechnology impact on various fields - Nature: the best nanotechnologist - challenges and future prospects.

Unit - II: Synthesis of Nanomaterials-I

Introduction - Mechanical Methods - High Energy Ball Milling - Melt Mixing - Methods Based on Evaporation - Physical Vapour Deposition - Ionized Cluster Beam Deposition - Laser Vaporization (Ablation) - Sputter Deposition (DC Sputtering) - Chemical Vapour Deposition (CVD) - Ion Beam Techniques (Ion Implantation) - Molecular Beam Epitaxy (MBE).

Unit - III: Synthesis of Nanomaterials-II

Introduction - Colloids and Colloids in Solutions - Interactions of Colloids and Medium - Effect of Charges on Colloids - Stearic Repulsion - Synthesis of Colloids - Nucleation and Growth of Nanoparticles - Synthesis of Metal Nanoparticles by Colloidal Route - Synthesis of Semiconductor Nanoparticles by Colloidal Route – Langmuir - Blodgett (LB) Method - Sol-Gel Method - Hydrothermal Synthesis - Sonochemical Synthesis.

Unit - IV: Lithography in Nanotechnology

Introduction - Lithography Using Photons (Optical Method) - Lithography Using UV Light and Laser Beams - Use of X-rays in Lithography - Lithography Using Particle Beams - Electron Beam Lithography - Ion Beam Lithography - Scanning Probe Lithography - Mechanical Methods - Dip Pen Lithography - Optical Scanning Probe Lithography - Thermo-Mechanical Lithography - Electrical Scanning Probe Lithography - Soft Lithography - Microcontact Printing (μCP) - Replica Molding (REM).

Unit - V: Applications of Nanotechnology

Dye Sensitized Photovoltaic Solar Cell - Organic Photovoltaic Cells - Fuel Cell - Hydrogen Generation and Storage - Hydrogen Storage (and Release) - Hybrid Energy Cells - Automobiles - Medical Field – Imaging - Drug Delivery - Cancer Therapy - Tissue Repair - Agriculture and Food - Space, Defense and Engineering.

Books for Study

1. B S Murty, P Shankar, Baldev Raj, B B Rath, James Murday, Textbook of Nanoscience and Nanotechnology, Springer-Universities Press, 2013.
2. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices, Springer publications, 3rd edition, 2015.

Unit	Book	Chapters	Sections
I	1	1	1.1, 1.2, 1.3 1.4, 1.5, 1.6, 1.7
II	2	3	3.1, 3.2 (3.2.1, 3.2.2), 3.3 (3.3.1, 3.3.2, 3.3., 3.3.4), 3.4 (3.4.1), 3.5, 3.7, 3.8
III	2	4	4.1, 4.2 (4.2.1, 4.2.4, 4.2.5, 4.2.6), 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10
IV	2	9	9.1, 9.2 (9.2.1, 9.2.2) 9.3 (9.3.1, 9.3.2) 9.4 (9.4.1, 9.4.2, 9.4.3, 9.4.4, 9.4.5) 9.5 (9.5.1, 9.5.2)
V	2	12	12.2 (12.2.1, 12.2.2, 12.2.3, 12.2.4, 12.2.5, 12.2.6) 12.7, (12.7.1, 12.7.2, 12.7.3, 12.7.4) 12.8, 12.9, 12.10

Books for Reference

1. Guozhong Cao, Nanostructures & Nanomaterials Synthesis, Properties & Applications, Imperial College Press, 2004.
2. Edward L. Wolf, Nanophysics And Nanotechnology, Wiley-Vch Publications, 2nd Edition, 2006.
3. K.P. Mathur, Rajat Publications, Nano Science And Nano Technology, New Delhi, 1st Edition 2007.
4. C. N. R. Rao, P. J. Thomas And G. U.Kulkarni, Nanocrystals: Synthesis, Properties And Applications, Springer, 2007.
5.

Web Resources *

1. https://www.nano.gov/nanotech-101
2. https://ee.stanford.edu/spotlight/nanotechnology-nemsmems
3. https://www.hse.gov.uk/nanotechnology/index.htm
4. http://crnano.org/whatis.htm

(* subject to availability - not to be used for exam purpose)

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

Semester	Course code			Title of the Course						Hours	Credit
II	21PPH2SP1D			Self-Paced Learning: NANOSCIENCE AND NAOTECHNOLOGY						-	2
Course outcomes (COs)	Programme Outcome (PO)					Programme Specific Outcome (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	2	2	2	2	2.4
CO-2	3	3	2	2	2	3	2	2	2	2	2.3
CO-3	3	3	3	2	2	3	2	2	2	2	2.4
CO-4	3	3	3	2	2	3	2	2	2	2	2.4
CO-5	3	3	2	2	2	3	2	2	2	2	2.3
	Mean Overall Score										2.36 (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 & C0,Revised Edition.
* Covey, Stephen. (2004). *7 Habits of Highly effective people,* Free Press.
* Egan, Gerard. (1994). *The Skilled Helper* (5^{th} 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.*

* 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). H*iring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Semester	Course Code	Title of the Course	Hours	Credit
II	21PPH2EG01A	GE – 1 (WS): SOLAR ENERGY AND UTILIZATION	4	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquir the principles of solar energy and predict its utilization.	K1
CO-2	understant the concepts of solar insolation and its effects.	K2
CO-3	apply the concepts of solar energy in the characteristics of different materials like flat plate, tubular, Fresnel etc.	K3
CO-4	analyse the differnt energy storage methods.	K4
CO-5	assess annual solar savings and its conversion and design the rechargeable batteries and solar pond.	K5 & K6

Unit - I: Energy Scenario & Solar Energy Option (12 Hours)

Introduction - Survey of production and Reserves of Commercial Energy sources - World - India - Alternate Solar option. Thermal Collection and Storage - Thermal Application - some observation.

Unit - II: Solar Installation (12 Hours)

Solar Spectrum - Effects of Earth's Atmosphere - Measurement of Irradiance - Solar Simulation - Solar Cell Testing Methods - The effect of temperature and illumination on cell efficiency - Loss Analysis.

Unit - III: Solar Thermal Collectors (12 Hours)

Characteristics of the materials - Flat Plate Collectors - Tubular Solar Energy Collectors - Fresnel Reflector and Lenses (parabolic).

Unit - IV: Solar Energy Storage (12 Hours)

Sensible heat Storage - Phase Transition Chemical Storage - Rechargeable Batteries - Solar Pond.

Unit - V: Other Methods of Solar Energy Utilization and Analysis (12 Hours)

Photovoltaic Conversion - Wave Energy - Ocean Thermal Energy conversion - Annular Solar Savings - Concluding remarks.

Books for Study

1. Sukhatme, Nayak, "Solar Energy Principles of Thermal Collection and Storage", Tata McGraw-Hill Publishing Company, 2008.
2. D Yogi Goswami, "Principles of Solar Engineering", CRC press, 2015.
3. Alan L. Fahrenbruch, Richard H. Bube, "Fundamentals of Solar Cells - Photovoltaic Solar Energy Conversion", Academic Press, 1983.
4. Julian Chen, "Physics of Solar energy", Wiley; 1st edition, 2011.

Unit	Book	Chapters	Sections
I	1	1, 2	1.1-1.4, 2.1-2.3
II	3	2, 6	2.1-2.5, 6.4.1, 6.4.2, 6.5
III	2 1	3 6	3.1, 3.3, 3.8, 3.9 6.2
IV	4 1	12 8	12.1, 12.2.1, 12.3, 12.3.1-12.3.4 8.1, 8.2
V	1	9, 10	9.4, 9.5; 10.5, example 10.1-10.4, 10.8

Books for Reference

1. H.P. Garg, "Solar Energy Fundamentals And Applications", Tata Mcgraw-Hill Publishing Company, 2000.

Web Resources*

1. https://www.e-education.psu.edu/earth104/node/950
2. https://www.britannica.com/science/solar-energy
3. https://science.sciencemag.org/content/184/4134/382

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
II	**21PPH2EG01A**	**GE – 1 (WS): SOLAR ENERGY AND UTILIZATION**	**4**	**3**

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	3	2	2	2	2.5
CO-2	3	3	2	2	2	3	3	3	2	2	2.5
CO-3	3	3	2	2	2	3	3	3	2	2	2.5
CO-4	3	3	2	2	2	3	3	2	2	2	2.5
CO-5	3	3	2	2	3	3	3	2	2	3	2.6
Mean Overall Score											**2.52 (High)**

Semester	Course Code	Title of the Course	Hours	Credit
II	21PPH2EG01B	GE – 1 (WS) : RENEWABLE ENERGY RESOURCES	4	3

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of physics of solar radiation.	K1
CO-2	understand the classifications of the solar energy collectors and methodologies of storing solar energy.	K2
CO-3	know the applications of solar energy, wind energy and biomass and other forms of energy sources.	K3
CO-4	analysis the different forms of energy resources based on its economic aspects.	K4
CO-5	assess the generated renewable energies and design the different energy resources.	K5 & K6

Unit - I: Direct Solar Energy (12 Hours)

Solar Energy supply - History of solar energy utilization - Technologies based on capture of heat from sunlight - Solar water heating system - Solar cookers - Solar steam generating system for cooking - Passive solar heating / cooling of buildings - Solar air conditioning - Solar refrigeration - Solar desalination - Salt production and solar ponds - Crop drying - Technologies for converting solar energy to electricity - Heat engines: Concentrated solar thermal energy systems - Photovoltaics.

Unit - II: Biomass Energy (12 Hours)

Composition of biomass - Sources of biomass for energy generation - Food crops - Hydrocarbon - rich plants - Waste - Weed and Wild growths - Lignocellulosic biomass: Fast -growing greases and woody species - Technical routes for obtaining different types of fuels from biomass - Thermochemical conversion of biomass - Biochemical processing - Emerging technologies.

Unit – III: Wind and Wave Energies (12 Hours)

Using the wind and power in the wind - Design of windmills - Summary of wind electric energy systems - Wind turbine sizes - Wind sites and properties - Storage - Wave energy generation - Potential energy - Kinetic energy - Wave energy conversion devices - Wave energy conversion by floats - High-level reservoir wave machine - Dolphin-type wave power machine - other wave machines - Advantage and disadvantages of wave energy.

Unit – IV: Geothermal Energy (12 Hours)

Origin and nature of geothermal energy - Energy extraction - High-enthalpy geothermal aquifers - Low-enthalpy reserves - Wet steam systems - Dry steam systems - Limitations.

Unit - V: Storage of Intermittently - Generated Renewable Energy (12 Hours)

Energy storage systems - Storage as electrical energy - Storage as mechanical energy - Storage as chemical energy - Storage as thermal energy.

Book for Study

1. Tasneem Abbasi & S.A. Abbasi, "Renewable Energy Sources", PHI Learning Private Limited New Delhi, 2010.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	3	3.2, 3.3, 3.4.1-3.4.9, 3.5.1, 3.5.2
II	1	4	4.3, 4.4.1-4.4.5, 4.5.1-4.5.3
III	1	6	6.3.1, 6.4, 6.5.1, 6.5.2, 6.6, 6.9, 6.10
IV	1	7 9	7.2.1, 7.2.2, 7.3.1-7.3.4, 7.4.1, 7.4.2 9.1.1, 9.3.1-9.3.4, 9.5
V	1	12	12.2.1-12.2.4

Books for Reference

1. Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007.
2. Ramesh R & Kumar K.U, "Renewable Energy Technologies", Narosa Publishing House, 2004.
3. Rai G.D., "Non-Conventional Energy Sources", Khanna Publishers, 2011.
4. Twidell & Wier, "Renewable Energy Resources", CRC Press (Taylor & Francis), 2011.

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

Semester	Course Code	Title of the Course	Hours	Credit
II	**21PPH2EG01B**	**GE-1 (WS): RENEWABLE ENERGY RESOURCES**	**4**	**3**

Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	2	2	2	1	2.3
CO-2	3	2	3	3	2	3	2	2	2	1	2.3
CO-3	3	3	3	3	2	3	3	3	2	1	2.6
CO-4	3	2	3	2	2	3	3	3	2	1	2.4
CO-5	3	2	3	3	2	3	3	3	2	1	2.5
Mean Overall Score											**2.42 (High)**

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3CC05	CORE-5: CONDENSED MATTER PHYSICS	6	6

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	Acquire knowledge and understand the behaviour of electrons in solids based on classical and quantum theories.	K1 & K2
CO-2	Apply the knowledge and analyse the available semiconducting and superconducting materials	K3 & K4
CO-3	Able to differentiate between ferroelectric, anti-ferroelectric, piezoelectric, pyroelectric materials, Plasmons, polaritons and polarons	K4
CO-4	Develop and synthesize new materials for a requirement.	K5 & K6
CO-5	Create an eco-friendly environment with lifelong development and usage of condensed matters.	K6

Unit-I: Semiconductor Crystals **(18 Hours)**

Origin of energy gap-Bloch function - Kronig-Penney model-crystal momentum of an electron-number of orbitals in a band- Effective mass – intrinsic carrier concentration - intrinsic mobility – impurity conductivity - thermal ionization of donors and acceptors –thermoelectric effect-semimetals – superlattice – Bloch oscillator – Wannier Ladder – Zener Tunnelling

Unit-II: Fermi Surfaces and Metals **(18 Hours)**

Reduced zone scheme – periodic zone scheme – construction of fermi surfaces- nearly free electrons- electron orbits, hole orbits and open orbits – calculations of energy bands – Tight binding method for energy bands- Wigner – Seitz method -cohesive energy – Pseudopotential methods- experimental methods in fermi surface studies – quantization of orbits in a magnetic field – De Haas-van Alphen effect – extremal orbits -fermi surface of copper and gold – magnetic break down.

Unit-III: Superconductivity **(18 Hours)**

Thermodynamics of the superconducting transition – London equation – Coherence length – BCS theory of superconductivity – ground state – Flux quantization in a superconducting ring - duration of persistent currents – Type II superconductors – vortex state – estimation of H_{c1} and H_{c2} – single particle tunnelling – Josephson superconductor tunnelling – Dc Josephson effect – Ac Josephson effect – macroscopic quantum interference – High temperature superconductors.

Unit-IV: Magnetic Properties of Solids and Magnetic Resonance (18 Hours)

Langevin diamagnetism equation - quantum theory of diamagnetism – Paramagnetism - quantum theory of Para magnetism - Hund rules - crystal field splitting, paramagnetic susceptibility of conduction electrons – ferromagnetic order - temperature dependence of the saturation magnetization – neutron magnetic scattering - ferrimagnetic order - curie temperature and susceptibility of ferrimagnets - antiferro magnetic order - susceptibility below the Neel temperature - ferromagnetic domains - origin of domains –coercivity and hysteresis -nuclear magnetic resonance – ferromagnetic resonance – antiferromagnetic resonance – electron paramagnetic resonance.

Unit-V: Plasmons, Polaritons, Polarons and Dielectrics (18 Hours)

Dielectric function of electron gas –plasmons – electrostatic screening -polaritons -electron - electron interaction – polarons - Polarization –macroscopic electric field – local electric field at an atom – dielectric constant and polarizability – structural phase transitions – ferroelectric crystals – displacive transitions

Book for Study

1. Charles Kittel, Introduction to solid state physics, 8th edition, John Wiley & Sons, Inc.2004.

UNIT	CHAPTERS
I	Chapter 7 & 8
II	Chapter 9
III	Chapter 10
IV	Chapter 11,12 & 13
V	Chapter 14, 15 & 16

Books for Reference

1. Wahab. M.A, Solid State Physics, 2nd Edition, Narosa, 2010.
2. Rita John, Condensed Matter Physics, 1st EditionTata McGraw Hill Publishers 2014
3. J.P. Srivastava, Elements of Solid-State Physics, 4th Edition, Prentice-Hall of India, 2015.

Web Resources*

1. https://nptel.ac.in/courses/115/106/115106061/
2. https://nptel.ac.in/courses/115/103/115103102/
3. https://nptel.ac.in/courses/115/105/115105099/
4. https://nptel.ac.in/courses/113/104/113104090/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code			Title of the Course				Hours	Credit
III	21PPH3CC05			CORE-5: CONDENSED MATTER PHYSICS				6	6
Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	3	2	2	1	2.3
CO-2	2	2	3	2	2	2	2	2	3	2	2.2
CO-3	3	2	3	1	2	3	2	3	2	2	2.3
CO-4	2	3	2	3	1	2	3	2	3	1	2.3
CO-5	3	2	2	2	1	3	3	2	2	1	2.3
Mean Overall Score											2.28 (High)

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3CC06	CORE-6: ELECTROMAGNETIC THEORY	6	6

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	impart and describe the knowledge on the concepts in electrostatics, magnetostatics, field equations and electromagnetic waves.	K1
CO-2	explain the boundary conditions in electrostatics and magnetostatics, Poynting theorem, propagation of electromagnetic waves.	K2
CO-3	apply and analyze the knowledge to solve image problems, magnetic field and potential problems, boundary conditions and radiation reaction.	K3 & K4
CO-4	compare and summarize TE, TM, TEM waves, normal and oblique incidences for conductors.	K5
CO-5	relate and check the knowledge from symmetry problems, Gauss law and Biot-Savart's law.	K6

Unit-I: Electrostatics (18 Hours)

Coulomb's law - Electric field - Continuous charge distributions - Field lines, Flux and Gauss's law - Divergence of E - Applications of Gauss's Law - curl of E - Electric potential - Poisson's and Laplace's Equation - Potential of a localized charge distribution - Electrostatic Boundary conditions - Uniqueness theorems - Method of images: Classic image problem - induced surface charge - Force and energy - other image problems - boundary value problems on spherical symmetry, cylindrical symmetry and plane symmetry.

Unit-II: Magnetostatics (18 Hours)

Lorentz Force Law - Biot-Savart Law - magnetic field of steady current - The Divergence and Curl of B - Applications of Ampere's Law - magnetic potential - uniform surface current of a long solenoid - torroidal coil - large parallel plate capacitor - magnetic field inside and outside a cylindrical wire - magnetic field inside and outside the slab - Magnetic vector potential - magnetostatic boundary conditions.

Unit-III: Field Equations and Conservation Laws (18 Hours)

Ohm's law - Faraday's law - induced electric field - Inductance - Energy in magnetic fields - Maxwell's equations in free space and linear isotropic media - Boundary conditions on fields at interface - continuity equations - Poynting's theorem - Potential formulation - Lorentz and Coulomb Gauge transformations - retarded potentials

Unit-IV: Electromagnetic Waves (18 Hours)

Waves in one dimension - Reflection, transmission and polarization - wave equation for E and B - monochromatic plane waves - Energy and momentum in EM waves - Propagation in linear

media - Reflection and transmission at normal and oblique incidence - EM waves in conductors - Absorption, dispersion and reflection at a conducting surface

Unit - V: Guided Waves and Radiation **(18 Hours)**

Wave guides - TE and TM waves in a rectangular wave guide - Coaxial transmission line - Electric dipole radiation - Magnetic dipole radiation - Radiation from an arbitrary source -power radiated by a point charge - Radiation reaction - radiation damping of a charged particle - Physical basis of the radiation reaction

Book for Study

1. David J. Griffiths, Introduction to Electrodynamics, 4th edition, 2018, Pearson.

Unit	Title	Chapters	Sections
I	Electrostatics	1,2,3	1.2-1.4, 2.1-2.4, 3.1, 3.3-3.5
	Potentials	1,2	1.5, 1.6, 2.1-2.4
II	Magnetostatics	1,2,3,4	1.1-1.3, 2.1, 2.2, 3.1-3.3, 4.1, 4.2
III	Electrodynamics	1,2,3	1.1, 2.1-2.4, 3.3-3.6
	Conservation Laws	1	1.1, 1.2
	Potentials and Fields	1,2	1.1-1.3, 2.1
IV	Electromagnetic Waves	1,2,3,4	1.1-1.4, 2.1-2.3, 3.1-3.3, 4.1, 4.2
V	Electromagnetic Waves	5	5.1-5.3
	Radiation	1,2	1.2, 1.3, 2.1-2.3

Books for Reference

1. J.D. Jackson, Classical Electrodynamics, 3rd Edition, John Wiley, New York, 1999.
2. Edward C. Jordan & Keith G. Balmain, Electromagnetic waves and Radiating systems – Second Edition, Prentice Hall of India, New Delhi, 2015.
3. Dr. Sureka Tomar, CSIR – UGC / NET / JRF/SET Physical Sciences, Upkar Prakashan, Agra, 2016.
4. Paul Lorrain and Dale Corson, Electromagnetic fields and waves, Second Edition, CBS Publishers & Distributors, New Delhi, 1986.

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

Semester	Course Code	Title of the Course								Hours	Credit
III	21PPH3CC06	CORE-6: ELECTROMAGNETIC THEORY								6	6
Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	3	2	3	2	3	2	2	2.5
CO-2	2	3	2	2	2	3	2	2	3	2	2.3
CO-3	3	2	2	3	2	3	3	2	1	2	2.3
CO-4	3	2	2	2	2	3	3	2	1	2	2.2
CO-5	3	3	2	2	2	3	3	3	1	2	2.4
Mean Overall Score											2.34 (High)

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3CP03	PHYSICS PRACTICAL – III	8	6

Any 15 Experiments

1. e/m - Zeeman effect
2. Microwave – Klystron /Gunn diode
3. Design of Multiplexer and De-multiplexer
4. Digital to Analog Converters design
5. Design of Asynchronous Counter
6. Study of Power Amplifier: IC
7. Modulation and De modulation Techniques : PAM, PPM, PWM and PCM
8. Laser III: Brewster angle and related parameters
9. Geiger Muller Counter – study of gamma rays
10. Analysis of XRD spectrum - Determination of lattice parameters of a crystal
11. Analysis of FTIR spectrum - Determination of vibration levels in a compound
12. Solar cell characteristics
13. Charge of an electron by spectrometer
14. Monte Carlo simulation of electronic distribution of hydrogen atom - Scilab
15. Characteristics of tri colour LED and production of different colours
16. Measurement and analysis of Raman Spectra of liquids and solids.
17. Magneto resistance of a semiconductor
18. Thin film preparation and measurement of its thickness
19. Determination of Rydberg constant
20. Study of porosity and grain size of thin film by SEM
21. Brass arc spectrum – emission spectral study
22. UV-Visible spectrometer - Analysis of spectrum - Determination of absorption coefficient and band gap
23. Analysis of rotation and vibration spectrum
24. Computational experiment: Solution of Poison's equation
25. Computational experiment: 2-D Electrostatic Calculation
26. Computational experiment: Chaotic and Non-chaotic dynamics
27. Study characteristics of optocoupler
28. NMR SPECTROMETER – spectral parameters
29. Atomic Scattering power and geometrical structure factor
30. Non-Destructive Testing by Ultrasonics – flaw detection, depth and length

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3ES03A	DSE - 3: MATERIALS SCIENCE	6	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	Acquire the knowledge and discuss about super capacitor materials, polymer and composite materials, and phase transitions of materials.	K1, K2 & K3
CO-2	Understand and Apply the concepts of alloys and composites	K2 & K3
CO-3	Identify and discuss the supercapacitor and its applications	K4 & K2
CO-4	Identify and analyze different energy conversion materials for conversion process	K2 & K4
CO-5	Categorize and Test different materials for storage device	K4,K5 & K6

Unit - I: Phase Transition in Materials (18 Hours)

Phases - Microstructure - Phase Equilibria - One-Component (or Unary) Phase Diagrams -Binary Isomorphous Systems - Interpretation of Phase Diagrams - Development of Microstructure in Isomorphous Alloys - Mechanical Properties of Isomorphous Alloys - Binary Eutectic Systems - Development of Microstructure in Eutectic Alloys - Materials of Importance - Lead - Free Solders - Equilibrium Diagrams Having Intermediate Phases or Compounds - Eutectoid and Peritectic Reactions - Congruent Phase Transformations - The Gibbs Phase Rule - The Kinetics of Phase Transformations - Metastable Versus Equilibrium States - Isothermal Transformation Diagrams.

Unit - II: Polymers and Composite Materials (18 Hours)

Introduction - Hydrocarbon Molecules - Polymer Molecules - The Chemistry of Polymer Molecules-Molecular Weight-Molecular Shape-Molecular Structure - Molecular Configurations -Thermoplastic and Thermosetting Polymers - Copolymers - Polymer Crystallinity - Polymer Crystals - Fracture of Polymers - Large - Particle Composites - Dispersion - Strengthened Composites - Influence of Fiber Length - Influence of Fiber Orientation and Concentration -The Fiber Phase - The Matrix Phase - Polymer - Matrix Composites - Metal - Matrix Composites - Carbon-Carbon Composites - Hybrid Composites - Laminar Composites.

Unit - III: Super Capacitor Materials (18 Hours)

Supercapacitors Background - Charge Storage Mechanisms - The Electric Double Layer - Helmholtz model - Stern and modern models - Pseudocapacitance Mechanism - Redox reactions - Ion electrosorption – Intercalation - Charge Storage Mechanism - Electric double layer capacitors - Pseudocapacitors - Conducting organic polymers - Hybrid supercapacitors - Nanocomposites and/or hybrid materials - Organic electrolytes - Ionic liquids - Polymeric electrolytes - Aqueous electrolytes - Designing High - Performance Environmental Friendly Supercapacitors

Unit - IV: Materials for Energy Conversion **(18 Hours)**

Materials Requirement: The Ideal Solar Cell - Types of Solar Cell - Silicon - Crystalline silicon solar cells - Si heterojunction solar cells - Gallium Arsenide - Dye sensitized solar cells - Organic and hybrid solar cells - Inorganic and ultra - low-cost cells - Quantum dots cells - Hybrid perovskite cells - Spectral conversion - Nanostructured solar cells based on zinc oxide nanowire arrays - Multijunction or Tandem Solar Cells - N-Type TCOs - P-Type TCOs - TCM Based on Metallic Nanowires - TCM Based on CNT and Graphene - Types of Fuel Cells - Alkaline Fuel Cells - Polymer Electrolyte Membrane Fuel Cells - Phosphoric Acid - Molten Carbonate - Solid Oxide Fuel Cells - Thermodynamic Efficiency - Voltaic Efficiency - Faradaic Efficiency - Heat Efficiency.

Unit - V: Storage Materials **(18 Hours)**

Chronopotentiometry - Chronoamperometry - Cyclic voltammetry - Lead Acid Batteries - Alkaline Rechargeable Batteries - Lithium Rechargeable Batteries - From Li metal to Li-ion- Negative electrodes - Positive electrodes - Electrolytes - Redox Flow Batteries - Conventional Hydrogen Storages - Compressed Gas - Liquid Hydrogen - Carbon Materials - Zeolites- Metal - Organic Frameworks - Metal Hydrides - Elements - AB5 Intermetallic Compounds - AB Intermetallic Compounds - Lithium borohydride: $LiBH_4$ - Magnesium borohydride - Hydrogenation of Li_3N - The Li-Mg-N-H System.

Books for Study

1. William D. Callister, Jr. and David G. Rethwisch, Fundamentals of Materials Science and Engineering an Integrated Approach, John Wiley & Sons, Inc, 2016.
2. Xavier Moya David Muñoz-Rojas,Materials for Sustainable Energy Applications Conversion, Storage, Transmission, and Consumption, Jenny Stanford Publishing, 2016.

UNIT	BOOK	CHAPTERS	SECTIONS
I	1	10,11	10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11, 10.12, 10.13, 10.14, 10.15, 10.18, 11.3, 11.4, 11.5
II	1	4,15	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 4.12,9.7, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.11, 15.12, 15.14
III	2	8	8.3, 8.4, 8.4.1, 8.4.1.1, 8.4.1.3, 8.4.2, 8.4.2.1, 8.4.2.2, 8.4.2.3, 8.5.1, 8.5.1.1, 8.5.1.2, 8.5.1.3, 8.5.1.5-8.5.1.7, 8.5.2.1, 8.5.2.2, 8.5.2.3, 8.5.2.4, 8.6
IV	2	2,6	2.1.5, 2.2, 2.2.1, 2.2.1.1, 2.2.1.2, 2.2.2, 2.2.4.1, 2.2.4.2, 2.2.4.3, 2.2.4.4, 2.2.4.5, 2.2.4.6, 2.2.4.7, 2.2.5, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 6.3, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.5.1, 6.5.2, 6.5.3, 6.5.4
V	2	7,10	7.1.3.1, 7.1.3.2, 7.1.3.3, 7.2.1, 7.2.2, 7.2.3, 7.2.3.1, 7.2.3.2, 7.2.3.3, 7.2.3.4, 7.4, 10.1, 10.1.1, 10.1.2, 10.2.1, 10.2.2, 10.2.3, 10.3, 10.3.1, 10.3.2, 10.3.4, 10.4.1.1, 10.4.1.2, 10.5.1, 10.5.2

Book for Reference

1. William F. Smith, Fundamentals of Materials Science and Engineering, 2004.

Web Resources*

1. https://www.sheffield.ac.uk/materials/department/what-mse
2. https://mse.umd.edu/about/what-is-mse

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code			Title of the Course						Hours	Credit
III	21PPH3ES03A			DSE - 3: MATERIALS SCIENCE						6	4
Course Outcomes↓ (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	3	2	3	2	1	2.3
CO-2	3	3	2	2	3	3	2	2	2	1	2.3
CO-3	3	2	2	3	3	2	3	3	2	1	2.4
CO-4	3	2	2	3	3	2	2	3	2	1	2.3
CO-5	3	3	2	2	3	2	2	3	2	1	2.3
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3ES03B	DSE – 3: TECHNIQUES OF MATERIALS CHARACTERIZATION	6	4

CO No.	CO- STATEMENTS	COGNITIVE LEVEL (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on the fundamental of various characterization techniques.	K1
CO-2	understand the characteristics of crystals, thin films and nanocrystals	K2
CO-3	apply the physics principle and concepts to approach the problems mathematically and develop a skills to solve the problems numerically.	K3
CO-4	identify an appropriate characterization technique to understand the crystal structure, molecular structure, surface analysis and elemental analysis of various materials.	K4
CO-5	evaluate the results of XRD, FTIR, Fluorescence, absorption spectroscopy, Electron microscopy, XPS and thermal analysis and formulate an appropriate interpretation with a detailed justification for a new material.	K5 & K6

Unit - I: Structural Analysis **(18 Hours)**

Powder XRD: determination of crystal structure - crystallites size - lattice parameters - Cubic and non-cubic system - point group and space group - single crystal XRD: determination of crystal systems - point group and space group. G-XRD - analysis of thin films.

Unit - II: Molecular Structure and Electronic Structure Analysis **(18 Hours)**

^{1}H-NMR and ^{13}C-NMR - Chemical structure identification of solids and liquids - case study, Fourier Transform Infrared Spectroscopy - analysis of chemical bonds - case study optical analysis: Fluorescence spectroscopy - electronic structure analysis - case study - Time resolved spectroscopy - Absorption spectroscopy.

Unit - III: Surface Analysis **(18 Hours)**

SEM and FESEM - Morphology analysis, TEM and HR-TEM Morphology - Crystalline nature and structure - Atomic Force Microscope - Surface roughness - Scanning Tunnelling microscopy - Surface Topography - Chemical etching - Microstructure and dislocation - case study.

Unit - IV: Elemental and Thermal Analysis **(18 Hours)**

Elemental analysis: CHN analysis, Energy dispersive spectroscopy, X-ray fluorescence, X-ray photoelectron spectroscopy - case study.

Thermal analysis: TG/DTG and DTA/DSC analysis - phase changes, melting point and thermal decomposition - case study.

Unit - V: Optical and Microhardness Measurements (18 Hours)

Optical Measurements - Nonlinear optics: Second harmonic generation - Phase matching and Kurtz - Perry powder method - Third order nonlinearity - Z-scan technique - Laser damage threshold measurements.

Microhardness measurement: Brinell and Vickers hardness tests.

Books for Study

1. Sam Zhang, Lin Li, Ashok Kumar, Materials Characterization Techniques, Taylor & Francis Ltd. CRC press, 2008.
2. B.D. Cullity, S.R. Stock, Elements of X-Ray Diffraction, 3rd Edition, Pearson Education, Delhi, 2001.
3. C.R. Brundle, Charles A. Evans, Shaun Wilson, Encyclopedia of Materials Characterization, Butterworth-Heinemann, 1992.
4. Richard L Sutherland, Daniel G. McLean, Sean Kirkpatrick, Hand book of Nonlinear Optics, 2nd Edition, Marcel Dekker, Inc, 2003.

Unit	Book	Chapters	Sections
I	1 2	5	5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8 10
II	1 3	9 7	9.1, 9.2 7.1, 8.4
III	1	4, 6, 7	4.2, 4.3, 4.4, 6.1-6.5, 7.1-7.3
IV	1	3, 10	3.3, 3.4, 10.1, 10.4
V	4 4 4	1 4 10	III. A I.A, I.D 1.B

Books for Reference

1. Keshra Sangwal, Etching of Crystals: Theory, Experiment, and Application, 1st Edition, North-Holland physics publishing, Netherland, 1987.
2. B.B. Laud, Lasers and non-linear optics, John Wiley & Sons, 2nd Edition, 1993.
3. Detlev Ristau, Laser-Induced Damage in Optical Materials, Taylor & Francis Group, CRC Press, New York, 2015.
4. Robert W Cahn Frs, Eric Lifshin, Concise Encyclopedia of materials characterization, 1st Edition, Pergamon Press Ltd, Oxford, New York, 1993.
5. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices, Capital publishing company, New Delhi, 2007.

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3ES03B	DSE – 3: TECHNIQUES OF MATERIALS CHARACTERIZATION	6	4

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	2	2	3	2	1	2	1	2.0
CO-2	3	3	3	2	2	3	2	1	2	1	2.2
CO-3	2	3	3	2	2	3	3	3	2	1	2.4
CO-4	3	3	3	2	2	2	3	3	2	1	2.4
CO-5	3	3	3	2	2	2	2	3	2	1	2.3
Mean Overall Score											2.26 (High)

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3EG02A	GE – 2 (BS) : PHYSICS FOR COMPETITIVE EXAMINATIONS	4	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of the fundamental concept of physics	K1
CO-2	understand the concepts of fundamental physics	K2
CO-3	apply the concept of physics to solve various problems	K3
CO-4	strengthen an appropriate problem-solving approach and assess a step to describe the quantitative analysis.	K4
CO-5	evaluate the results of new analytical problems and develop a correct solutions or conclusions.	K5 & K6

Unit-I: General Mechanics and Properties of Matter (12 Hours)

Physical quantities - SI system of units - dimensions - scalars and vectors (Concepts) - Newton's equations of motion - impulse - principle of conservation of linear momentum - projectile motion - Kepler's laws - Newton's law of gravitation - acceleration due to gravity - escape velocity - angular momentum - banking of roads - simple harmonic motion - viscosity - surface Tension.

Unit-II: Heat and Thermodynamics (12 Hours)

Different scales of temperatures - thermal expansions - calorimetry - specific heat - latent heat - triple point - transmission of heat - heat conductivity - Black body radiation - Stefan Boltzmann law - Wien's displacement law - Gas equation - Boyle's law - Charle's law - Law of equipartition of energy.

Unit-III: Light and Sound (12 Hours)

Reflection and refraction - Snell's law - total internal reflection - polarization - Brewster's Law - Huygen's principle – Young's double slit interference and single slit diffraction - longitudinal and transverse waves - velocity of sound - Newton's formula, Laplace correction, effects of pressure - beats - laws of vibrating strings - open and closed organ pipes - resonance.

Unit-IV: Electricity and Magnetism (12 Hours)

Coulomb's Law - Electric field due to charged particles: a point charge, a dipole, a line of charge - electric flux - Gauss' law and applications – Biot-Savart law, magnetic field due to a current in: a long straight wire, a circular arc of wire - Ampere's Law - magnetic field outside and inside a long straight wire - solenoids and toroids - Faraday's laws and Lenz's law.

Unit-V: Modern Physics **(12 Hours)**

Postulates of Einstein's theory of relativity - Galilean and Lorentz transformation - time dilation - length contraction - Planck's radiation - photoelectric effect - Compton shift, matter waves - Bohr's atomic theory.

Nuclear properties - binding energy and mass defect -radioactive decay - alpha decay, beta decay and gamma decay - Radioactive dating.

Books for Study

1. J. Walker, D. Halliday, R. Resnick, Fundamentals of Physics, 10th Edition, Wiley, United states of America, 2007.
2. H.C Verma, Concept of Physics, (Volume II), 1st Edition, Bharati Bhawan Publishers & Distributors, New Delhi, 2008.
3. H.C Verma, Concept of Physics, (Volume I), 1st Edition, Bharati Bhawan Publishers & Distributors, New Delhi, 2008.

Unit	Book	Chapters	Sections
I	1	1, 3, 4, 5, 9, 11, 13, 14, 15	1.3, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 4.5, 4.6, 5.3, 5.6, 5.8, 9.4, 9.5, 9.6, 9.7,11.7,13.2, 13.4, 13.6, 13.7, 14.8, 15.2, 15.3, 15.4
II	2	23, 24, 25, 27, 28	23.3, 23.4, 23.5, 23.6, 24.7, 25.3, 25.4, 25.6, 27.8, 28.1, 28.5, 28.5, 28.7, 28.9, 28.10
III	1 3	16,17, 33, 35, 36	33.7, 33.8, 33.9, 35.4, 36.4, 36.5, 16.3, 17.3 16.4, 16.9, 16.11
IV	1	21, 22, 23, 29, 30	21.4, 22.4, 22.5, 22.6, 23.2, 23.4, 23.7, 23.8, 23.9, 29.2, 29.3, 29.4, 29.5, 30.3, 30.4
V	1	37, 38, 42	37.2, 37.3, 37.5, 37.6, 38.1, 38.2, 38.3, 38.5, 42.2, 42.3, 42.4, 42.5, 42.6

Books for Reference

1. A Book on Physics for Competitive Examinations, Department of Physics, St. Joseph's College, Tiruchirappalli, 2015.
2. Michael Nelkon, Philip Parker, Advanced Level Physics, 7th Edition, CBS Publishers, India, 1995.
3. D. Young Hugh, A. Freedman Roger, University Physics with Modern Physics, 14th Edition, Pearson Education, India, 2017.

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21PPH3EG02A	GE – 2(BS): PHYSICS FOR COMPETITIVE EXAMINATIONS	4	3

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	2	2	3	2	2	1	1	2.0
CO-2	3	3	2	2	3	3	2	2	2	1	2.3
CO-3	3	3	2	2	3	2	3	3	2	1	2.4
CO-4	3	3	2	2	3	1	3	3	2	1	2.3
CO-5	3	3	2	2	3	1	3	3	2	1	2.3
Mean Overall Score											2.26 (High)

Semester	Course Code	Title of the Course	Hours	Credit
III	**21PPH3EG02B**	**GE –2 (BS) : NANO SCIENCE**	**4**	**3**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on fundamentals of nanoscience.	**K1**
CO-2	understand and realize the applications of various nanostructures towards optical and electronic devices.	**K2**
CO-3	apply quantum physics concepts on nanostructures and study the corresponding physical and chemical properties.	**K3**
CO-4	analyse the various processing techniques to fabricate nanodevices.	**K3**
CO-5	evaluate the properties of nanostructures with size and morphology and develop an appropriate conclusion in favour of change in properties.	**K5 & K6**

Unit-I: Fundamentals of Nanoscience **(12 Hours)**

Definition of Nano, influence of nano over micro/macro size - classification of nanostructures - Moore's Law - size effect - amorphous carbon - carbon nanotubes: types carbon tubes - Fullerenes C_{60}, Carbon Nanohorn, nanobuds and Pea pods

Unit-II: Optical Properties and Applications **(12 Hours)**

Quantum effect - optical properties of metal and semiconductor nanoparticles - size and morphology dependent absorption and emission - applications: Lycurgus cup and Glass window.

Unit-III: Nanolithography **(12 Hours)**

Lithography - photolithography - lithography using photons - lithography using particle beam - Scanning probe lithography - soft lithography

Unit-IV: Applications of Semiconductor Nanostructures **(12 Hours)**

Injection lasers - Quantum cascade lasers – Single photon sources - Optical memories - Dye sensitized solar cell.

Unit-V: Electronic Applications **(12 Hours)**

Data storage - displays - organic LEDs - organic field effect transistors - quantum dot LED display - flexible electronics - nanoparticle transistor - Carbon nanotube single electron transistors - Carbon nanotube field effect transistor.

Books for Study

1. Robert W. Kelsall, Ian W. Hamley, Mark Geoghegan, Nanoscale Science and Technology, John Wiley & Sons Ltd, England, 2005.

2. Sulabha K. Kulkarni, Nanotechnology: Principles and Practices, Capital publishing company, New Delhi, 2007.
3. Chris Binns, Introduction to Nanoscience and Nanotechnology, John Wiley & Sons, New Jersey, 2010.
4. Satoshi Horikoshi, Nick Serpone, Microwaves in Nanoparticle Synthesis, Fundamentals and Applications, Wiley-VCH Verlag GmbH & Co. Germany,2013.

Unit	Book	Chapters	Sections
I	1 2 3	1,3 9 3	1.1.1, 1.1.2, 3.8.6 9.2, 9.2.1, 9.2.2, 3.1, 3.14, 3.15
II	1 2 4	3 7 1	3.3.1, 3.3.2, 3.3.3, 7.6.1, 7.6.2, 7.6.3 1.1, 1.3, 1.4
III	2	8	8.1, 8.2, 8.3, 8.4, 8.5
IV	1	3	3.8.1, 3.8.2, 3.8.3, 3.8.4
V	1 2	6 5	6.2.2, 6.2.3 5.1, 5.3, 5.4

Books for Reference

1. G. Cao, Nanostructures and Nanomaterials: Synthesis, properties and applications, Imperial College Press, 2004.
2. R. Fahrner, Nanotechnology and Nanoelectronics, Springer-Verlag Berlin Heidelberg, New York, 2005.
3. T. Pradeep, NANO: The Essentials: Understanding Nanoscience and Nanotechnology, 1st Edition, McGraw Hill Education, India, 2017.

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

Semester	Course Code			Title of the Course				Hours		Credit
III	21PPH3EG02B			GE – 2: NANOSCIENCE				4		3
Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	2	2	2	1	2.3
CO-2	3	2	3	3	2	3	2	2	2	1	2.3
CO-3	3	3	3	3	2	3	3	3	2	2	2.7
CO-4	3	2	3	2	2	3	3	3	2	1	2.4
CO-5	3	2	3	3	2	3	3	3	2	2	2.6
Mean Overall Score											2.46 (High)

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4CC07	CORE-7: NUCLEAR AND PARTICLE PHYSICS	6	6

CO No.	CO –Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	recall and explain a clear picture of nuclear composition, Radio activity, cosmic rays and understand various nuclear models.	K1 & K2
CO-2	understand the working of nuclear detectors and counters, realize the importance of Cosmic rays and its effects on earth	K2
CO-3	apply and Evaluate the applications of Nuclear Physics to Medical field and various other fields related to Physics.	K3 & K5
CO-4	analyse the different types of nuclear particles and particle accelerators.	K4
CO-5	formulate the four-factor formula and compound nuclear theory based on nuclear fission and fusion concepts	K6

Unit-I: Basic Properties of Nucleus (18 Hours)

Nuclear mass and binding energy - atomic masses - systematics of nuclear binding energy - nuclear size - charge radius - potential radius - spin and parity - statistics of nucleus - magnetic dipole moment – electric moments - electric quadrupole moments - isospin - nuclear forces-ground state of the deuteron - wave equation for the deuteron and solution - excited state of deuteron - low energy proton neutron scattering - spin dependence of n-p interaction. Liquid Drop Model - Evidence of Shell Structure - Single Particle Shell Model

Unit-II: Nuclear Decay and Radio Activity (18 Hours)

Theory of alpha disintegration - hindrance and formation factors - fine structure of alpha decay - energetics of beta decay - neutrino hypothesis - Fermi theory of beta decay - selection rules - Sargent diagram - orbital electron capture - parity non conservation - double beta decay - gamma ray spectra and nuclear energy level - radioactive transition in nuclei-nuclear isomerism - internal conversion - resonance fluorescence - angular correlation.

Unit-III: Nuclear Reactions (18 Hours)

Types of nuclear reactions - conservation laws - reaction energetics - Q value - threshold energy - nuclear reaction cross section - level width - compound nuclear theory - Breit Wigner dispersion formula and interpretation - direct reaction - striping and pickup reactions - nuclear fission - energy released in fission - nuclear chain reaction - four factor formula - nuclear reactor - nuclear fusion - Stellar energy.

Unit-IV: Particle Physics (18 Hours)

Production of new particles in high energy reaction - classification of elementary particle - fundamental interaction - quantum numbers - antiparticles - resonances - law in production and

decay process - symmetry and conservation laws - special symmetric groups - Gelman -Neumann theory - Quark model - SU(3) symmetry - unification of fundamental interactions - CPT in variance and applications of symmetry arguments to particle reaction, parity non conservation in week interaction.

Unit-V: Cosmic Rays and Applications of Nuclear Physics (18 Hours)

Nature of Cosmic rays - soft and hard components - Instruments and apparatus used in research of cosmic rays - absorption of cosmic ray - discovery of positron - cosmic ray shower discovery of muons - properties of ì - meson - discovery of Pi meson - Trace Element Analysis - Diagnostic Nuclear Medicine - Therapeutic Nuclear Medicine.

Books for Study

1. S.N. Ghoshal, Nuclear Physics, S. Chand and company Ltd., 2003.
2. Satya Prakash, Nuclear Physics and Particle Physics, First edition, Sultan Chand and sons, 2014.
3. S.L. Kakani, Shubhrakakani, Nuclear Particle and Physics, Second edition, Vivo books (private) Ltd, 2013.
4. Kenneth S. Krane-Introductory Nuclear Physics, 3rd edition, John Wiley and Sons, New York, 1988.

Unit	Book	Chapters	Sections
I	1	2,17	2.1, 2.13, 17.2, 17.3, 17.4, 17.6, 17.8
II	1	4,5,6	4.9-4.12, 5.5-5.7, 5.9, 5.10, 5.12, 5.16, 5.18, 6.8-6.11, 6.16, 6.19
III	2	8,9	8.1, 8.2, 8.4, 8.5, 8.7, 8.10, 8.12, 8.13, 8.15, 8.16, 9.2, 9.4, 9.11, 9.12, 9.13, 9.17, 9.21
IV	2	11	11.4-11.14, 11.15, 11.16
V	3 4	10,20	10.3, 10.4, 10.7-10.12, 10.14 20.1, 20.4, 20.5

Books for Reference

1. Pandya and Yadav-Nuclear and Particle Physics world, Cambridge University Press, Reprint 2004.
2. Bernard L. Cohen -Concepts of Nuclear Physics, Tata McGraw Hill Publishing Co., New Delhi. Reprint 2002.
3. Irwing Kaplan, Nuclear Physics, 2nd edition, Addison-Wesley Pub. Co., Reprint 2001.

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4CC07	NUCLEAR AND PARTICLE PHYSICS	6	6

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	93	2	2	3	3	2	2	2	2.4
CO-2	2	2	3	2	2	3	2	2	2	2	2.2
CO-3	3	2	2	2	2	2	2	3	2	2	2.2
CO-4	3	3	2	2	2	2	3	2	2	2	2.3
CO-5	2	2	2	2	2	3	2	2	2	2	2.1
Mean Overall Score											2.2 (High)

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4CC08	CORE-8: STATISTICAL MECHANICS AND THERMODYNAMICS	6	5

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of different laws of thermodynamics.	K1
CO-2	understand about diverse thermodynamic potentials and their importance to deduce reciprocity relations and Bragg-William's approximation.	K2
CO-3	apply the Knowledge about Liouville's theorem and its importance, MB distribution law, BE and FD distribution law.	K3
CO-4	apply and analyse the statistical laws to study transport phenomena	K3 & K4
CO-5	evaluate and check the knowledge from phase transitions of first and second type	K5 & K6

Unit-I: Fundamentals of Statistical Mechanics (18 Hours)

Objectives of statistical Mechanics - Concept of Entropy and disorder - Thermodynamic potentials and reciprocity relations - chemical potential - description of systems of particles system - phase space - volume in phase space - concept of ensembles - micro canonical - canonical - grand canonical - Liouville's theorem - priori Probability - Statistical, thermal, mechanical and particle equilibrium - Gibb's paradox - Gibbs canonical ensemble.

Unit-II: Classical Statistical Mechanics (18 Hours)

Micro and Macro states - classical Maxwell - Boltzmann distribution law - distribution of velocities - principle of equipartition of energy - connection between the partition function and thermodynamic quantities - mean values obtained from distribution law - Boltzmann's entropy relation-perfect gas in micro canonical ensemble - Comparison of ensembles.

Unit-III: Quantum Statistical Mechanics (18 Hours)

Statistical weight - density matrix - Bose - Einstein - Fermi-Dirac - Maxwell - Boltzmann Statistics - black body radiation and Planck's radiation law - Thermodynamic behaviour of ideal Bose and Fermi gas - Bose-Einstein condensation - Liquid Helium - Super fluidity -Tisza's two Fluid model - second sound - electron gas of metals - Free electron model and electronic emission.

Unit - IV: Transport Properties and Fluctuation (18 Hours)

Boltzmann transport equations - Boltzmann transport equations for electrons and Lorentz solution - chambers equation - thermal conductivity of metals - mean square deviation - fluctuations in energy, Probability of one-dimensional random walk - Brownian movement - Fokker Planck equation - Nyquist's theorem.

Unit-V: Phase Transitions and its Models **(18 Hours)**

Phase transitions - first and second kind - critical exponent - YANG and LEE theory - phase transition of second kind - Ising model: Bragg-Williams approximation - one dimensional model - adiabatic demagnetisation.

Book for Study

1. Gupta S.L & Kumar V., Statistical Mechanics, Pragati Prakashan, Meerut ED, 2006.

Unit	Book	Chapters	Sections
I	1	1	1-3, 7, 1.1, 1.1-1, 1.3, 1.7, 1.9, 1.10-1.13, 3.0-3
II	1	2,3	2.1, 2.7, 2.10, 2.12, 2.14, 2.15, 2.16, 3.0-2
III	1	5,6,8,9	5.8, 5.10, 6.2-6.4, 6.10, 8.0, 8.2, 9.0, 8.4, 8.4-1, 9.3
IV	1	10,12	10.1, 10.2, 10.3, 10.5, 12.1, 12.5, 12.6, 12.10
V	1	13	13.1-13.7

Books for Reference

1. Satya Prakash and JP Agarwal, Statistical Mechanics, Pragati Prakahan, 2002.
2. K. Huang, Introduction to Statistical Mechanics.
3. Surekha Tomar, CSIR-UGC NET/JRF/SET Physical Sciences, 3rd Edition (for problems).
4. B.K. Agarwal and Melvin Eisner, Statistical Mechanics, Third edition New Age International (P)ltd, 2013.

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

Semester	Course Code	Title of the Course					Hours				Credit
IV	21PPH4CC08	CORE-8: STATISTICAL MECHANICS AND THERMODYNAMICS					6				5
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	3	2	3	2	3	2	2	2.5
CO-2	2	3	2	2	2	3	2	2	3	2	2.3
CO-3	3	2	2	3	2	3	3	2	1	2	2.3
CO-4	2	2	2	2	2	3	3	2	1	2	2.1
CO-5	2	3	2	2	3	3	3	3	1	2	2.4
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4CP04	PHYSICS PRACTICAL – IV	8	6

Any 15 Experiments

1. AlO Band – spectral parameters
2. Laser IV: Fiber Optics cable parameters
3. Op-amp: Solving I order Simultaneous Equation
4. Analog to Digital Converter design
5. Design of Synchronous Counter
6. Digital Modulation: ASK, FSK and PSK
7. Four Probe and two probe Method
8. Optical constants of dielectric and metal films
9. Electron Spin Resonance Spectrometer
10. Determination of Fermi energy of copper
11. Measurement of radiant flux density and luminous intensity of emission source
12. Surface morphological characterization of nanomaterial by TEM
13. Jamin's interferometer - refractive index of air
14. Measurement of thermoelectric power
15. Computation through Origin: Mathematical functions
16. Computation through Origin: Curve Fitting
17. Computational experiment: Origin - Signal processing
18. Basic programs – Arduino
19. Frequency and humidity measurement - Arduino
20. Light intensity and distance measurement - Arduino
21. Pressure and density measurement - Arduino
22. Density and viscosity measurement - Arduino
23. Design of LCR meter - Arduino
24. Measurement and control of temperature - Arduino
25. Weather and astronomy related image processing using Python
26. Fast Fourier Transform using Python
27. Sound measurement – Arduino
28. Ellipsometer – Determination of n and k of a material
29. Design of MOSFET power inverter
30. Hydrogen Spectrum and Rydberg Constant

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4ES04A	DSE - 4: MICROCONTROLLER BASED PHYSICS INSTRUMENTATION	4	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe and discuss the architecture of Microcontroller, Arduino and IoT.	K1 & K2
CO-2	list and outline the features of Arduino IDE, syntax and algorithm and use this to solve the problems.	K1, K2 & K3
CO-3	use professional ethics on using sensors to rate modern society.	K3 & K5
CO-4	investigate and explain the automatic electronic devices and plan self-sustainability, employability and over all personality	K4 & K6
CO-5	identify the applications of Arduino, recommend the methods, design and construct various physics Instruments.	K6

Unit-I: Microcontroller and Architecture of Arduino (12Hours)

Microprocessor and Microcontroller - ATmega328/P: Introduction - Feature - Description - Block Diagram - Pin Configurations - Pin Descriptions

Arduino: Block diagram - Architecture - Pin functions - features - I/O Ports - Timers - interrupts - serial port - variants - Introduction to Arduino IDE - writing, saving, compiling and uploading sketches

Unit-II: Arduino Language Reference and Programming (12 Hours)

Language Reference: Variables - Operators - Control structures - Time and math functions Libraries and library management - Board management - digital I/O: blinking LED - interfacing Switch and 4x4 matrix keyboard - Interfacing LCD - simple programs.

Unit-III: Programing with Analog I/O for Physical Parameters (12 Hours)

ADC - AnalogRead - AnalogReference - Pulse Width Modulation PWM - control of DC motor - Serial Communication - Inter Integrated Circuit I2C- Serial Peripheral Interface SPI- Ethernet shield.

Unit-IV: Microcontroller Instruments Design (12 Hours)

Pressure meter - thermometer - lux meter - Ultrasonic range finder - humiditymeter - density meter - viscometer - dielectric meter - LCR meter

Unit-V: Internet of Things (IoT) **(12 Hours)**

Introduction - Block diagram - Networking with ESP8266 Wi-Fi module - MQTT Protocol - IoT service platform - IoT weather monitoring - IoT Physics Applications - IoT based air pollution meter.

Books for Study

1. Atmega328/P Data sheet.
2. Brain Evans, "Beginning Arduino Programing", Apress, 2011.
3. Peter Waher, "Learning Internet of Things", Packt Publishing, 2015.

Unit	Book	Chapters	Sections
I	1	1, 2, 4, 5, 11 & 12.1	1, 2, 4, 5, 11 & 12
	2	1	All
II	2	2, 3, 4, & 5	2, 3, 4, & 5
III	2	6, 7 & 10	6, 7 & 10
IV	2	Projects	Programs
V	3	1, 2, 5, & 7	1, 2, 5, & 7

Book for Reference

1. Simon Monk, "Programming Arduino, Getting Started with Sketches", Second Edition, McGraw-Hill Education, 2016.

WEB RESOURCES*

1. https://www.arduino.cc/
2. https://www.arduino.cc/en/Tutorial/HomePage
3. https://opensource.com/resources/what-arduino
4. https://nurdspace.nl/ESP8266

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	**21PPH4ES04A**	**DSE - 4: MICROCONTROLLER BASED PHYSICS INSTRUMENTATIONS**	**4**	**4**

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	3	3	3	2	2.6
CO-2	3	3	3	2	2	3	3	3	3	2	2.7
CO-3	3	3	2	3	2	3	3	3	3	2	2.7
CO-4	3	3	3	3	2	3	3	3	2	2	2.7
CO-5	3	3	3	2	2	3	3	3	3	2	2.7
Mean Overall Score											**2.68 (High)**

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4ES04B	DSE - 4: PHYSICS OF SENSORS AND TRANSDUCERS	4	4

CO No.	CO- Statements	Cognitive Levels (K- Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe and discuss different signals	K1 & K2
CO-2	list, explain and use different sensors and transducers	K1, K2 & K3
CO-3	compare the sensor principles, classify the sensors and transducers and design a transducer to sense the physical quantity.	K2, K3 & K6
CO-4	identify and recommend suitable sensors and transducers to an instrument.	K4 & K5
CO-5	examine the signals, assess the problems and synthesize a new sensors and transducers.	K4, K5 & K6

Unit-I: Data Acquisition and Sensors (12 Hours)

Sensors, Signals, and Systems - Sensor Classification - Mathematical models - Calibration - Computation of parameters - mobile communication sensors - Span - Full-Scale Output - Calibration Error - Hysteresis - Nonlinearity - Saturation - Repeatability – Dead band - Resolution - Special Properties - Dynamic Characteristics – Uncertainty.

Unit-II: Physical Principles of Sensing (12 Hours)

Capacitance - Magnetism - Induction - Resistance - Piezoelectric Effect - Pyroelectric Effect - Hall Effect - Thermoelectric Effects - Temperature and Thermal Properties of Materials - Heat Transfer.

Unit-III: Physics of Detectors (12 Hours)

Ultrasonic Detectors - Microwave Motion Detectors - Linear Optical Sensors - Optoelectronic Motion Detectors - Optical Presence Sensors - Pressure-Gradient Sensors - Gesture Sensing - Tactile Sensors.

Unit-IV: Transducers I (Principle and Design) (12 Hours)

Metal detector - Magnetostrictive detector - proximity detector with polarized light - ablation transducer - cryogenic liquid level transducer - Tachometer - laser gyroscope - Inclinometer - Seismic transducer - piezoelectric accelerometer - pressure sensitive film - vacuum pressure gauge - ultrasonic flow transducer.

Unit-V: Transducers II (Principle and Design) (12 Hours)

Condenser microphone - optical microphone - optical hygrometer - oscillating hygrometer - soil moisture - image detector - UV detector - thermal radiation detector - Ionization detector - ceramic PTC transducer - chemical transducer - biological transducer.

Book for Study

1. Jacob Fraden, "Handbook of Modern Sensors - Physics, Designs, and Applications", Fifth Edition, Springer, 2016.

Unit	Book	Chapters	Sections
I	1	1, 2, 3	1.1, 1.2, 2.1-2.3, 3.1-3.3, 3.5-3.12, 3.16, 3.21
II	1	4	4.2-4.9, 4.11, 4.12.
III	1	7	7.1, 7.2, 7.5, 7.8-7.13
IV	1	8, 9, 10	8.4.5, 8.4.8, 8.5.2, 8.6.1, 9.1.2, 9.2.3, 9.3.2, 9.3.3, 9.3.6, 10.3, 11.10, 12.4
V	1	13, 14, 15, 16, 17, 18	13.3, 13.5, 14.6-14.8, 15.6-15.8, 16.2, 17.4.5, 18.1-18.4, 18.9

Book for Reference

1. Michael Stanley and Jongmin Lee, "Sensor Analysis", Morgan & Laypool publishers, 2018.

Web Resources*

1. https://www.nap.edu/read/4782/chapter/4
2. https://www-physics.lbl.gov/~spieler/TSI-2007/PDF/Sensor_Physics_I.pdf
3. https://www.elprocus.com/tilt-sensor-types-working-principle-and-its-applications/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	**21PPH4ES04B**	**DSE - 4: PHYSICS OF SENSORS AND TRANSDUCERS**	**4**	**4**

Course Outcomes (COs)↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	2	3	3	2	2	2	2	3	2	2.3
CO-2	3	2	2	2	3	2	3	3	3	2	2.5
CO-3	3	2	2	2	2	2	3	3	3	2	2.4
CO-4	3	2	3	2	2	3	3	2	2	3	2.5
CO-5	3	2	2	2	2	3	3	3	2	2	2.4
Mean Overall Score											**2.42 (High)**

Semester	Course Code	Title of the Course	Hours	Credit
IV	21PPH4CE01	COMPREHENSIVE EXAM	-	2

Unit-I: Classical and Statistical Mechanics

Generalized coordinates system, Lagrangian and Hamiltonian formulation and equation of motion, Central force motions, Two body collisions - Scattering in laboratory and center of mass frames, Rigid body dynamics - non linear frame and pseudo forces, Special theory of relativity - Lorentz transformation, relativistic Kinematics and mass energy Equivalence.

Fundamentals of statistical mechanics, classical statistical mechanics - micro and macro states, thermodynamic quantities, Maxwell's relations, Boltzmann's entropy relation, quantum statistical mechanics - ideal Bose and Fermi gas - Bose-Einstein condensation, Transport properties - Boltzmann transport equations - random walk - Brownian movement.

Unit-II: Mathematical Physics and Electromagnetic Theory

Mathematical tools of vector and matrix spaces - vector algebra and vector calculus, linear algebra, matrices, eigen values and eigen vectors, partial differential equations - Laplace, wave and heat equations in two and three dimensions, Complex analysis - Cauchy's theorem -derivatives of analytic Complex function - Laurent series, Fourier series - Fourier and Laplace transforms, Special function – series solution of Hermite and Legendre polynomial.

Gauss law and its applications - Laplace and Poisson equations - boundary value problems - Biot-Savart law - Ampere's theorem - Maxwell's equations in free space and linear isotropic media - Boundary conditions on fields at interface - Scalar and vector potential, Electromagnetic waves in free space, dielectrics and conductors, wave guides - Radiation from moving charges and retarded potential.

Unit-III: Quantum Mechanics

Basic postulates and quantum system - Schrodinger equation and wave packets - Properties of 1D motions, one and three dimensional problems - Tunneling through barrier - Eigen value problems - Harmonic oscillator and Hydrogen atom problem, Angular momentum - spin angular momentum - orbital angular momentum - Iso spin, Approximation methods - Time independent Perturbation Theory - JWKB approximation.

Unit-IV: Condensed Matter Physics

Semiconductor crystals - Origin of energy gap - carrier concentration - mobility – conductivity - Fermi surface - construction of Fermi surface - nearly free electron model – Pseudo potential Thermodynamics of the superconducting transition - London equation - BCS theory of superconductivity - Type II superconductors - DC and AC Josephson effect - High temperature superconductors, Magnetic properties of solids - Dia, para and ferro magnetism, magnetic resonance, dielectric function of gas.

Unit-V: Spectroscopy and Nuclear Physics

Electronic, rotational, vibrational and Raman spectra of diatomic molecules - selection rule, Spin and applied field - NMR spectroscopy - Electron spin resonance spectroscopy - Mossbauer Spectroscopy.

Basic nuclear properties: size, shape and charge distribution - binding energy - Nuclear models - Theories of alpha and beta decay, types of nuclear reactions, elementary particles and their quantum numbers - Quark model, Cosmic rays - discovery and applications, diagnostic nuclear medicine.

Books for Reference

1. Herbert Goldstein, Charles P. Poole, John L. Safko, Classical Mechanics, 3rd Edition, Pearson Education, 2002.
2. Quantum Mechanics: Concepts and Applications, Nouredine Zettile, 2/e, John Wiley & Sons, UK, 2009.

B.Sc. PHYSICS

LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE

WITH CHOICE BASED CREDIT SYSTEM (CBCS)

DEPARTMENT OF PHYSICS
SCHOOL OF PHYSICAL SCIENCES
ST.JOSEPH'S COLLEGE (AUTONOMOUS)
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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 21st 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	N	N	XX	NN/NNX
Year of Revision	UG Department Code	Semester number	Part specification	Part Category	Running 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):

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 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.

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

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

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K- LEVELS	Lower Order Thinking			Higher Order Thinking			Total %
	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 EXAMINATION	
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 SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.							**Max Mark : 100**
K- LEVELS / **SECTIONS**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total 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) Courses having only **K4** levels				3			**30**
Courses having **K4** and **K5** levels **One K5 level question is compulsory**				2	1		
(Courses having **all the 6** cognitive levels **One K5 and K6 level questions can be compulsory**				1	1	1	
Total	**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.							**Max Mark: 60.**
K- LEVELS / **SECTIONS**	**K1**	**K2**	**K3**	**K4**	**K5**	**K6**	**Total Marks**
SECTION –A (One Mark, No choice) (7 x 1 = 7)	7						**07**
SECTION-B (2-Marks, No choice) (6 x 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) Courses having only **K4** levels				2			**20**
Courses having **K4** and **K5** levels **One K5 level question is compulsory**				1	1		
Courses having **all the 6** cognitive levels **One K6 level question is compulsory**					1	1	
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	50 (Three Components)	50 (COE) (Specific Question Pattern)	100
Assessment Pattern for Courses in Part - 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)		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:

$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}$	$WAM\,(Weighted\,Average\,Marks) = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$
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_i 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.

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.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	**10**	**O**
80 and above and below 90	**9**	A+
70 and above and below 80	**8**	**A**
60 and above and below 70	**7**	**B+**
50 and above and below 60	**6**	**B**
40 and above and below 50	**5**	**C**
Below 40	**0**	**RA**

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	**O**	**Outstanding**
8.00 to 8.99	A+	Excellent
7.00 to 7.99	**A**	**Very Good**
6.00 to 6.99	**B+**	**Good**
5.0 0 to 5.99	**B**	**Above Average**
4.00 to 4.99	**C**	**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%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

Mean Scores of COs $= \frac{\text{Sum of values}}{\text{Total No.of POs \& PSOs}}$		**Mean Overall Score** $= \frac{\text{Sum of Mean Scores}}{\text{Total No.of COs}}$	
Result	**Mean Overall Score**	**< 1.2**	**# Low**
		≥ 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 value-driven 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. Acquired academic excellence with an aptitude for higher studies and research.
2. Gained knowledge about properties of different matter and its application for developing technology to the problems related to the society.
3. Analysed the applications to the problems in Physics through experimental and theoretical means.
4. Acquired the ability to design knowledge and demonstrate their understanding of the scientific methods and processes.
5. Apply appropriate techniques and modern tools to complex scientific activities, and develop skills in communicating Physics-related topics by learning beyond syllabus**.**

B.Sc. PHYSICS						
PROGRAMME STRUCTURE						
Part	**Sem.**	**Specification**	**No. of Courses**	**No. of Hours**	**Credits**	**Total Credits**
I	**1-IV**	**Languages** **(Tamil / Hindi/ French/ Sanskrit)**	**4**	**16**	**12**	**12**
II	**I-IV**	**General English**	**4**	**20**	**12**	**12**
III	**I –VI**	**Core course : Theory** **Core course : Practical**	**10** **5**	**74**	**45**	**82**
	I-IV	**Core course- Allied /(Practical)**	**4 / (2)**	**24**	**16**	
	V-VI	**Discipline Specific Elective**	**4**	**20**	**12**	
	VI	**Project Work**	**1**		**2**	
	V	**Self-paced learning –** to promote independent learning Syllabus for 5 units 1 Staff in charge to conduct CIA outside regular class hours	**1**	**--**	**2**	
	V	**Field study/ Industrial visit/ Case study** (Submit a detailed report- with photos- staff in charge)	**1**		**1**	
	V	**Internship (3 weeks during summer holidays after semester iv) credit will be entered in the 5th Sem. Mark sheet**	**1**	**-**	**2**	
	VI	**Comprehensive Exam** **(Syllabus must be given)**	**1**	**--**	**2**	
	II,III ,V	**Extra Credit courses (MOOC)**	**(3)**	**--**	**(6)**	**(6)**
IV	**V-VI**	**Generic Elective**	**2**	**8**	**6**	20
	I	**AECC-1 Communicative English**	**1**	**--**	**4**	
	II	**AECC-2 Environmental studies**	**1**	**2**	**2**	
	III	**SEC -1 Within Dept. (WD)**	**1**	**2**	**1**	
	IV	**SEC -2 Between Schools (BS)**	**1**	2	1	
	V	**SEC -3 Soft skill**	**1**	2	1	
	VI	**SEC -4 within school (WS)**	**1**	2	1	
	I-IV	**Value Education**	**4**	**8**	**4**	
V	**I-V**	**Outreach Programme /NCC**	**-**	**-**	**4**	4
		Total		**180**	**130(6)**	**130(6)**

B.Sc. PHYSICS								
PROGRAMME PATTERN								
Course Details						**Scheme of Exams**		
Sem	**Part**	**Code**	**Course Title**	**Hrs**	**Cr**	**CIA**	**SE**	**Final**
I	1	21UTA11GL01	General Tamil - I	4	3	100	100	100
		21UFR11GL01	French-I					
		21UHI11GL01	Hindi-I					
		21USA11GL01	Sanskrit-I					
	2	21UEN12GE01	General English -I	5	3	100	100	100
	3	21UPH13CC01	Properties of Matter and Sound	7	6	100	100	100
	3	@	Physics Practical – I	3	--			
		@	Basic Workshop Practice	3	-			
	3	21UPH13AC01	**Allied:** Mathematics for Physics– I	6	4	100	100	100
	4	21UEN14AE01	**AECC-1:** Communicative English	(6)	4	100	-	100
	4	21UHE14VE01	Essentials of Humanity	2	1	50	50	100
			Total	**30**	**21**			
II	1	21UTA21GL02	General Tamil - II	4	3	100	100	100
		21UFR21GL02	French-II					
		21UHI21GL02	Hindi-II					
		21USA21GL02	Sanskrit-II					
	2	21UEN22GE02	General English -II	5	3	100	100	100
	3	21UPH23CC02	Mechanics	*5*	3	100	100	100
	3	21UPH23CP01	Physics Practical – I	*3*	2	100	100	100
		21UPH23WS01	Basic Workshop Practice	*3*	2	100	-	100
	3	21UPH23AC02	**Allied :** Mathematics for Physics– II	6	4	100	100	100
	4	21UHE24AE02	**AECC-2**: Environmental studies	2	2	50	50	50
		21UHE24VE02	Techniques of Social Analysis: Fundamentals of Human Rights	2	1	50	50	50
			Extra Credit Courses (MOOC)-1	-	(2)			
			Total	**30**	**20(2)**			
III	1	21UTA31GL03	General Tamil - III	4	3	100	100	100
		21UFR31GL03	French-III					
		21UHI31GL03	Hindi-III					
		21USA31GL03	Sanskrit-III					
	2	21UEN32GE03	General English -III	5	3	100	100	100
	3	21UPH33CC03	Mathematical Physics - I	4	4	100	100	100
	3	21UPH33CC04	Elctromagnetism	4	3	100	100	100
	3	@	Physics Practical – II	3	-			
	3	21UPH33AO03A	**Allied Optional** : Chemistry –I	4	3	100	100	100
		21UPH33AO03B	**Allied Optional** : Computer Science-I					
		@	**Allied: Practical**	2	*	*		
	4	21UPH34SE01A	**SEC -1 (WD):** Solar Power System Installation and Maintenance	2	1	100	-	100
		21UPH34SE01B	**SEC -1 (WD):** Techniques of Problem Solving in Physics					
	4	21UHE34VE03A	Professional Ethics–I: Social Ethics - I	2	1	50	50	50
		21UHE34VE03B	Professional Ethics -I: Religious Doctrine-I					
			Extra Credit Courses (MOOC)-2	-	(2)			
			Total	**30**	**18 (2)**			
IV	1	21UTA41GL04B	Scientific Tamil (SBS, SPS,SCS)	4	3	100	100	100
		21UFR41GL04	French- IV					
		21UHI41GL04	Hindi- IV					
		21USA41GL04	Sanskrit- IV					
	2	21UEN42GE04	General English - IV	5	3	100	100	100

	3	21UPH43CC05	Mathematical Physics - II	4	4	100	100	100
	3	21UPH43CC06	Thermal Physics	4	3	100	100	100
	3	21UPH43CP02	Physics Practical – II	3	2	100	100	100
	3	21UPH43AO04A	**Allied Optional** : Chemistry –II	4	3	100	100	100
		21UPH43AO04B	**Allied Optional** : Computer Science-II					
		21UPH43AP01A	**Allied Optional** : Chemistry Practical	2	2	100	100	100
		21UPH43AP01B	**Allied Optional** : Computer Science Practical					
	4	21UPH44SE02A	**SEC -2 (BS):** Weather Physics	2	1	100	-	100
		21UPH44SE02B	**SEC -2 (BS):** Electrical Wiring					
	4	21UHE44VE04A	Professional Ethics–II: Social Ethics - II	2	1	50	50	50
		21UHE44VE04B	Professional Ethics -II: Religious Doctrine-II					
			Total	**30**	**22**			
V	3	21UPH53CC07	Optics	4	2	100	100	100
	3	21UPH53CC08	Concepts of Modern Physics	4	2	100	100	100
	3	21UPH53CP03	Physics Practical – III	6	4	100	100	100
	3	21UPH53ES01A	**DSE-1:** Analog and Digital Electronics	5	3	100	100	100
		21UPH53ES01B	**DSE-1:** Design of Analog and Digital Circuits					
	3	21UPH53ES02A	**DSE-2:** Classical Mechanics	5	3	100	100	100
		21UPH53ES02B	**DSE-2:** Solid State Physics					
	3	21UPH53IS01	Internship	-	2	100	-	100
	3	21UPH53SP01	**Self-paced learning:** Astronomy	-	2	50	50	50
	3	21UPH53FV01	Field study/ Industrial visit/ Case study	-	1	100	-	100
	4	21USS54SE03	**SEC -3:** Soft Skills	2	1	100	-	100
	4	21UPH54EG01A	**GE-1:** Everyday Physics	4	3	100	100	100
		21UPH54EG 01B	**GE-1:** Renewable Energy Physics					
			Extra Credit Courses (MOOC)-3	-	(2)			
			Total	**30**	**23(2)**			
VI	3	21UPH63CC09	Quantum Mechanics	4	2	100	100	100
	3	21UPH63CC10	Atomic, Nuclear and Particle Physics	4	2	100	100	100
	3	21UPH63CP04	Physics Practical – IV	6	4	100	100	100
	3	21UPH63ES03A	**DSE-3:**Statistical Mechanics	5	3	100	100	100
		21UPH63ES03B	**DSE-3:** Spectroscopy and Laser					
	3	21UPH63ES04A	**DSE-4:** Embedded System and Microcontroller	5	3	100	100	100
		21UPH63ES04B	**DSE-4:** Sensors, Transducers and IoT					
	3	21UPH63PW01	Project Work and Viva Voce	-	2	100	100	100
	3	21UPH63CE01	Comprehensive Exam	-	2	50	50	50
	4	21UPH64SE04A	**SEC -4 (WS):**Radiation Physics and Safety	2	1	100	-	100
		21UPH64SE04B	**SEC -4 (WS):** Non Destructive Testing					
	4	21UPH64EG02A	**GE-2:**Laser Technology and its Application	4	3	100	100	100
		21UPH64EG02B	**GE-2:** Physics of Earth					
			Total	**30**	**22**			
	1 - 5	21UCW65OR01	Outreach Programme (SHEPHERD)		4			
			Total	**180**	**130(6)**			

@ Practical Exam will be conducted at even semester

For the courses with scheme of Exam 50 in CIA and SE will be converted to 100.

SEC-2: BETWEEN SCHOOL 4th Semester							
Between schools (BS)- Offered to students of other schools (Except the school offering the course)							
Course Details					Scheme of Exams		
Offering Department	**Course Code**	**Course Title**	**Hr**	**Cr**	**CIA**	**SE**	**Final**
SBS							
Botany	21UBO44SE02	Mushroom Technology	2	1	100	-	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	21UTA44SE02	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

GENERIC ELECTIVE -1: 5th Semester							
Generic Elective Courses are designed for the students of other disciplines. (open to the students of other departments)							
Course Details					**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	21UEN54GE01	Film Studies	4	3	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

GENERIC ELECTIVE -2: 6th Semester							
Generic Elective Courses are designed for the students of other disciplines. (open to the students of other departments)							
Course 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	Industry 4.0	4	3	100	100	100
SLAC							
English	21UEN64EG02	English for the Media	4	3	100	100	100
History	21UHS64EG02	Intellectual Revivalism in Tamil Nadu	4	3	100	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							
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
I	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
CO–3	அயலகக் கவிதை வடிவங்களை விளங்கிக் கொள்வர்	K2
CO–4	மொழிபெயர்ப்புக் கவிதைகளின் வாயிலாக மொழிபெயர்ப்புத் திறனை வளர்த்தெடுப்பர்	K3
CO–5	புதுக்கவிதை வாயிலாக வெளிப்படும் சமூக, அரசியல் விழுமியங்களை மதிப்பிடுவர்	K4

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 - 3 **(12 மணிநேரம்)**

சுரதா - நல்ல தீர்ப்பு
கண்ணதாசன் - ஒரு பானையின் கதை
அப்துல் ரகுமான் - வீடு
மேத்தா - ஒரே குரல்
இலக்கிய வரலாறு - மூன்றாம் பாகம் - இருபதாம் நூற்றாண்டு
இலக்கியவளர்ச்சி
சிறுகதை - முதல் ஐந்து சிறுகதைகள்

அலகு – 4 : அரசியல் கவிதைகள் **(12 மணிநேரம்)**

ஈரோடு தமிழன்பன் - அகல் விளக்காக இரு
ஆதவன் தீட்சண்யா - இன்னும் இருக்கும் சுவர்களின் பொருட்டு

சுகிர்தராணி - என் கண்மணியே இசைப்பிரியா
சக்தி ஜோதி - யுகாந்திர உறக்கம்
பழநிபாரதி - வெள்ளைக்காகிதம்
லிவிங் ஸ்மைல் வித்யா - நினைவில் பால்யம் அழுத்தம்
இலக்கணம் - சொல்

அலகு - 5 அயலகக் கவிதைகள் **(12 மணிநேரம்)**

ஓசே 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	Credits
I	21UTA11GL01	General Tamil - I	4	3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO–1	PO–2	PO–3	PO–4	PO–5	PSO–1	PSO–2	PSO–3	PSO–4	PSO–5	
CO–1	2	1	2	2	3	3	3	2	3	2	2.3
CO–2	2	1	2	2	2	3	2	2	2	2	2.0
CO–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
I	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.	K2
CO–3	construct simple phrases by using 'er' verbs in present tense.	K3
CO–4	make use of correct terminology and introduce oneself in French.	K3
CO–5	distinguish between affirmative and negative phrases and take part in role play - conversation.	K4

Unit – I **(12 hours)**

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 **(12 hours)**

TITRE:SALUT ! JE M'APPELLE AGNES
GRAMMAIRE : La conjugaison du 1er 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 **(12 hours)**

TITRE:QUI EST-CE?
GRAMMAIRE : La phrase interrogative : Qu'est-ce que… ?/Qu'est-ce que c'est ?/Qui est-ce ?, 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 **(12 hours)**

TITRE:DANS MON SAC, J'AI?
GRAMMAIRE : la phrase négative, c'est/il est, les articles contractes, les pronoms personnels toniques
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, 2^{e}edition, 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
I	21UFR11GL01			FRENCH – I				4		3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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
I	21UHI11GL01	HINDI- I	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 literary works in Hindi during the period of 12th century in India.	K1
CO -2	compare the vocabulary & expressions related to day-to-day conversation.	K2
CO -3	use simple Phrases from English to Hindi.	K3
CO -4	investigate the values of Indian society & summarize the duties of a citizen for his/her country.	K4
CO -5	identify the sentences in Hindi using basic grammar.	K4

Unit - I **(12 Hours)**

Dr. Abdul Kalam
Ling
Kabir Ke Dohe
Baathcheeth - Aspathal mein
Adhikal - Namakarn

Unit - II **(12 Hours)**

Vachan Badaliye
Thulasi ke Dohe
Adhikal - Samajik Paristhithiyam
Moun Hee Mantra Hai

Unit - III **(12 Hours)**

Sangya
Soordas ke Pad
Baathcheeth - Hotel mein
Adhikal - Sahithyik Paristhithiyam

Unit - IV **(12 Hours)**

Sarvanam
Rahim ke Dohe
Bathcheeth - Kaksha mein
Adhikal - Salient Features, Main Divisions

Unit - V **(12 Hours)**

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*
2. Viswanath Tripaty, *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd, New Delhi,2018.
   Unit-II, III and IV *Chapters 4 and 5*
3. 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			Title of the Course					Hours	Credits
I	21UHI11GL01			HINDI - I					4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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
									Mean Overall Score		2.38 (High)

Semester	Course Code	Title of the Course	Hours	Credits
I	21USA11GL01	SANSKRIT - I	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 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

Unit - I **(12 Hours)**

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, Programme outcomes /Programme Specific Outcomes

Semester	Course Code			Title of the Course				Hours		Credit
I	21USA11GL01			SANSKRIT- I				4		3
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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											2.34
Result											# High

Semester	Course Code	Title of the Course	Hours	Credits
I	**21UEN12GE01**	**GENERAL ENGLISH - I**	**5**	**3**

CO No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
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 **(15 Hours)**

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 **(15 Hours)**

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 **(15 Hours)**

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. Match the Visual
30. Letter Spell-Check
31. Drafting a Letter

Unit-IV **(15 Hours)**

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 **(15 Hours)**

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.

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	Course Code			Title of the Course						Hours	Credit
I	21UEN12GE01			GENERAL ENGLISH – I						5	3
Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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
I	21UPH13CC01	CORE-1: PROPERTIES OF MATTER AND SOUND	7	6

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on elastic moduli, elasticity and viscosity of liquids and gases, molecular theory of surface tension, diffusion, osmosis, Doppler Effect in sound and ultrasonics.	K1
CO-2	understand the concepts of elasticity, viscosity and surface tension in real situations, the diffusion in liquids, the methods to produce ultrasonic waves and the factors affecting the acoustics of building.	K2
CO-3	apply the knowledge to find the bending of beams, internal pressure in a shell, coefficient of viscosity, surface tension of liquids, Doppler effect and acoustic measurements.	K3
CO-4	analyse the characteristics of Exhaust pumps, factors affecting the acoustics of building.	K4
CO-5	analyse the bending moments in beams, flow of liquids in capillary tubes, surface tension of liquid versus temperature.	K4

Unit- I: Elasticity **(21 Hours)**

Hooke's law and elastic moduli - relation between the elastic constants - limiting value of μ - stresses subjected to internal pressure in a spherical shell and cylindrical shell - torsion of a cylinder - torsional oscillation - experimental determination of I by torsional oscillation - Elasticity of liquids and gases - potential energy due to strain - bending of beams - internal bending moment - energy of bending - cantilever - a supported beam - beam rigidly fixed at both ends - Asymmetrically bent beam - Cornu's method of measuring μ.

Unit - II: Viscosity **(21 Hours)**

Introduction - coefficient of viscosity - Newtonian and non-Newtonian fluids - critical velocity and Reynolds Number - Poiseuille's formula - corrections - Experimental determination of coefficient of viscosity - Falling pressure at the inlet end - Flows through capillaries in series and in parallel - Viscosity of gases - Rankine's method for determining viscosity of a gas - pressure drag - viscous drag - terminal velocity - nature of motion through viscous fluid - effects of temperature and pressure on viscosity.

Unit - III: Surface Tension **(21 Hours)**

Molecular theory of surface tension - surface energy - total surface energy - Measurement of angle of contact - pressure difference between two sides of a curved liquid surface - soap bubbles in contact - water in U tube - a charged soap bubble - the force between two plates separated by a thin layer of liquid - Measurement of surface tension: capillary rise method - Quincke's method - drop weight method - surface tension of solids and gases - empirical relations between surface tension and temperature.

Unit- IV: Diffusion, Osmosis and Low Pressure **(21 Hours)**

Diffusion: Introduction Fick's law - relation between time of diffusion and length of column - experimental measurement of diffusivity - Graham's law - effusion.

Osmosis: Osmosis and Osmotic pressure - Laws of osmotic pressure - Osmosis and vapour pressure of a solution - osmosis and boiling point of a solution - osmosis and freezing point of a solution.
Low Pressure: Production of low pressure - Exhaust pump characteristics - Rotary oil pumps - diffusion condensation pump - Mc Leod vacuum gauge - Pirani gauge - Knudsen gauge.

Unit - V: Sound, Acoustics and Ultrasonics (21 Hours)
Sound: Doppler Effect - applications - **Acoustics:** Reverberation - Sabine's reverberation formula - Determination of absorption coefficient - Acoustic Intensity - Acoustic measurements - Factors affecting the acoustic buildings - Sound distribution in an Auditorium - Requisites for good acoustics.
Ultrasonics: Production of ultrasonic waves - Detection of ultrasonic waves - Acoustic grating - Applications of ultrasonic waves.

Books for Study
1. Satyendra Nath Maiti, Debi Prasath Raychaudhuri - *Classical mechanics and general properties of Matter* - New Age International Publishers, 2008.
2. D.S. Mathur - *Elements of Properties of Matter* - S. Chand & Company, 2010.
3. N. Subrahmanyam and Brij Lal - *A text book of Sound*, Vikas Publishing House private Ltd., 2014.

Books for Reference
1. Michael de Podesta, *Understanding of Properties of matter*, second edition.
2. Saighal R.L, *Text book of sound*, 2nd edition, S. Chand & Co Ltd, 1998.
3. Murugesan R, *Properties of Mater*, S. Chand & Co Pvt Ltd, 2013.

Unit	Book	Chapters	Sections
I	1	11	11.4, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.6, 11.6.1, 11.6.3, 11.7, 11.8, 11.9, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.15
II	1	12	12.1-12.5, 12.6.1-12.6.3, 12.6.5, 12.6.7-12.6.9, 12.8.1-12.8.5, 12.9
III	1	14	14.2 -14.4, 14.5.2, 14.6, 14.6.2, 14.8, 14.8.1, 14.8.2, 14.8.4, 14.11, 14.12
IV	2	13,15	13.1-13.12, 15.12-15.16, 15.19, 15.24, 15.25, 15.29
V	3	8,10	8.1-8.6, 10.14-10.27

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

Semester	Course Code	Title of the Course	Hours	Credit
I	21UPH13CC01	CORE-1: PROPERTIES OF MATTER AND SOUND	7	6

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	2	2	3	2	2	2.3
CO-2	2	2	3	2	3	2	2	2	3	2	2.3
CO-3	3	2	2	3	3	2	3	2	2	2	2.4
CO-4	3	2	2	2	3	2	2	3	2	2	2.3
CO-5	2	2	3	2	2	3	2	2	2	2	2.2
Mean Overall Score											2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credits
I	21UPH13AC01	ALLIED: MATHEMATICS FOR PHYSICS-I	6	4

CO No.	CO-Statements On successful completion of this course, students will be able to	Cognitive Levels (K-levels)
CO-1	attain knowledge of higher derivatives, definite integrals, first and second order differential equations, matrices and infinite series.	K1
CO-2	understand formation of equations involving derivatives, trigonometrical transformation in derivatives, properties of definite integrals operations and properties of matrices and convergence of series.	K2
CO-3	Illustrate integration by parts,reduction formula,simultaneous linear equations in threeunknowns, different methods in first order differential equations and convergence of series.	K3
CO-4	verify integration by parts, Leibnitz's formula, reduction formula, linear equation, Bernoulli's equation, Cayley Hamilton theorem and comparisontest, ratiotest and root test.	K4
CO-5	evaluate definite integrals, reduction formula, solutions of first and second order differential equations, rank of a matrix eigenvalues and eigenvectorsand convergence.	K5

Unit-I **(18 Hours)**

Higher Derivatives – Trigonometrical Transformation – Formation of Equation Involving Derivatives – Leibnitz's Formula for the n^{th} Derivatives of a Product (Without Proofs) – Integration by Parts.

Unit-II **(18 Hours)**

Properties of Definite Integrals - Reduction Formula for $x^n e^{ax}$,$x^n \cos ax$,$x^n \sin ax$, $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ and $\tan^n x$.

Unit-III **(18Hours)**

First Order Differential Equations - Variable Separable - Homogenous Equations- Non-Homogenous Equations - Linear Equation - Bernoulli's Equation-Second Order Differential Equations - Linear Equation with Constant Coefficients.

Unit-IV **(18 Hours)**

Matrices - Rank of a Matrix - Solving Simultaneous Linear Equations in ThreeUnknowns Using Elementary Operations Method - Eigen Values and EigenVectors - Verification of Cayley Hamilton Theorem.

Unit-V **(18 Hours)**

Concept of Limit of a Sequence - Limit of a Function - Simple Problems -Convergence, Divergence and Oscillation of a Series - Geometric Series -Tests of Convergence and Divergence, ComparisonTest, RatioTest and Root Test(Without Proofs).

Books for Study

1. S. Narayanan, R.Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy, "**Ancillary Mathematics, Vol-I**",2009 Edition.
   Unit I:*Chapter 6 – Sec 6.1, pp: 266-281*
   Unit IV:*Chapter 3 – Sec 3.2 - 3.4, pp: 137-160.*

2. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy, "**Ancillary Mathematics, Vol-II**", 2010 Edition.
   Unit I:*Chapter 1 – Sec 12, pp: 68-72*
   Unit II:*Chapter 1 – Sec 11, 13.1-13.6, pp: 61-67, 73-82*
3. S. Narayananand T.K. Manickavasagam Pillai, "**Ancillary Mathematics, Book II**", 1999 Edition.
Unit III:*Chapter 2 - Sec 1-5, pp: 7-18, Chapter 3 - Sec 1-4, pp: 42-60*

4. M.K.Venkataraman, **"Higher Mathematics for Engineering and Science"**, Third Edition The National Publishing Co., Madras, 1986,
Unit V:*Chapter 6 – Sec 1-14*

Books for Reference

1. S.Narayanan, R.Hanumantha Rao, T.K.Manicavachagom Pillay, "Ancillary Mathematics" Volume-I-2009 Edition.
2. S. Narayanan & T.K. Manichavachagom Pillay, "Differential equation and its applications", S.Viswanathan Pvt. Ltd., 2001 Edition.

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

Semester	Course Code	Title of the Course	Hours	Credits
I	21UPH13AC01	ALLIED: MATHEMATICS FOR PHYSICS-I	6	4

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	3	3	2	2	3	2.3
CO-2	3	2	2	1	2	3	3	3	2	3	2.4
CO-3	2	3	2	2	1	2	3	2	3	2	2.2
CO-4	2	3	2	3	1	2	3	2	2	3	2.3
CO-5	2	2	2	2	1	2	3	2	2	3	2.1
Mean Overall Score											2.26 (High)

Semester	Course Code	Title of the Course	Hours	Credits
I	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	K2
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 (6 Hours)

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 (6 Hours)

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 (6 Hours)

Areas of Development: Physical, Intellectual, Emotional, Social Development, Moral & Spiritual development

Unit-IV Responsible Parenthood (6 Hours)

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 (6 Hours)

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.

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**

(12 மணிநேரம்)

அலகு - *1*

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 பிரபந்தம்- அமலானாதிபிரான் *(10 பாடல்கள்)*
- பெருமாள் திருமொழி *(11 பாடல்கள்)*
கம்பராமாயணம் - கைகேயி சூழ்வினைப்படலம்
உநைடை - *7 முதல் 9 முடிய உள்ள கட்டுரைகள்*

அலகு - *4* ***(12 மணிநேரம்)***

சீறாப்புராணம் - உடும்பு பேசிய படலம்
இலக்கணம் - புறப்பொருள் இலக்கணம்
இலக்கிய வரலாறு - தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள் முடிய

அலகு - 5 **(12 மணிநேரம்)**

திருக்காவலூர்க் கலம்பகம் - சமூக உல்லாசம்
உரைநடை - 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

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

Semester	Course Code			Title of the Course				Hours	Credit
II	21UTA21GL02			General Tamil - II				4	3
Course Outcomes (Cos)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	
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 No.	CO–Statements On successful completion of this course, students will be able to	Cognitive Levels (K –Levels)
CO–1	relate pronominal verbs in expressing one's day today activity.	**K1**
CO–2	compare the different types of articles.	**K2**
CO–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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

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

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, 2^{e}edition,2017
2. Régine Mérieux and Yves Loiseau, *Latitudes A1*, Didier, 2012.
3. Isabelle Fournier, *Talk French*, Goyal Publishers, 2011

Web Resources

1. https://www.frenchtoday.com/blog/french-verb-conjugation/french-reflexive-verbs-list-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				Hours		Credits
II	21UFR21GL02			FRENCH – II				4		3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
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**
CO -4	Analyze the social & political conditions of Devotional period in Hindi Literature	**K4**
CO -5	Justify the human values stressed on the works of the following authors “Premchand, Nirala, etc.”	**K5**

Unit - I **(12 Hours)**

Kafan
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

Unit - V **(12 Hours)**

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	Course Code			Title of the Paper				Hours		Credits
II	21UHI21GL02			HINDI - II				4		3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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											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	remembering names of different objects , remembering different verbal forms and sandhi.	K1
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
2. 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	Course Code		Title of the Course			Hours		Credit			
II	21USA21GL02		SANSKRIT -II			4		2			
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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											2.28
Result											# High

Semester	Course Code	Title of the Course	Hours	Credits
II	**21UEN22GE02**	**GENERAL ENGLISH - II**	**5**	**3**

CO No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	remember the use of suitable punctuation marks in appropriate places	**K1**
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 **(15 Hours)**

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 **(15 Hours)**

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 **(15 Hours)**

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 **(15 Hours)**

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 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 **(15 Hours)**

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.

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			Title of the Course						Hours	Credits
II	21UEN22GE02			GENERAL ENGLISH - II						5	3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
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
II	**21UPH23CC02**	**CORE-2: MECHANICS**	**5**	**3**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on the concepts of mechanics for the application of physics in real life physical problems	**K1**
CO-2	understand the concepts of kinematics and dynamics for solving the problems related to conservation laws and rigid body dynamics	**K2**
CO-3	apply laws of motion and gravitation for understanding the complex problems in physics	**K3**
CO-4	analyze the behavior of nature from the understanding of the various laws and theories of mechanics	**K4**
CO-5	analyze the concepts in the theory of gravitation and cosmology	**K4**

Unit -I: Kinematics and Dynamics (15 Hours)

Formal Solution of Kinematic Equation - Derivative of a vector - Circular Motion of Rotating Vectors - Motion in plane polar coordinates - velocity of a bead on a spoke - Newton's laws - Astronauts in space - Some applications of Newton's laws - Freight train - Constraints - wedge and block - masses and pulley - pulley system - Block on strings - The whirling rope - contact forces - block and string - Dangling rope - pulleys - tension and atomic forces - normal force and friction- block and wedge with friction.

Unit -II: Work and Energy (15 Hours)

Equation of motion in one dimension - Mass thrown upward in gravitational field - solving the equation of motion of simple harmonic oscillator - The work energy theorem in one dimension - Vertical motion in an inverse square field - The work energy theorem - Applying the work energy theorem - The inverted pendulum- work done by a uniform force - work done by a central force - A Path-dependent line integral - Potential energy - Potential energy of a uniform force field - Potential energy of an inverse square field - Potential energy from force - Energy diagrams - Non Conservative forces - The general law of conservation of energy - Power.

Unit -III: Conservation of Linear and Angular Momentum (15 Hours)

Internal forces and momentum conservation - Centre of mass - collision of particles that stick together - Transverse momentum components - Collision of particles with internal excitations - General elastic collision of particles with different masses - Systems with variable mass - satellite in interplanetary dust - space vehicle problem - Force due to a falling chain - Conservation of angular momentum - Torques due to internal forces sum to zero - Torque due to gravity - Angular momentum of the centre of mass - Angular acceleration accompanying contraction - shape of the galaxy.

Unit - IV: Dynamics of Rigid Bodies (15 Hours)

The vector nature of angular velocity and angular momentum - rotations through finite angles - rotations in the XY plane - vector nature of angular velocity. The equation of motion - Angular momentum and kinetic energy - Moments of inertia - Paralleland perpendicular axis theorem - thin ring - uniform thin rod - circular disc - rectangular plate - Rotations about fixed axis -

Rotation about point of contact - energy consideration - acceleration of the center of mass and angular acceleration of the center of mass - Torques about a center of mass - cylinder on an accelerated rough plane.

Unit - V: Inverse Square Law Force **(15 Hours)**

Potential energy and the force between a point mass and a spherical shell - Potential energy between a point mass and a solid sphere - Gravitational and electrostatic self-energy - Gravitational energy of a galaxy - Gravitational energy of a uniform sphere - Radius of the obit of the electron - Inverse square law forces and static equilibrium - orbits: equation and eccentricity - circular orbit - Kepler's laws - Two body problem: Reduced mass - Vibration of a diatomic molecule.

Books for Study

1. Kleppner and Kolenkow, *An introduction to Mechanics*, 1ST Edition, McGraw Hill Education, 2017.
2. Charles Kittel, Walter Knight, Helmholtz, Ruderman and Moyer, *Mechanics*, McGraw Hill Education 2017.

Unit	Chapters	Sections
I	1 2	1.7-1.9 2.2, 2.4
II	1	4.2, 4.3, 4.5-4.9, 4.11
III	2	Ch 6
IV	1 2	7.2 Ch 8
V	2	Ch 9

Books for Reference

1. Robert Resnick, David Halliday, Jearl Walker, *Principles of Physics*, 10th edition, John Wiley, 2015.
2. Richard Philip Feynman, *The Feynman lectures on Physics*, Pearson, 2012.
3. I E Irodov, *Problems in general Physics*, Arihant Publishers, 2016.

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

Semester	**Course Code**			**Title of the Course**				**Hours**		**Credit**
II	**21UPH23CC02**			**CORE-2: MECHANICS**				**5**		**3**
Course Outcomes (COs)	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	2	3	2	1	3	3	3	2	1	2.3
CO-2	3	2	3	2	1	3	3	2	3	1	2.3
CO-3	3	3	2	2	2	3	3	2	1	1	2.2
CO-4	3	3	2	3	1	3	3	3	2	1	2.4
CO-5	3	3	*3*	2	1	3	3	2	2	1	2.3
Mean Overall Score											**2.3 (High)**

Semester	Course Code	Title of the Course	Hours	Credits
II	**21UPH23CP01**	**PHYSICS PRACTICAL – I**	**3**	**2**

Any 20 Experiments

1. Surface Tension – drop weight method.
2. Surface Tension – capillary rise method.
3. Viscosity – constant pressure head method.
4. Viscosity – variable pressure head method.
5. Viscosity – Stoke's method.
6. Young's modulus – cantilever / stretching.
7. Young's modulus – non uniform bending (pin and microscope).
8. Sonometer – frequency of the tuning fork – RD of solid.
9. Sonometer – AC frequency determination.
10. Spectrometer – refractive index - solid prism (glass).
11. Spectrometer – dispersive power - prism.
12. Potentiometer – internal resistance.
13. Potentiometer – low range voltmeter.
14. P.O Box – temperature coefficient.
15. Carey Fosters bridge – R and ρ (rho).
16. Convex lens – f, R and μ.
17. Concave lens – f, R and μ.
18. Field along the axis of a coil – deflection magnetometer.
19. M1/M2- Tan A & Tan B simultaneous method.
20. M1/M2 – Vibration magnetometer.
21. Air wedge-Thickness of wire.
22. Newton's rings.
23. B.G. – Figure of merit.
24. B.G. comparison of EMF's and capacitance.
25. Resonators - Helmholtz and Cylindrical Resonators.
26. g – by fall plate.
27. Specific heat by cooling method.
28. Specific heat capacity of solid by the method of mixture.

Semester	Course Code	Title of the Course	Hours	Credits
II	**21UPH23WS01**	**BASIC WORKSHOP PRACTICE**	**3**	**2**

1. Paper Weight
2. Pen Stand
3. Letter box
4. Wood Carving
5. Electroplating
6. Assembling the Extension board
7. Tube light assembling.
8. LED light assembling.

Semester	Course Code	Title of the Course	Hours	Credits
II	21UPH23AC02	ALLIED: MATHEMATICS FOR PHYSICS-II	6	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
	On successful completion of this course, students will be able to	
CO-1	acquire knowledge of basic concepts of numerical methods, partial differential equations, vector analysis, trigonometry and complex analysis.	K1
CO-2	understand numerical methods, curl and divergence of a vector function, types of PDEs, series expansion , analyticity of a function.	K2
CO-3	apply various methods in solving problems.	K3
CO-4	illustrate with suitable examples.	K4
CO-5	evaluate numerical solutions of ODE by numerical methods , PDEs, line, surface and volume integrals, series expansion, complex integration.	K5

Unit-I: **(18Hours)**

Simultaneous Linear Algebraic Equations - Gauss Elimination Method – Iteration Method: Gauss Seidel Method -Numerical Solution of O.D.E - Solution by Taylor's Methods - Euler's Method –Runge-Kutta Method (4th Order).

Unit -II: **(18 Hours)**

Derivation of partial differential equations - by Elimination of Arbitrary Functions - Different Integrals of partial differential equations - Standard type of First Order Equations - Lagrange's Equation.

Unit -III: **(18 Hours)**

Gradient - Divergence and Curl - Gauss Divergence Theorem - Green Theorem - Stokes Theorem (No proofs of theorem, only simple applications).

Unit -IV: **(18 Hours)**

Expansion of $Sinn\theta$ and $Cosn\theta$ - Powers of Sines and Cosines of θ in terms of function of multiple of θ - Hyperbolic Functions - Inverse Hyperbolic Functions .

Unit -V: **(18Hours)**

Analytic function - Cauchy Riemann equations (No derivation, only simple applications) - Residues - Evaluation of definite integrals (Integral over the unit circle only).

Books for Study:

1. M.K.Venkataraman, *Numerical Methods in Science and Engineering*, The National Publishing Company, 5th Edition, 2013.

UNIT I: *Chapter IV (Sec: 2, 6), Chapter XI (Sec: 6, 10, 16).*

2. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy,*Ancillary Mathematics Vol-II*, 2010 Edition.

UNIT II: *Chapter 6-Sec 1-6, pp: 252-274.*

UNIT III:*Chapter 8 - Sec 1.17-1.20, 6, 8 and 9, pp: 335-350, 381-389, 399-407.*

3. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy,

Ancillary MathematicsVol-I, 2009 Edition.
UNIT IV:*Chapter 5 - Sec 5.1, 5.2 and 5.4, pp: 220-232, 242-256.*
4. S. Narayanan and T.K.Manickavachagom Pillay, *Complex Analysis*, 1997 Edition.
UNIT V:*Chapter 1 - Sec 11, pp : 43-57, Chapter 5 - Sec 1-3, (pp : 185-196).*

Books for Reference:
1. S.Narayanan & T.K. Manichavachagom Pillay, *Differential equations and its applications*, Viswanathan Pvt Ltd 2013.
2. M.K.Venkataraman, *Higher Mathematics for Engineering and Science*, Third Edition, The National Publishing Co., Madras, 1986.

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

Semester	**Course Code**			**Title of the Course**					**Hours**	**Credits**
II	**21UPH23AC02**			**ALLIED: MATHEMATICS FOR PHYSICS-II**					**6**	**4**
Course Outcomes (COs)	**Programme Outcomes (PO)**					**Programme Specific Outcomes (PSO)**					**Mean Scores of COs**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	
CO-1	3	2	3	2	1	3	3	1	2	3	2.3
CO-2	3	3	2	1	2	3	3	2	2	2	2.3
CO-3	3	2	3	1	2	2	3	2	3	2	2.3
CO-4	3	2	3	1	2	3	2	1	2	3	2.2
CO-5	3	3	3	2	2	2	3	1	2	3	2.4
Mean Overall Score											**2.3 (High)**

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	**K3**
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 (6 Hours)

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 (6 Hours)

Food Resources – Land Resources – Forest resources – Mineral Resources – Water Resources – Energy Resources

Unit III Ecosystems, Biodiversity and Conservation (6 Hours)

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 (6 Hours)

Air Pollution – Water Pollution – Oil Pollution – Soil Pollution – Marine Pollution – Noise Pollution - Thermal Pollution – Radiation Pollution

Unit VEnvironmental Organizations and Treatise (6 Hours)

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.

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
II	**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 (6-Hours)
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 (6-Hours)
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 (6-Hours)
Introduction-Classification of Fundamental Rights-Salient Features of Fundamental Rights- and Fundamental Duties.

Unit-IV Human Rights of Women and Children (6-Hours)
Women's Human Rights- Issues related to women's rights - and Rights of Women's and Children

Unit-V Human Rights Violations and Organizations (6-Hours)
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.
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	K 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 - 5 பாடல்கள் - (1, 19, 21, 70, 148)
ஐங்குறுநூறு - அன்னாய் வாழிப்பத்து.
யாப்பிலக்கணம் - வெண்பா, ஆசிரியப்பா

அலகு - 3 **(12 மணிநேரம்)**

கலித்தொகை - (குறிஞ்சிக்கலி- 62, பாலைக்கலி -22, மருதக்கலி- 87, நெய்தற்கலி-149, முல்லைக்கலி - 116)
இலக்கிய வரலாறு - முதற்பாகம் ('தமிழ் மொழியின் தொன்மையும் சிறப்பும்' முதல் 'சங்க தொகை நூல்கள்' முடிய),
புதினம் - குடும்ப அட்டை (2022-2023)

அலகு - 4 **(12 மணிநேரம்)**

பதிற்றுப்பத்து - 3 பாடல்கள் (14, 32, 61)
புறநானூறு - 5 பாடல்கள் (95, 121, 130, 204, 279)
அணியிலக்கணம்

அலகு - 5 **(12 மணிநேரம்)**

திருக்குறள் - புறங்கூறாமை, பழமை, புலவி நுணுக்கம் ஆகிய 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	Course Code			Title of the Course				Hours		Credit
III	21UTA31GL03			General Tamil - III				4		3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	
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	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

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
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, 2^{e}edition,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	Course code			Title of the Course				Hours		Credits
III	21UFR31GL03			FRENCH – III				4		3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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	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 No.	CO–Statements On successful completion of the course, students will be able to	Cognitive Levels (K –Levels)
CO-1	find out the dialects of Hindi language.	K1
CO-2	compare the poems of Sumithra Nandanpanth, Prasad & Bachan in Context with their experience of life.	K2
CO-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.	K5

Unit - I **(12 Hours)**

Tera sneh na khooon
Samband Bodak
Reethikal - Namakarn
Tense

Unit - II **(12 Hours)**

Himadri Thung Sring Se
Paribakshik shabdavali
Samuchaya Bodak
Reethikal - Samajik Paristhithiyam

Unit - III **(12 Hours)**

Insan our Kuthae
Vismayadi Bodak
Reethikal - Sahithyik Paristhithiyam
Reethikal - Salient Features

Unit - IV **(12 Hours)**

Shokgeeth
Avikary shabdh
Reethikal - Main Divisions
Social media and modern world

Unit - V **(12 Hours)**

Reethikal - Visheshathayem
Anuvad – 3
Bahoo ki vidha (one act play)

Books for Study

1. 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	Course Code			Title of the Course					Hours	Credits
III	21UHI31GL03			HINDI - III					4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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.	K3
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 , Bhavishyat Kaalah

Book for Study

VEDIC LITERATURE, 2019

Books for Reference

1. Parameshwara, Ramodantam, LIFCO Chennai 2018
2. 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

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21USA31GL03	SANSKRIT-III	4	3

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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
Result											# High

Semester	Course Code	Title of the Course	Hours	Credits

III	21UEN32GE03	GENERAL ENGLISH - III	5	3

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	On successful completion of this course, students will be able to	
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 **(15 Hours)**

1. Suggestions to Develop Your Reading Habit
2. General Writing Skill: Letter Writing – Informal
3. Grammar: Simple Present Tense

Unit-II **(15 Hours)**

4. The Secret of Success: An Anecdote
5. General Writing Skill: Letter Writing – Formal
6. Grammar: Present Continuous Tense

Unit-III **(15 Hours)**

7. The Impact of Liquor Consumption on the Society
8. General Writing Skill: Letter to Newspaper
9. Grammar: Simple Past Tense

Unit-IV **(15 Hours)**

10. Dr. A.P.J. Abdul Kalam: A Short Biography
11. General Writing Skill: Job Application Letter
12. Grammar: Past Continuous Tense

Unit-V **(15 Hours)**

13. Golden Rule: A Poem
14. General Writing Skill: Circular-Writing
15. Grammar: Simple Future Tense and Future Continuous Tense

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. https://www.waywordradio.org/listen/podcast-itunes/?gclid=EAIaIQobChMIrbeRtbP12AIVCYZpCh0-XwnvEAAYAiAAEgLcjvD_BwE
3. https://eltlearningjourneys.com/2015/05/19/websites-for-learning-english/

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

Semester	Course Code	Title of the Course					Hours	Credits
III	21UEN32GE03	GENERAL ENGLISH - III					5	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
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	21UPH33CC03	CORE-3: MATHEMATICAL PHYSICS –I	4	4

CO No.	CO- STATEMENTS	COGNITIVE LEVELS (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire and understand the knowledge about different mathematical methods like vector and matrix algebra, differential equations, multiple integrals and Fourier series for solving different physics problems.	**K1, K2**
CO-2	solve first order differential equations, and Fourier series to identify the solutions of physics problems like radio carbon dating, harmonic oscillator.	**K3**
CO-3	apply matrices, differential equations, Fourier series, multiple integrals, and vector calculus to obtain the solution for complex physics problems.	**K3**
CO-4	compute vector calculus, multiple integrals for different physics problems and apply the concept of change of variables in different coordinate systems.	**K4**
CO-5	analyse and interpret the solutions obtained by mathematical methods.	**K4**

Unit - I: Matrices **(12 Hours)**

Linear transformation - Vector spaces - Eigen Values and Eigen Vectors - Application of Eigen value problems - stretching of an elastic membrane - Vibrating system of two masses on two springs - Symmetric, Skew symmetric and orthogonal matrices - Diagonalization of matrices - Complex matrices - Hermitian and Skew Hermitian form.

Unit - II: Vector Calculus **(12 Hours)**

Position, Displacement and Separation vectors - Vector Transformation - Derivatives - Gradient - Del operator - Divergence - Curl - Product rule - second derivatives - Line, surface and volume integrals - Fundamental theorems of calculus - Fundamental theorems of gradient, divergence and curl - Integration by parts - Curvilinear coordinates - Spherical polar and cylindrical coordinates - one dimension Dirac delta function.

Unit - III: Differential Equation **(12 Hours)**

First order differential equation - Basic concepts - concept of a solution - Initial value problem - radioactivity: exponential decay - separable ODE - Radio Carbon dating - Mixing problems - Newton's law of cooling - leaking tank (Torricelli's law) - differential operators - Free oscillation - undamped system - undamped motion , Harmonic oscillation - Damped system - forced oscillation resonance - damped and undamped forced oscillation - electrical circuits - solving ODE for current - LCR circuit.

Unit - IV: Multiple Integrals **(12 Hours)**

Double integral - Application - Change of order of the Integral - Change of variables - general change of variables in double integral - Change of variable in Cartesian polar coordinates - triple integral - Application - general change of variables in triple integral - cylindrical and spherical polar coordinates.

Unit -V: Fourier Series **(12 Hours)**

Fourier series - periodic rectangular wave - Function of period p:2L - periodic rectangular wave I and II - Half wave rectifier - Even and Odd function - rectangular pulse - half wave rectifier - sawtooth wave - half range expansion - triangle - Complex Fourier series - Forced oscillation - under non sinusoidal periodic force - Fourier integral.

Books for Study

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th edition, Wiley; 2010.
2. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill, 2006
3. David J. Griffiths, *Introduction to Electrodynamics*, 4th edition, Pearson, 2018.

Unit	Book	Chapters	Sections
I	1	7,8	7.9, 8.1-8.5
II	3	1	1.1.4-1.1.5
III	1	1,2	1.1, 1.3, 2.3, 2.4, 2.8, 2.9
IV	2	7	7.1-7.6
V	1	11	11.1-11.5, 11.7

Books for Reference

1. H.K. Dass, *Mathematical Physics*, S. Chand, New Delhi, 2006.
2. Satya Prakash, *Mathematical Physics*, Sultan Chand, New Delhi, 2008.
3. AK Mukhopadhyay, *Mathematical Methods for Engineers and Physicists*, Wheeler Pub, New Delhi, 1998.

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21UPH33CC03	CORE-3: MATHEMATICAL PHYSICS - I	4	4

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	3	3	2	2	2.6
CO-2	3	3	2	3	2	3	2	3	2	2	2.5
CO-3	3	2	2	3	2	3	3	3	2	2	2.5
CO-4	3	2	2	2	2	2	3	3	2	2	2.3
CO-5	3	3	2	3	2	3	2	3	2	3	2.6
Mean Overall Score											2.5 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UPH33CC04	CORE-4:	4	3

		ELECTROMAGNETISM		

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO 1	acquire and describe the knowledge on basic electrostatics, magnetostatics and electrodynamics laws.	**K1**
CO 2	understand the behaviour of electric fields, electromagnetic fields and electromagnetic wave propagation in matter.	**K2**
CO 3	understand the basic knowledge of the static and time varying electromagnetic field as determined by Maxwell's equations.	**K2**
CO 4	apply the principles of Coulomb's Law, Gauss's law, Biot-Savart's law, Ampere's law and Faraday's laws in various systems.	**K3**
CO 5	analyse electric field, electric potential, electric flux, and magnetic field in different symmetry systems.	**K4**

Unit - I: Electrostatics (12 Hours)

Coulombs law - electric field - charge distribution - Flux - Gauss's law: applications of Gauss's law in spherical - Cylindrical and Planar symmetry - Electric potential: potential of a localized charge distribution - Potential for a uniformly charged spherical shell and solid sphere - Energy of point charge distribution and continuous charge distribution - Electric field and charge density: inside and on the surface of a conductor - Surface charge and force on a conductor - Capacitor: capacitance of an isolated spherical conductor and parallel plate capacitor.

Unit - II: Electric Field in Matter (12 Hours)

Dielectrics - induced dipoles - polarisation - electric potential and field due to dipole - force and torque on dipole - bound charged field inside the dielectric - Gauss's law in dielectrics - linear dielectrics: Susceptibility - Permittivity and dielectric constant - Energy in capacitor (parallel plate, spherical and cylindrical) filled with dielectric.

Unit - III: Magnetostatics (12 Hours)

Lorentz force law - Force on a moving point charge - Biot-Savart's law - Application of Biot - Savart's law: determination of magnetic field on a straight wire - circular coil - Force between two straight current carrying wires - divergence and curl of magnetic field - magnetic vector potential - Ampere's law - applications of Ampere's law in: an infinite straight wire - an infinite planar surface current and Solenoid.

Unit - IV: Magnetostatic Fields in Matter (12 Hours)

Magnetisation - diamagnets - paramagnets and ferromagnets - torque and force on a magnetic dipole - effect if a magnetic field on atomic orbits - field of a magnetised object - bound currents and its physical interpretation - magnetic field inside matter - auxiliary field H-Ampere's law in magnetised materials - boundary conditions - linear and non-linear media - magnetic susceptibility and permeability - ferromagnetism.

Unit - V: Electrodynamics (12 Hours)

Electro motive force - Faraday's laws of electromagnetic induction - Lenz's law - induced electric field - self-inductance and mutual inductance - energy stored in magnetic field - electrodynamics before Maxwell - modified Ampere's law - Maxwell's equations - magnetic charge - Maxwell's equations inside the matter - boundary conditions.

Book for Study

1. D.J. Griffiths, *Introduction to Electrodynamics*, 4th Edition, PHI Learning, New Delhi, 2012.

Unit	Book	Chapters	Sections
I	1	2	2.1, 2.2, 2.3, 2.4, 2.5
II	1	4	4.1, 4.2, 4.3, 4.4, 4.5
III	1	5	5.1, 5.2, 5.3, 5.4
IV	1	6	6.1, 6.2, 6.3, 6.4
V	1	7	7.1, 7.2, 7.3

Books for Reference

1. Edward M. Purcell and David J. Morin, *Electricity and Magnetism*, 3rd Edition, Cambridge University Press, 2013.
2. J. Walker, D. Halliday, R. Resnick, Wiley, *Fundamentals of Physics*, 10th Edition, United states of America, 2007.

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21UPH33CC04	CORE-4: ELECTROMAGNETISM	4	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	3	2	3	3	3	2	2	2.5
CO-2	3	2	2	2	2	2	3	2	3	2	2.3
CO-3	3	3	3	3	2	3	3	3	1	2	2.6
CO-4	3	2	2	3	2	3	3	2	1	2	2.3
CO-5	3	2	2	2	2	3	3	2	1	2	2.2
Mean Overall Score											2.38 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UPH33AO03A	ALLIED OPTIONAL:	4	2

		CHEMISTRY–I		

CO No.	CO – Statements	Cognitive Level (K–Level)
	On successful completion of this course, students will be able to	
CO–1	explain the reactions of alkanes and alkenes and to apply them in new substrates.	**K1**
CO–2	summarize principles of photochemistry and photophysics.	**K2**
CO–3	understand the concepts of hybridization and isomerism in organic molecules.	**K2**
CO–4	solve the problems on reaction rates using principles of chemical kinetics.	**K3**
CO–5	examine the structures of various inorganic compounds.	**K4**

Unit –I: Hydrocarbons and Isomerism (12 Hours)

Nomenclature of simple hydrocarbons – covalent bond– bond length, bond angle, dipole moment, inductive effect, mesomeric effect and hyperconjugation effect. Hybridization – sp^3, sp^2, sp (examples: acetylene, ethylene and methane). Intermolecular forces–hydrogen bonding. Isomerism – geometrical and optical isomerism, asymmetry, (R, S notation not necessary). Reactive intermediates – carbocation, carbanion and carbon free radicals (generation, structure and stability).

Unit – II: Alkanes and Alkenes (12 Hours)

Methods of preparation of alkanes (Wurtz method, Kolbe's method, using Grignard reagent, using HI/P), chemical properties of alkanes – substitution reaction only (example: only halogenation of alkanes with free radical mechanism), conformation analysis of ethane, n–butane and cyclohexane. Methods of preparations of alkenes (Kolbe's method, Hoffman degradation, using Lindlar's catalyst, Birch reduction of alkynes, dehydration of alcohols, dehydrohalogenation of alkyl halides), chemical properties of alkenes – electrophilic addition mechanism (example: only mechanisms of bromination of alkenes, hydrohalogenation of alkenes, hydration of alkenes and addition of diborane to alkenes)

Unit – III: Bonding and Structure in Inorganic Compounds (12 Hours)

Bonding – ionic, covalent, metallic and non–covalent interactions – ionic bonding– lattice energy, Born Haber's cycle, factors influencing lattice energy – covalent bonding– Lewis theory and its limitations, VSEPR theory– deducing hybridization and predicting structure of some basic inorganic compounds (BF_3, NH_3, H_2O, PCl_5, Bent's Rule–PCl_3F_2, ClF_3, SF_4, I_3^-, SF_6, IF_7).

Unit – IV: Elements of Analytical Techniques (12 Hours)

Data in chemical analysis- The mean and the median, precision and accuracy. Types of errors in chemical analysis- determinate errors and its types and indeterminate error.

Chromatographic separations, classification of chromatographic methods, chromatogram, principles of TLC and HPLC and instrumentation of HPLC.

Unit – V: Photochemistry (12 Hours)

Difference between photochemical reactions and dark reactions. Laws of photochemistry – Beer – Lambert's Law – derivation and applications. Einstein law of photochemical equivalence – quantum yield – kinetics of hydrogen–chlorine reaction, hydrogen–bromine reaction and decomposition of HI. Photophysical processes– Jablonski diagram, chemi–luminescence.

Books for Study

1. Morrison R T, Boyd R N and Bhattacharjee S K, *Organic Chemistry*, 7th Edition, Pearson, New Delhi, 2010.
   Unit-I *Chapter 1*
   Unit-II *Chapter 3 and Chapter 8*
2. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Wiley–India, New Delhi, 2010.
   Unit-III *Chapter 4*
3. Skoog D A, WestD M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole, Cengage Learning, Delmont, CA, USA, 2014.
   Unit-IV *Chapter 5, Chapter 31E and 33*

Books for Reference

1. Atkins P W, *Physical Chemistry*, 7th Edition, Oxford University Press, London, 2009.
2. Finar I L, *Organic Chemistry*, Vol 1and2, 6th Edition, England, Addison Wesley Longman Ltd., 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.
5. Huheey J E, Keiter E A, Keiter R L and Medhi O K, *Inorganic Chemistry: Principles of Structure and Reactivity*, 4th Edition, Pearson Education, New Delhi, 2006.

Web Resources

1. https://opentextbc.ca/chemistry/chapter/20-1-hydrocarbons/
2. https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch105-consumer chemistry/
3. http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch8/vsepr.html
4. https://www.edinst.com/blog/jablonski-diagram/
5. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Book%3A_Physical_Chemistry_(Fleming)/11%3A_Chemical_Kinetics_I

Hydrocarbons

Organic Chemistry

VSPER Theory

Jablonski– Diagram

Chemical Kinetics

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

Semester	Course code	Title of the Course	Hours	Credits
III	21UPH33AO03A	ALLIED OPTIONAL: CHEMISTRY–I	4	2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO–1	2	3	2	3	1	2	2	3	1	3	2.2
CO–2	1	3	2	2	2	2	2	2	2	1	1.9
CO–3	2	1	2	2	2	2	3	1	3	2	2.0
CO–4	1	3	1	3	1	2	3	1	2	3	2.0
CO–5	2	2	1	2	1	2	3	3	3	2	2.1
Mean overall Score											2.04 (Medium)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UPH33AO03B	Allied: Computer Science-I	4	3

		(INTERNET AND DATABASE CONCEPTS)		

CO No.	**CO-Statements**	**Cognitive Levels (K- Levels)**
	On successful completion of this course, students will be able to	
CO-1	define and understand the Internet concepts and Protocols.	**K1**
CO-2	understand and classify the basic knowledge of HTML.	**K2**
CO-3	apply the knowledge of HTML tags in web related applications.	**K3**
CO-4	analyze the basic concepts of database &	**K4**
CO-5	examine and analyze the skills of queries using SQL.	**K4**

UNIT- I **(12 Hours)**

Introduction to the Internet: Computers in Business – Networking – Internet – Email – Resource Sharing – WWW – Protocols.

UNIT - II **(12 Hours)**

Introduction to HTML: Designing a home page – HTML document – Anchor tag - Hyperlinks – Head and Body sections – Header section – Title – Prologue – links – colourful pages – comments – body section – heading – Horizontal ruler – paragraph – tabs.

UNIT – III **(12 Hours)**

Images and pictures - Lists and their types – nested lists – table handling. Forms and form elements.

UNIT - IV **(12 Hours)**

Database System Applications – Database Systems versus File Systems – View of Data – Data Models – Database Languages – Database Users and Administrators – Transaction Management – Database System Structure – Application Architectures.

UNIT - V **(12 Hours)**

SQL Statements: Data Retrieval: SELECT, Data Definition Languages: Create, Alter, Drop, Rename, and Truncate, Data Manipulation Language: Insert – Update, Delete – Merge. Transactional Control: Commit, Rollback and Data Control Language: Grant, Revoke, Select Order By – Select Group By.

Books for study

1. C. Xavier, "*World Wide Web Design with HTML*", Tata McGraw Hill, New Delhi 2000. Unit 1-3
2. Henry F. Korth Abraham Silberschatz, *"Database System Concepts"*, McGraw Hill, New Delhi, Fourth Edition, 2002.

Books for reference

1. Wendy Willard, "*Web Design – A beginners Guide*", Tata McGraw Hill Education, New Delhi, 2009
2. Thomas A. Powell, "The Complete Reference Web Design", Tata McGraw Hill, New Delhi.
3. C.J. Date, *"An Introduction to Database System",* Pearson Education, New Delhi, Seventh Edition, 2002.

Semester	Course Code	Title of the Course	Hours	Credit
III	21UPH33AO03B	Allied: Computer Science-I (INTERNET AND DATABASE CONCEPTS)	4	3

Course Outcomes↓	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	
CO-1	3	2	2	2	2	3	3	2	2	3	2.4
CO-2	2	3	2	2	2	3	3	2	2	3	2.4
CO-3	2	2	3	2	3	2	3	3	3	2	2.5
CO-4	2	2	2	3	2	2	3	2	3	3	2.4
CO-5	1	2	2	2	3	2	3	2	2	3	2.2
Mean Overall Score											2.38 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	**21UPH34SE01A**	**SEC-1 (WD): SOLAR POWER SYSTEM INSTALLATION AND MAINTENANCE**	**2**	**1**

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge about basics of electricity, PV system and its installation.	**K1**
CO-2	understand and realise the need of solar power and its conversion.	**K2**
CO-3	identify and implement the PV installation technique for suitable places and analyze the different installation techniques, categorize the work ethics and work place safety.	**K3, K4**
CO-4	evaluate the efficiency of PV system, know the need of its improvement and recommend the techniques to install the PV system.	**K5**
CO-5	design and construct the solar PV system to power a house.	**K6**

Unit -I: Basics of Electricity, Solar Energy and Components of a PV System (6 Hours)
Basics of Electricity and Power Generation System - Renewable Energy and Solar Energy System - Solar Cells - Photovoltaic Solar Panels - Electrical Power System - Solar PV Modules - PV Panel components

Unit - II: Solar Panel Installation Skill (6 Hours)
Responsibilities of a Solar Panel Installation Technician - Prerequisites for Solar Panel Installation - Site Analysis - Installation and Maintenance of Solar Panel - Work Ethics - Workplace Safety - Soft Skills - Assessing site conditions - installation requirement - quality of material and handling - tools used

Unit - III: Solar PV System Design and Installation (6 Hours)
PV Circuit Fundamentals - Sample System Designs - Power and PV Panel calculation - One-Line Electrical Diagrams - Mechanical Installation: Rooftop - Mechanical Installation: Ground-Mount

Unit - IV: Electrical Installation (6 Hours)
Batteries in a PV System - Study of Charge Controllers - Study of Inverters - Mounting Structures - Tracking mechanisms - Off-Grid System Installation - On Grid System Installation

Unit - V: Commissioning, Testing and Trouble Shooting (6 Hours)

Troubleshooting of different PV system - Commissioning and Testing of Solar Power Plant - O & M of Solar Power Plant - Grid Integration and System - Jawaharlal Nehru National Solar Mission - MNRE guidelines - DPR preparation for power plants - Visit to a solar power plant

Book for Study

Text Prepared by the Department.

Books for Reference

1. Joseph Burdick and Philip Schmidt, *Install your own solar panels designing and installation*, eBook version 1.0, 2017.
2. Mike Sullivan, *Solar Rooftop DIY*, The Countryman Press, 2016.

Web Reference*

1. https://www.greenmatch.co.uk/blog/2014/09/solar-panel-installation-and-maintenance
2. https://solar-to-the-people.com/solar-installation-solar-maintenance/
3. https://merculexenergy.com/design-installation-and-maintenance-of-solar-pv-systems/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21UPH34SE01A	SEC–1 (WD): SOLAR POWER SYSTEM INSTALLATION AND MAINTENANCE	2	1

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	3	1	2	3	2.4
CO-2	3	2	2	2	3	3	2	2	2	3	2.4
CO-3	3	3	3	2	2	3	3	3	2	2	2.6
CO-4	3	2	2	3	3	3	2	2	3	3	2.6
CO-5	3	3	2	2	3	3	3	2	2	3	2.6
Mean Overall Score											2.52 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UPH34SE01B	SEC - 1 (WD): TECHNIQUES OF PROBLEM SOLVING IN PHYSICS	2	1

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on physics concepts in mechanics, properties of mater, electricity and magnetism, optics, sound and modern physics and all related problems.	K1
CO-2	understand the different physics concepts and related problems by gaining the knowledge.	K2
CO-3	use physics principles to solve the simple physics problems.	K3
CO-4	apply the modern physics concepts to solve simple physics problems.	K3
CO-5	identify the physics formulae and method of solving the physics problems and interpret it.	K4

Unit–I: Mechanics (6 Hours)

Newton's Laws of Motion: Everyday phenomena - examples - problems with Newton's first and second laws of motion - Newton's third law - effect of Newton's third law on the motion of an object - identifying the third law pair to a force.

Kinematics: Definition of position - distance - displacement - speed - velocity and acceleration - difference between instantaneous and average quantities - unit conversions using dimensional analysis.

Gravitation: Problems with Newton's Universal Law of Gravitation - problems with gravitational field strength - Difference between mass and weight - conversion of mass and weight and vice versa.

Unit– II: Properties of Matter (6 Hours)

Definitions and Units: work - mechanical energy - kinetic energy - gravitational potential energy - joule in basic SI units - application of the concept of conservation of energy to solve problems - Determination of an appropriate height in the system to label as zero and understand that this choice is arbitrary - application of the work - kinetic energy theorem to solve problems.

Unit – III: Electricity and Magnetism (6 Hours)

The electric field - Coulomb's law - Gauss's law - Potential of the electric field - Calculation of the electric field intensity from the potential - Capacitors and dielectrics - Electric current and resistance - Kirchhoff's rules for solving DC circuits - Magnetic field - Hall effect - Laws: Biot-Savart, Ampere and Faraday - Inductance and self-inductance - Magnetic properties of matter.

Unit - IV: Sound and Optics (6 Hours)

Oscillations (spring-mass system, pendulums) - Waves and wave characteristics and phenomena: velocity, frequency, wavelength, amplitude, Sound: Pitch, intensity, decibels, power, beats, interference, Doppler effect - Application of sound to musical instruments - Optics: Mirrors,

lenses, ray diagrams, EM spectrum, refraction, Snell's law - Application of optics to optical instruments and telescopes

Unit - V: Modern Physics **(6 Hours)**

Quantum theory of light and the particle nature of matter - basics of quantum mechanics: wave functions and Schrödinger equation, nuclear reactions and nuclear processes - molecular structure - basic laws of statistical physics for classical and quantum particles - application of quantum mechanical concepts in solid state physics.

Book for Study

Text Prepared by the Department

Book for Reference

1. Walter Benenson John W. Harris and Holger Lutz, *Handbook of Physics,* Springer, 2002.

Web Reference*

1. http://www.csun.edu/science/courses/525/old_files/thinking/probsolv_physics.htm
2. https://phys.libretexts.org/Bookshelves/University_Physics/Book%3A_University_Physics_(OpenStax)/Book%3A_University_Physics_I_-_Mechanics_Sound_Oscillations_and_Waves_(OpenStax)/01%3A_Units_and_Measurement/1.08%3A_Solving_Problems_in_Physics
3. https://phys.libretexts.org/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
III	21UPH34SE01B	SEC - 1 (WD): TECHNIQUES OF PROBLEM SOLVING IN PHYSICS	2	1

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	2	2	2	2	3	2.3
CO-2	2	3	2	2	2	3	2	3	2	2	2.3
CO-3	3	3	3	2	2	2	3	2	2	2	2.4
CO-4	3	3	2	2	2	2	2	3	2	2	2.3
CO-5	3	3	2	2	2	3	2	2	2	2	2.3
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UHE24VE03A	PROFESSIONAL ETHICS–I: SOCIAL ETHICS - I	2	1

CO. No.	Co- Statements	Cognitive Levels (K-Levels)
	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.	K3
CO-4	analyse the various kinds of political systems.	K4
CO-5	analyse the behaviour of the elected representatives.	K4

Unit-I Introduction to Social Ethics (6-Hours)

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 (6-Hours)

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 (6-Hours)

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 (6-Hours)

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 (6-Hours)

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

Book for Study

Department of Human Excellence, *Formation of Youth*, St Joseph's College(Autonomous), Tiruchirappali -02, 2021

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	Course Code	Title of the Course	Hours	Credits
III	**21UHE34VE03B**	**PROFESSIONAL ETHICS I: RELIGIOUS DOCTRINE- I**	**2**	**1**

CO.No.	Co – Statements	Cognitive Levels (K-Levels)
	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)**

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
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.	K 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

பதார்த்த 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

அலகு - 3 **(12 மணிநேரம்)**

திருக்குறள் *(2 அதிகாரங்கள்)*

வான் சிறப்பு, மருந்து

வலைப்பூக்கள் உருவாக்கல், பராமரித்தல்

புதிய அறிவியல் கலைச்சொல்லாக்கங்களை உருவாக்குதல்

உரைநடைக்கட்டுரை: தமிழ் இலக்கியங்களில் நீர் மேலாண்மையியல்

அலகு- 4 **(12 மணிநேரம்)**

புதினம்: சொர்க்கத்தீவு – சுஜாதா

நூல் - திறனாய்வு

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 நூல்கள்

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*
2. நெடுஞ்செழியன், **இன்னும் மீதமிருக்கிறது நம்பிக்கை,** பூவுலகின் நண்பர்கள் 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.*

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

Semester	Course Code			Title of the Course				Hours		Credit
IV	21UTA41GL04B			Scientific Tamil (SBS, SPS,SCS)				4		3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	
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	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

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 **(12 hours)**

TITRE:FAIRE SES ETUDES A L'ETRANGER/ BON VOYAGE/ LA METEO
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, 2^{e}edition,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			Title of the Course				Hours		Credits
IV	21UFR41GL04			FRENCH – IV				4		3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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
CO–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.	K3
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

Unit - I **(12 Hours)**

Computer ka yug
Prathyay
Adhunik Kal - Namakarn
Namakaran

Unit - II **(12 Hours)**

Vigyan hani/labh
Paryayvachy Shabdh
Adhunik Kal - Samajik Paristhithiyam
Samanarthy Shabdh

Unit - III **(12 Hours)**

Nari shiksha
Upasarg
Adhunik Kal – Sahithyik Paristhithiyam
Adhunik kal – Salient Features

Unit - IV **(12 Hours)**

Review- Book/Film
Paryavaran Pradookshan
Adhunik Kal - Main Divisions
Adhunik Kal - Visheshathayem

Unit - V **(12 Hours)**

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	Course Code			Title of the Course					Hours	Credits
IV	21UHI41GL04			HINDI - IV					4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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											2.44 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21USA41GL04	SANSKRIT - IV	4	3

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	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.	K3
CO-4	create new conversational sentences and to Improve self-character (Personality Development).	K4
CO-5	appreciate ancient Sanskrit dramas.	K5

Unit - I **(12 Hours)**

Samskrita Vyavahara sahasri vakiya Prayogaha

Unit - II **(12 Hours)**

Lot Lakaarah , Prqayaogh Kartari Vaakyaani

Unit - III **(12 Hours)**

Naatakasya Itihaasah Vivaranam, Thuva and Tum Prathiyaha

Unit - IV **(12 Hours)**

Karnabhaaram , Naatakasya Visistyam

Unit - V **(12 Hours)**

Samskrita Rachanani priyogaha

Book for Study

Karnabhavam & Literature Language, 2019 , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007

Books for Reference

1. R.S.Vadhyar & Sons , Book – sellers and publishers , Kalpathu ,Palghat – 678003 , Kerala , south India , History of Sanskrit Literature 2019
2. Kulapathy , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007 2018
3. Samskrita Bharathi , Aksharam 8 th cross , 2nd phase Giri nagar Bangalore Vadatu sanskritam – Samaskara Binduhu 2019

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

Semester	Course Code			Title of the Course				Hours		Credit
IV	21USA41GL04			SANSKRIT-IV				4		3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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											# High

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UEN42GE04	GENERAL ENGLISH - IV	5	3

CO No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
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	K3
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

Unit-I **(15 Hours)**

1. Women through the Eyes of Media
2. General Writing Skill: Writing Minutes of a Meeting
3. Grammar: Present Perfect Tense

Unit-II **(15 Hours)**

4. Effects of Tobacco Smoking
5. General Writing Skill: Note-Taking
6. Grammar: Present Perfect Continuous Tense

Unit-III **(15 Hours)**

7. Short Message Service (SMS)
8. General Writing Skill: Note-Making
9. Grammar: Past Perfect Tense

Unit-IV **(15 Hours)**

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 **(15 Hours)**

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. https://blog.lingoda.com/en/10-news-sites-to-practice-your-english-reading-skills/
2. https://www.espressoenglish.net/how-to-learn-english-for-free-50-websites-for-free-english-lessons/
3. https://www.ef.com/wwen/english-resources/

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

Semester	Course Code			Title of the Course					Hours	Credits
IV	21UEN42GE04			GENERAL ENGLISH - IV					5	3
Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
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
IV	21UPH43CC05	CORE-5: MATHEMATICAL PHYSICS - II	4	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	gain knowledge on the mathematical methods in complex analysis, numerical methods, transformation methods and error analysis to understand the problems in physics.	K1, K2
CO-2	apply the knowledge gained in computational and numerical methods to solve problems in physics.	K3
CO-3	compute problems in physics by various theoretical models.	K4
CO-4	analyse complex problems in physics based on the special functions and find the solution for higher order differential equation by understanding Laguerre and Hermite polynomials.	K4
CO-5	elaborate the Numerical methods to produce precise and accurate results for physics problems.	K4

Unit-I: Errors, Approximations and Extremum of Functions

(12 Hours)

Introduction to errors - classifications - accuracy of a function methods - errors in laboratory instruments and methods - utility of errors. Approximation and applications. Maxima and minima: Geometrical interpretation and physical application - two and more independent variables - Lagrangian multiplier.

Unit -II: Special Functions **(12 Hours)**

Definitions - simple properties of Gamma, Beta, Delta and Error functions - series solutions of differential equations: Laguerre and Hermite - functions and polynomial - Orthogonality properties.

Unit -III: Laplace Transforms and its Applications **(12 Hours)**

Definition - transform rules: Addition, scaling, derivatives, integrals, differentiation, integration of transforms, shift of the time function, shift of the transform function, periodic function - Inverse Laplace transforms - denominator containing: distinct linear factors, repeated linear factors and quadratic factors – Applications

Unit -IV: Complex Analysis **(12 Hours)**

Cauchy - Riemann conditions - Cauchy's integral theorem - applications to multiply connected region - Cauchy's II integral theorem - derivatives of analytic Complex function - Singular points and their classification - Laurent series - Cauchy's residue theorem

Unit -V: Numerical Methods **(12 Hours)**

Transcendental Equation - Solving by Graphical Method - Newton Raphson method - Numerical Integration - Trapezoidal and Simpson's 1/3 rule Numerical Method of solving differential equation - Euler's Method – Runge Kutta IV order method - applications.

Books for Study

1. Study material prepared by the department
2. AK Mukhopadhyay, *Mathematical Methods for Engineers and Physicists*, Wheeler Pub, New Delhi, 1998.
3. M.K Venkatraman, *Numerical Method for Science and Engineering*, National publishing company Madras, (year)

Unit	Book	Chapters	Sections
I	1	1	Chapter – 1
II	1	4	Chapter – 4
III	1	3	Chapter – 3
IV	2	11	11.25, 11.5, 11.6, 11.10-11.15
V	3	3	1, 2, 5
		9	7, 8, 10
		11	10, 11, 12, 13

Books for Reference

1. H.K. Dass, *Mathematical Physics*, S. Chand, New Delhi, 2006.
2. Satya Prakash, *Mathematical Physics*, Sultan Chand, New Delhi, 2008.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th edition, Wiley;2010.

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UPH43CC05	CORE-5: MATHEMATICAL PHYSICS - II	4	4

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	3	3	2	2	2.6
CO-2	3	3	2	3	2	3	3	3	2	2	2.6
CO-3	3	3	2	3	2	3	3	3	2	2	2.6
CO-4	3	3	2	3	2	3	3	3	2	2	2.6
CO-5	3	3	2	3	2	3	3	3	2	3	2.7
Mean Overall Score											2.4 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH43CC06	CORE-6: THERMAL PHYSICS	4	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of thermodynamic laws and its applications, thermal properties of solids and its behavior.	K1
CO-2	understand the concepts of thermodynamic potentials, thermo dynamical behavior and different phase transitions.	K2
CO-3	compare thermodynamic laws and its applications, thermal properties of solids based on its applications.	K3
CO-4	analyze the thermodynamical laws, phase transition and thermo dynamical behavior of real gases.	K4
CO-5	categorize the thermo dynamical laws and their applications, thermal properties of solids and its behavior and advancement of thermodynamics.	K4

Unit- I: Law of Thermodynamics (12 Hours)

Macroscopic point of view - Microscopic point of view - Scope of thermodynamics - Thermal equilibrium and the zeroth law – Thermocouple - Thermodynamic equilibrium - work and heat - adiabatic work - Mathematical formulation of the first law - Differential form of the first law - Heat conduction - Heat convection - Thermal radiation - Black body - Kirchhoff's law; Radiated heat - Conversion of work into heat and vice versa - Heat engine - Kelvin Planck statement of the second law – Refrigerator - Clausius's statement of the second law - Equivalence of the Kelvin Planck's and Clausius's statements - Reversibility and irreversibility.

Unit- II: Thermodynamic Potentials and Phase Transitions (12 Hours)

Enthalpy - Helmholtz function and Gibbs function - two mathematical functions - Maxwell's relations - TdS Equations - Internal energy equations - Heat capacity equations - Latent heat - Chemical potential and phase changes - The Clausius - Clapeyron equation - Stability &metastability - The Gibbs phase rule - Colligative properties - Classification of phase transitions.

Unit- III: Thermal Properties of Solids (12 Hours)

Statistical mechanics of a Nonmetallic crystal - Frequency spectrum of crystals - thermal properties of non metals - thermal properties of metal - critical state - critical point exponents of a hydrostatic system - critical point exponents of a magnetic system - higher order phase transitions - Lambda transition in ^{4}He - Liquid and solid Helium.

Unit - IV: Thermodynamical Behaviour of Real Gases (12 Hours)

Relativistic dispersion relation for massive particles - ultra relativistic gas - Adiabatic expansion of an ultra relativistic gas - van der Waals gas - Dieterici equation - Virial expansion - The law of corresponding states - The Joule expansion - Isothermal expansion - Joule-Kelvin expansion - Liquefaction of gases - The non-interacting quantum fluid - The Fermi gas - The Bose gas - Bose–Einstein condensation.

Unit-V: Advanced Thermodynamics **(12 Hours)**

Entropy – change in entropy during reversible and irreversible process – entropy and second law of thermodynamics. **Sound waves:** Sound waves under isothermal conditions - Sound waves under adiabatic conditions - Are sound waves in general adiabatic or isothermal - Derivation of the speed of sound within fluids. **Shock waves:** The Mach number - Structure of shock waves - Shock conservation laws - The Rankine-Hugoniot conditions.

Books for Study

1. M.W. Zemansky, Richard Dittman, *Heat and Thermodynamics*, McGraw-Hill, 1981
2. S.J. Blundell and K.M. Blundell, *Concepts in Thermal Physics*, 2nd Edition, Oxford University Press, 2012.

Unit	Book	Chapters	Sections
I	1	1	1.1, 1.2, 1.4, 1.5, 1.15,
		2	2.1
		4	4.1, 4.2, 4.4, 4.6, 4.11, 4.12, 4.13, 4.14,
		6	6.1, 6.6, 6.7, 6.8, 6.9
II	1	10	10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8
	2	28	28.1, 28.2, 28.3, 28.4, 28.5, 28.6, 28.7
III	1	13	13.1, 13.2, 13.3, 13.4,
		14	14.1, 14.2, 14.3, 14.4, 4.5, 14.6
IV	2	25	25.1, 25.2, 25.3, 26.1,
		26	26.2, 26.3, 26.4,
		27	27.1, 27.2, 27.3, 27.4,
		30	30.1, 30.2, 30.3, 30.4
V	2	31	31.1, 31.2, 31.3, 31.4,
		32	32.1, 32.2, 32.3, 32.4

Books for Reference

1. Meghnad Saha, and B.N. Srivastava, *A Treatise on Heat*, Indian Press, 1958.
2. Carl S. Helrich, *Modern Thermodynamics with Statistical Mechanics*, Springer, 2009.
3. Sears and Salinger, *Thermodynamics, Kinetic Theory & Statistical Thermodynamics*, Narosa, 1988.
4. S. Garg, R. Bansal and Ghosh, *Thermal Physics*, 2nd Edition, Tata McGraw-Hill, 1993.
5. D.S. Mathur, *Heat and Thermodynamics*, Fifth Edition, Sultan Chand & Sons Educational publishers, New Delhi.

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

Semester	Course Code			Title of the Course				Hours	Credit	
IV	21UPH43CC06			CORE-6: THERMAL PHYSICS				4	3	
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	3	2	3	2	1	2.3
CO-2	3	3	2	2	3	3	2	2	2	1	2.3
CO-3	3	2	2	3	3	2	3	3	2	1	2.4
CO-4	3	2	2	3	3	2	2	3	2	1	2.3
CO-5	3	3	2	2	3	2	2	3	2	1	2.3
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH43CP02	PHYSICS PRACTICAL – II	3	2

Any 16 Experiments

1. Jolly's bulb - pressure coefficient
2. Thermal conductivity – Lee's disc.
3. Thermal Conductivity – Forbes' method.
4. y, n, ó – Searles method.
5. n and M.I – Torsional pendulum.
6. Compound pendulum.
7. Kater's pendulum
8. Kundt's tube.
9. Frequency – Melde's apparatus.
10. Young's modulus – uniform bending - scale and telescope method.
11. Young's modulus – Koenig's method.
12. Rigidity modulus - static method.
13. Rankine's method.
14. Spectrometer – i-d curve.
15. Spectrometer – i-i' curve.
16. Field along the axis of a coil – Vibration magnetometer.
17. Potentiometer – Ammeter calibration.
18. Resistance by Potentiometer – R and ρ.
19. B.G. – comparison of mutual inductance.
20. B.G. – Resistance and figure of merit (condenser method).
21. Absolute determination of M and H.
22. Junction diode and Zener diode characteristics.
23. Study of basic and universal logic gates (IC's).

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH43AO04A	ALLIED OPTIONAL: CHEMISTRY–II	4	3

CO No.	CO–Statements	Cognitive Levels (K –level)
	On successful completion of this course, students will be able to	
CO–1	list out the different types of carbohydrates, amino acids and proteins.	K1
CO–2	explain the concepts in coordination chemistry and apply them to infer the properties of complexes.	K2
CO–3	outline the principles and applications of electrochemistry.	K2
CO–4	illustrate phase rule and relate the applications of adsorption.	K3
CO–5	classify silicates and understand their industrial applications.	K4

Unit–I: Carbohydrates, Amino Acids, Proteins (12 Hours)

Synthesis of carbohydrates – photosynthesis–classification of carbohydrates (based on hydrolysis and reducing nature)–structure of (+)–Glucose, (–)–Fructose– epimers– mutarotation– conversion of glucose to fructose. Amino acids – classification (based on acidic and basic groups)–essential and non–essential amino acids–preparations (Gabriel synthesis, Strecker synthesis and Koop synthesis)–zwitter ion formation– isoelectric point and its importance in the separation of amino acids– chemical properties (reactions involving both amine group and carboxyl group) of glycine and alanine only. Proteins – peptide linkage – primary, secondary and tertiary structure of proteins.

Unit–II: Coordination Chemistry (12 Hours)

Coordination compounds– Werner's theory– central metal atom– types of ligands – nomenclature and isomerism of coordination compounds– effective atomic number– VBT – prediction of structure and calculation of spin only magnetic moment–crystal field theory of octahedral, tetrahedral and square planar complexes– effects of crystal field splitting– chelates– important biological complexes– haemoglobin, chlorophyll, cis–platin (representative structure and functions).

Unit–III: Silicates and Group 18 Elements (12 Hours)

Silicates–principles of silicate structures– classification–silicates in technology–silicones.

Group 18– Noble gas– physical properties– special properties of helium–clathrates– structure and bonding in xenon compounds (XeF_2, XeF_4 and XeF_6).

Unit–IV: Phase Rule and Adsorption (12 Hours)

Phases– components– degree of freedom– derivation of Gibbs phase rule– phase diagram of H_2O, CO_2, S and Pb–Ag systems. Adsorption – Langmuir and Frendluich adsorption isotherms– applications of adsorption.

Principles of TLC and column chromatography.

Unit–V: Electrochemistry (12 Hours)

Difference between Galvanic cell and electrolytic cell– types of electrodes – metal – metal ion electrode– Gas electrode (hydrogen electrode)– metal – insoluble metal salt electrodes (calomel electrode)– oxidation – reduction electrode (quinhydrone electrode)– single

electrode potential, oxidation potential and reduction potential– sign of electrode potential, Nernst equation, reference electrode, electrochemical series– electromotive force, potentiometric titrations – acid – base titrations– redox and precipitation titrations.

Books for study

1. Morrison R T, Boyd R N and Bhattacharjee S K, *Organic Chemistry*, 7th Edition, New Delhi, Pearson, 2010.
   Unit I *Chapter 34 and 36*
2. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, New Delhi, Wiley–India, 2010.
   Unit II *Chapter 7*
   Unit III *Chapter 13 and 17*
3. Puri B R, Sharma L R and Pathania M S, *Principles of Physical Chemistry*, 23rd Edition, New Delhi, ShobanLalNagin Chand and Co., 1993.
   Unit IV *Chapter 18 and 33*
   Unit V *Chapter 23*

Books for Reference

1. Atkins P W, *Physical Chemistry*, 7th Edition, Oxford University Press, London, 2009.
2. Finar I L, *Organic Chemistry*, Vol 1and 2, 6th Edition, Addison Wesley Longman Ltd., London. 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.
5. Huheey J E, Keiter E A, Keiter R L and Medhi O K, *Inorganic Chemistry:Principles of Structure and Reactivity*, 4th Edition, Pearson Education, New Delhi, 2006.

Web Resources

1. https://opentextbc.ca/chemistry/chapter/19-2-coordination-chemistry-of-transition-metals/
2. https://www.tulane.edu/~sanelson/eens211/silicate_structures08.htm
3. https://www.youtube.com/watch?v=HjeQOKomAQc
4. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry/Basics_of_Electrochemistry

Coordination Chemistry

Silicate Structure

Phase rule

Electrochemistry

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

Semester	Course code			Title of the Course				Hours		Credits
IV	21UPH43AO04A			ALLIED OPTIONAL: CHEMISTRY–II				4		3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO–1	2	3	2	2	2	2	3	1	3	2	2.2
CO–2	2	3	2	3	2	2	2	3	2	3	2.4
CO–3	2	3	2	2	2	2	2	3	3	1	2.2
CO–4	2	3	1	3	3	2	3	1	3	3	2.4
CO–5	2	3	1	2	1	2	3	3	3	2	2.2
Mean overall Score											2.28 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH43AP01A	ALLIED OPTIONAL: CHEMISTRY PRACTICAL	2	2

CO No.	CO–Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO–1	know about the handling of chemicals and safety measures in the laboratory.	K1
CO–2	estimate the principle of volumetric analysis and various types of titration.	K2
CO–3	illustrate the theoretical aspects of organic analysis.	K2
CO–4	detect various elements present in the organic compounds.	K3
CO–5	demonstrate various techniques of volumetric analysis.	K4

Unit –I: Safety Rules in the Laboratory (4 Hours)

Introduction – personal protection – nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals– philosophy of lab safety – first–aid techniques – general work culture inside the chemistry lab – handling of chemicals and apparatus in the laboratory: storage and handling of chemicals – disposal of chemical wastes – glassware – handling of glassware – handling of different types of laboratory equipment's like bunsen burner–centrifuge– Kipp's apparatus.

Unit–II: Volumetric Analysis (3 Hours)

Volumetric analysis – principle – standard solutions – normality and molarity – principles of titrations– primary standard and secondary standard solutions– acid–base titration– redox titration–complexometric titration– precipitation titration and example of each with indicators used.

Unit –III: Theory of Organic Qualitative Analysis (3 Hours)

Qualitative analysis of organic substances: solubility test in $NaHCO_3$ – NaOH and HCl– test for saturation and unsaturation– aliphatic and aromatic– acidic– basic and neutral nature– element test for N, S and halogens.

Unit – IV: Volumetric Analysis (25 Hours)

1. Estimation of HCl (Std. oxalic acid x NaOH x HCl).
2. Estimation of NaOH (Std. Na_2CO_3 x HCl x NaOH).
3. Estimation of oxalic acid (Std. FAS x $KMnO_4$ x oxalic acid).
4. Estimation of FAS (Std. oxalic acid x $KMnO_4$ x FAS).
5. Estimation of $KMnO_4$ (Std. $K_2Cr_2O_7$ x FAS x $KMnO_4$).
6. Estimation of $K_2Cr_2O_7$ by Thio solution.
7. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution.
8. Estimation of zinc (EDTA titration).
9. Estimation of magnesium (EDTA titration).
10. Estimation of hardness of water (EDTA titration).

Unit – V Organic Analysis (25 Hours)

1. Identification of acidic, basic, phenolic and neutral organic substances.

2. Test for aliphatic and aromatic nature.
3. Test for saturation and unsaturation.
4. Preparation of sodium fusion extract.
5. Detection of N, S, and Cl.

Books for Study

1. Puri B R, Sharma L R and Kalia K K, *Principles of Inorganic Chemistry*, 23rd Edition, ShobanLal, Nagin Chand and Co, New Delhi, 1993.
   Unit–II*Chapter 41*
2. Gnanapragasam N S and Ramamurthy G, *Organic Chemistry Lab Manual*, 2nd Edition, S. Viswanathan Printers and Publishers (P) Ltd., Chennai, 2007.
   Unit–III*Part A*
3. *Allied Practical Manual*, Department of Chemistry, St. Joseph's College, Tiruchirappalli, 2021. (Private circulation).

Books for Reference

1. Venkateswaran V, Veeraswamy R andKulandaivelu A R, *Basic Principles of Practical Chemistry*, 2nd Edition, Sultan Chand and Sons, New Delhi, 1997.
2. Furniss B S, *Vogel's Textbook of Practical Organic Chemistry*, 7th Edition, ELBS Longman, London, 1984.

Web Resource

1. https://www.youtube.com/watch?v=FUo428guKt0
2. https://www.youtube.com/watch?v=_G6_OEa1BjA

Detection of Elements

Acid– Base Titration

Note:

1. Mono–functional compounds are given for organic analysis.
2. Each student is expected to practice the analysis of at least 10 different organic substances.
3. Apart from the TWO CIA tests, one MODEL TEST comprising both volumetric and organic analysis is to be conducted to enable the students ready for semester examination.

Scheme of Valuation
ALLIED: CHEMISTRY PRACTICAL
(For B.ScPhysics)

Continuous Internal Assessment **(100 marks)**

1. Regular Practical Sessions 50 (Based on his observation and record notes)
2. CIA I + CIA II tests 50 (conducted for 100 marks each and converted to 25 each)

Scheme for CIA tests I and II **(100 mark each)**

I. Analysis **40 marks**

1. Acid/base/neutral 5 marks
2. Aliphatic/aromatic 10 marks
3. Saturated/unsaturated 10 marks
4. Elements test
   a) Test for N present/absent 5 marks
   b) Tests for S present/absent 5 marks
   c) Tests for halogens present/absent 5 marks

II. Volumetric analysis **50marks**

Error upto2% 50 marks
1.1–3.0 % 45 marks
3.1–4.0 % 40 marks
>4.0 % 20 marks

III. Observation and Record note–book **10marks**

Scheme for Semester examination **100 marks**

I. Analysis **40 marks**

1. Acid/base/neutral 5 marks
2. Aliphatic/aromatic 5marks
3. Saturated/unsaturated 5marks
4. Tests for elements
   a) Test for N present/absent 5 marks
   c)Tests for S present/absent 5marks
   d)Tests for halogens present/absent 5marks
5. Correct procedure 10 marks

II. Volumetric analysis **50marks**

Error upto 2% 50marks
2.1–3.0 % 45marks
3.1-4.0 % 40marks
5.0 % 30marks
>5.0% 20marks

III. Theory behind practical **10 marks**

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH43AO04B	ALLIED OPTIONAL: COMPUTER SCIENCE-II (Data And Communication Networks)	4	3

CO No.	CO- Statements	Cognitive Level (K- level)
	After successful completion of the course, the student will be able to	
CO-1	understand the foundations of data communications	K2
CO-2	appraise the classification and basic concepts of Switching and Routing	K5
CO-3	analyze the concepts of LAN Network	K4
CO-4	use the concepts of Wireless LAN Technology	K3
CO-5	acquire the basic knowledge on IoT	K1

Unit – I: **(12 Hours)**

Introduction to Computer Networks and Data Communication: Need for Computer Networks – Evolution – Data Communication Fundamentals – Data Transmission– Transmission Media.

Unit – II: **(12 Hours)**

Network Classification, Communication and Components: Classification of Computer Networks – Switching and Routing – Routing – Multiplexing and Concentration – Concentrator – Terminal Handling – Components of Computer Network.

Unit – III: **(12 Hours)**

Network Standards and OSI Model: Need for Network Standards – The OSI Reference Model. Local Area Network: The Evolution of LAN – LAN Architecture – LAN advantages and Services – Characteristics of LAN – LAN Topologies.

Unit – IV: **(12 Hours)**

Wireless LAN and VSAT: Wireless LANs – Components of Wireless LAN – Working of Wireless LANs –Infrared Technology – Wireless LAN Types – Protocols for Wireless LAN – Uses of Wireless LANs – Bluetooth Technology.

Unit – V: **(12 Hours)**

Introduction to Internet of Things: Definition of Internet of Things –Application Areas of IoT – Characteristics of IoT – Things in IoT – IoT Stack – Enabling Technologies – IoT Challenges.

Books for Study

1. Rajesh, Eswarakumar and Balasubramanian, *Computer Networks, Fundamentals and Applications*, Vikas Publishing House Pvt. Ltd.,2002.
   Unit I: Chapter-1
   Unit II: Chapter-2
   Unit III: Chapter-3 (Sec.3.1 & 3.2) Chapter-5 (Sec.5.1 to 5.5)
   Unit IV: Chapter-7 (Sec.7.1 to 7.3, 7.5 to 7.7, 7.9 & 7.12)

2. Shriram K Vasudevan, Abhishek S. Nagarajan and R.M.D., Sundaran, *Internet of Things,* Wiley Publication, 2nd Edition, 2020.
   Unit V: Chapter-1 (Sec.1.1, 1.3 to 1.8)

Books for Reference

1. William Stallings, "Data and Computer Communications", Prentice Hall of India, Seventh Edition, 2004.
2. Andrew S Tanenbaum, "Computer Networks", Prentice Hall of India, New Delhi 1999.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things- A Hands-on Approach", Universities Press Private Limited, India, 2015.

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UPH43AO04B	ALLIED OPTIONAL: COMPUTER SCIENCE-II (Data And Communication Networks)	4	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	2	2	3	3	2	2	3	2.4
CO-2	2	3	2	1	2	3	3	2	2	3	2.3
CO-3	1	2	3	2	3	2	3	2	3	3	2.4
CO-4	2	2	2	3	2	2	3	2	2	3	2.3
CO-5	2	2	2	2	3	1	3	2	2	3	2.2
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH43AP01B	ALLIED: COMPUTER SCIENCE PRACTICAL	2	2

CO No.	CO- Statements After successful completion of the course, the student will be able to	Cognitive Level (K- level)
CO-1	understand the various text formatting tags, adding images to web page, presenting list of information.	K1, K2
CO-2	apply the knowledge in creating a simple web page with links to other web page and display information in table form.	K3
CO-3	design a form in a web page and divide the browser window in multiple sections using frames.	K3, K6
CO-4	categorize various commands in SQL.	K4, K5
CO-5	analyze and build a web page.	K4, K6

1. Simple web page with all the Text Formatting tags
2. Adding Images to Web Pages
3. Creating Lists (Ordered and Unordered List)
4. Adding Links to Web Pages
5. Creating Tables using various attributes
6. Creating Frames
7. Designing forms (DDL)
8. Implementation of Data Definition language commands
9. Implementation of DML, TCL and DCL commands

Simple Projects using HTML

1. Web blogs creation.
2. Department Website creation.

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UPH43AP01B	ALLIED: COMPUTER SCIENCE PRACTICAL	2	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	2	3	3	2	2	2.3
CO-2	2	3	2	2	1	2	3	3	2	2	2.2
CO-3	3	2	2	2	2	2	3	3	2	2	2.3
CO-4	3	3	2	3	2	2	2	3	2	1	2.3
CO-5	3	3	2	3	2	2	3	3	2	2	2.5
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH44SE02A	SEC - 2 (BS): WEATHER PHYSICS	2	1

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on concepts in weather physics, climatic changes and basics of weather station.	K1
CO-2	understand the fundamentals and determine the basic parameters of the atmosphere through various weather devices	K2
CO-3	apply the knowledge on weather physics and categorize weather and climate and its changes and predict the natural disaster to alert people.	K3
CO-4	analyze the measurement systems through the modern tools and process of measurement using basic weather station.	K4
CO-5	evaluate general ethics for the human society with awareness on pollution and weather changes through mobile apps.	K4

Unit- I: Introduction to Atmosphere (6 Hours)

Weather and climate - structure and composition of the atmosphere - Atmospheric pressure - temperature - wind - relative humidity - solar and terrestrial radiation - clouds - different forms of precipitation - diurnal variation of surface pressure and variation of pressure with height - diurnal variation of surface temperature and variation of temperature with height - Categorization of wind and circulation.

Unit - II: Measuring the Weather (6 Hours)

Forces acting to produce wind - wind speed direction - units - direction - measuring wind speed and direction - humidity - clouds and rainfall - radiation - absorption - emission and scattering in atmosphere - radiation laws.

Unit - III: Weather Systems (6 Hours)

Wind systems - Cyclone - Thunder - Tornado - Hurricanes.

Unit - IV: Climate and Climate Change (6 Hours)

Classification of climate - causes of climate change - global warming - air pollution - aerosols – Ozone depletion - acid rain.

Unit -V: Basics of Weather Forecasting (6 Hours)

Principles of satellite motion - satellite attitude and its control - types of orbits - polar and geostationary – Earth - and sun synchronous - orbit optimization - Meteorological satellites - multi-scanner radiometers and their applications in the observation of weather parameters - Forecasting Mobile apps

Book for Study

Text Prepared by the Department

Books for Reference

1. I.C. Joshi, *Aviation Meteorology*, 3rd edition, Himalayan Books, 2014.
2. Stephen Burt, *The weather Observers Hand book*, Cambridge University Press, 2012.
3. S.R. Ghadekar, *Meteorology*, Agromet Publishers, Nagpur, 2001.
4. S.R. Ghadekar, *Text Book of Agrometeorology*, Agromet Publishers, Nagpur, 2005.
5. Charls Franklin Brooks, *Why the weather*, Chapman & Hall, London, 1924.
6. John G. Harvey, *Atmosphere and Ocean*, 1995.

Web Resources*

1. https://en.wikipedia.org/wiki/Atmospheric_physics#:~:text=In%20order%20to%20model%20weather,mathematical%20and%20related%20to%20physics.
2. https://www.iop.org/education/school-and-college-students/Qubit/physics-weather-forecast
3. https://physicstoday.scitation.org/doi/10.1063/PT.3.4365

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UPH44SE02A	SEC - 2 (BS): WEATHER PHYSICS	2	1

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO-1	3	2	3	2	2	3	2	3	2	2	2.4
CO-2	3	2	3	2	2	3	2	2	3	2	2.4
CO-3	3	2	2	2	2	3	2	2	3	2	2.3
CO-4	3	3	2	2	2	3	2	2	2	2	2.3
CO-5	3	2	2	2	2	3	3	2	2	3	2.4
Mean Overall Score											2.36 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UPH44SE02B	SEC - 2 (BS): ELECTRICAL WIRING	2	1

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge and understand the basics of electricity, electrical components and wiring methods and troubleshooting.	K1, K2
CO-2	classify various electrical components and its applications.	K3
CO-3	identify and assess the need, design and wire the panel	K4, K5, K6
CO-4	illustrate and explain the wiring circuits.	K3, K4
CO-5	recommend and plan to wire a house and industry.	K5, K6

Unit - I: Basics of Electricity **(6 Hours)**

Electricity and generation - Electrical Terms - Electrical Circuits - Grounding and Polarization - Home wiring Tools - Power Station and Substation - IEE Rules - Safety and precautions.

Unit - II: Electrical Components **(6 Hours)**

Wire and Cable - Conduit - Boxes - Panels - Switches - Sockets - control switches - MCB - ELCB - RCD - GFCI and AFCI Breakers - House Surge Arrestors - Service Panels.

Unit - III: House Wiring **(6 Hours)**

Household Circuits - Single Phase wiring - Three Phase Wiring - Open and Concealed wiring - Grounding and Bonding a wire system - Lights - Motor - Fans - wiring a room - wiring a kitchen - Staircase Wiring.

Unit - IV: Panel Wiring **(6 Hours)**

Types of Panels - panel diagrams - circuit breakers - switches on the panel - Emergency Shut Down reset - PLC wiring - control panel components - Connections and routing - Conductor and cable runs - EMC compliant panel - layout of equipment in a panel - reference regulations and standards.

Unit - V: Trouble Shooting **(6 Hours)**

Electrical faults - main board - distribution board - socket, plug and cord - Light fixtures - LED lamps - Ceiling Fans - Heater.

Book for Study

Text Prepared by the Department.

Books for Reference

1. Black Decker, *The complete guide to wiring*, Updated 7th Edition, Quarto Publishing Group USA, 2018.
2. Ray C. Mullin, Phil Simmons, *Electrical Wiring Residential*, 17th Edition, Delmar, Cengage Learning, 2012.

Web Resources*

1. https://www.hplindia.com/wire-cables/domestic-wires.php
2. https://www.contractorbhai.com/basics-of-how-your-home-electrical-works/
3. https://www.primecabindia.com/all-about-house-electrical-wiring-system-a-small-guide

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UPH44SE02B	SEC - 2 (BS): ELECTRICAL WIRING	2	1

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	3	2	2	3	2.6
CO-2	2	3	3	3	2	3	3	3	2	2	2.6
CO-3	3	3	3	3	2	3	3	3	3	2	2.8
CO-4	3	2	3	2	2	3	3	2	2	2	2.4
CO-5	2	3	3	3	2	2	3	3	3	3	2.7
Mean Overall Score											2.62 (High)

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UHE44VE04A	PROFESSIONAL ETHICS–II: SOCIAL ETHICS - II	2	1

Co. No.	CO- Statements	Cognitive Levels (K-Levels)
	On completion of this course the graduates will be able to	
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.	K3
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 (6-Hours)

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 (6-Hours)

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 (6-Hours)

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 (6-Hours)

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 (6-Hours)

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 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
IV	21UHE44VE04B	PROFESSIONAL ETHICS II: RELIGIOUS DOCTRINE - II	2	1

CO.No.	CO-Statements	Cognitive Levels (K-Levels)
	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
V	21UPH53CC07	CORE-7:OPTICS	4	2

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire and understand the concepts of Geometrical optics and Wave optics.	K1, K2
CO-2	obtain the fundamental knowledge of nodal points in an optical system and analyse the combination of lenses using matrix formulation.	K1, K4
CO-3	gain knowledge on interference, diffraction, polarization and Optical fibers and understand basic principles behind fiber optic sensors	K1, K2
CO-4	apply the knowledge to analyse the interference and diffraction pattern and evaluate the functions of an optical instrument.	K3, K4, K5
CO-5	design and align optical elements to set up new optical system	K6

Unit- I: Geometrical Optics (12 Hours)

Laws of reflection and refraction from Fermat's principle - ray paths in an inhomogeneous medium - the ray equation and its solution - refraction of rays at the interface between an isotropic medium and an anisotropic medium - refraction at a single spherical surface - the Gaussian formula for a single spherical surface - reflection by a single spherical surface - the thin lens - the Newton formula - aplanatic points of a sphere.

Unit- II: The Matrix Method (12 Hours)

The matrix method - effect of translation - effect of refraction - imaging by a spherical refracting surface - unit planes - nodal planes - a system of two thin lenses - chromatic aberration - the achromatic doublet - removal of chromatic aberration of a separated doublet - monochromatic aberrations - coma - astigmatism and curvature of field - distortion.

Unit- III: Wave Optics (12 Hours)

Origin of refractive index - Rayleigh scattering - Huygen's theory - rectilinear propagation - application of Huygen's principle to study refraction and reflection - Huygen's principle in inhomogeneous media.

Interference of light waves - Fresnel Biprism - Interference by a plane parallel film when illuminated by a plane wave - cosine law - Non-reflecting films (only) - Fiber Bragg Gratings - Newton's rings - The Michelson interferometer.

Unit- IV: Diffraction and Polarization (12 Hours)

Fraunhofer diffraction - diffraction by a circular aperture - resolving power of a microscope - two slit Fraunhofer diffraction pattern - the diffraction grating - oblique incidence - Fresnel diffraction - Fresnel half period zones - the zone plate.

Polarization - Malus' Law - production of polarized light - superposition of two disturbances - the phenomenon of double refraction - interference of polarized light: Quarter wave plate and half wave plate - analysis of polarized light - optical activity - Faraday rotation.

Unit- V: Optical Fiber **(12 Hours)**

Total internal reflection - the optical fiber - glass fibers - the coherent bundle - the numerical aperture - attenuation in optical fibers - multimode fibers - pulse dispersion in multimode opticalfibers - material dispersion - plastic optical fibers - fiber optic sensors - physical understanding of modes.

Book for Study

1. Ajoy Ghatak, *Optics*, 6th Edition, McGraw Hill Education (India) Private Limited, 2017.

UNIT	CHAPTERS	SECTIONS
I	3 & 4	3.2-3.5, 4.1-4.4, 4.6, 4.8
II	5 & 6	5.1-5.5, 6.1-6.4
III	7, 12, 14 & 15	7.5, 7.6, 12.1-12.5, 14.4, 14.8, 15.2-15.4, 15.10, 15.11
IV	18, 20 & 22	18.1, 18.3, 18.6, 18.8, 18.9, 20.1-20.3, 22.1-22.8, 22.15
V	28 & 29	28.3-28.10, 28.13, 28.14, 29.3

BOOKS FOR REFERENCE

1. Rajpal S. Sirohi, Wave Optics and its Application, 1st Edition, Orient Blackswan Publication, 2012.
2. F.A. Jenkins and H.E. White, Fundamentals of Optics, 3rd edition, McGraw-Hill, 1957.
3. S.L. Kakani and K.C. Bhandari S, A text book of Optics, 10th Edition, Chand and Sons, New Delhi, 2005.
4. Khanna & Gulati, Fundamentals of Optics, R. Chand & Co., 14th edition, New Delhi.

WEB RESOURCES*

1. https://ocw.mit.edu/courses/mechanical-engineering/2-71-optics-spring-2009/
2. https://nptel.ac.in/courses/115/107/115107095/
3. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ph09/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53CC07	CORE-7: OPTICS	4	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	1	3	2	3	3	1	2.2
CO-2	3	3	3	2	1	3	2	2	3	1	2.3
CO-3	3	2	2	3	1	3	3	3	2	1	2.3
CO-4	3	3	2	3	1	3	3	2	2	1	2.3
CO-5	3	2	2	3	1	3	2	3	3	1	2.3
Mean Overall Score											2.28 (High)

Semester	Course Code	Title of the Course	Hours	Credits
V	21UPH53CC08	CORE-8: CONCEPTS OF MODERN PHYSICS	4	2

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire conceptual knowledge of space-time, frames of references and creating changes of physical parameters, their behaviour as a particulate and matter waves and to differentiate the size of the matter.	K1
CO-2	explain and demonstrate various theoretical and experimental methods in relativity, quantum physics and cosmology.	K2
CO-3	apply suitable methods to solve problems in physics of subatomic structure, matter waves and relativistic speeds.	K3
CO-4	examine the existence of solution to a problem.	K4, K5
CO-5	connect the concepts of modern physics to a real-life problem under different situations.	K6

Unit - I: Special Theory of Relativity -I (12 Hours)

Frames of reference - The Need for Ether - The Michelson-Morley Experiment - Einstein's Postulates - The Lorentz Transformation - Time Dilation and Length Contraction - Addition of Velocities - Experimental Verification - Muon Decay - Atomic Clock Measurement - Velocity Addition - Testing Lorentz Symmetry - Twin Paradox – Space-time.

Unit - II: Special Theory Of Relativity -II (12 Hours)

Doppler Effect - Applications of the Doppler Effect - Relativistic Momentum - Relativistic Energy - Total Energy and Rest Energy - Equivalence of Mass and Energy - Relationship of Energy and Momentum - Massless Particles - Computations in Modern Physics - Binding Energy - Electromagnetism and Relativity.

Unit - III: Particle Properties of Waves (12 Hours)

Electromagnetic Waves - Blackbody Radiation, Ultraviolet catastrophe, Planck’s radiation formula - Photoelectric Effect, quantum theory of light - Thermionic emission - Dual nature of light - X-Rays - X-Ray Diffraction - Compton Effect: Theory and experiment-Pair Production - Photon absorption - Photons and Gravity - Gravitational red shift.

Unit - IV: Wave Properties of Particles (12 Hours)

De Broglie Waves - Probability Waves - Describing a Wave - Phase and Group Velocities - Particle Diffraction, Davisson and Germer experiment - Particle in a Box - Uncertainty Principle I(wave) - Gaussian function - Uncertainty Principle II (particle) - Application of the Uncertainty Principle, Energy and time - Interferometry with electrons and atoms - Quantum interference with electron beam.

Unit - V: The Big and The Small: Cosmology and Nanoscience (12 Hours)

Evidence of the Big Bang - Hubble's Measurements - Cosmic Microwave Background Radiation Nucleosynthesis - Olbers' Paradox - The Big Bang - Stellar Evolution - The Ultimate Fate of Stars - Planck's Time, Length, and Mass - Active Galactic Nuclei and Quasars - Novae and Supernovae - Problems with the Big Bang - The Inflationary Universe - The Lingering Problems - Nanoscale: Carbon Nanotubes - Graphene - Nano Electronics- Quantum wires - Quantum dots.

Books for Study

1. Stephen T. Thornton, Andrew Rex, *Modern Physics for Scientists and Engineers*, 4th Edition, Brooks/Cole, Cengage Learning, 2013.
2. Arthur Besier, Shobhit Mahajan and S. Rai Choudhury, *Concepts of Modern Physics*, 7th Edition, McGraw Hill Education, 2017.
3. Chris Binns, *Introduction to Nanoscience and Nanotechnology*, John Wiley & Sons, 2010.

Unit	Book	Chapters	Sections
I	1	2	2, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9
II	1	2	2.10, 2.11, 2.12, 2.13, 2.14
III	2	2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9
IV	2	3	3.1, 3.2, 3.3, 3.4, 3.5, 3.5, 3.6, 3.7, 3.8, 3.9
V	1	16	16.1, 16.2, 16.3, 16.4, 16.5
	3	1 3 5	1.1 3.1, 3.8, 3.9, 3.10 5.1, 5.2, 5.3, 5.4

Books for Reference

1. R.A. Serway, C.J. Moses and C.A. Moyer, *Modern Physics*, 3rd Edition. Brooks/Cole Publications 2004.
2. P.A. Tipler and R. Llewellyn, *Modern Physics*, 5th Edition, W.H. Freeman 2007.
3. R. Resnick, *Introduction to Special Relativity*, 1st Edition, Wiley, 2007.
4. K.D. Sattler, *Handbook of Nanophysics*, CRC Press, 2011.

Web Resources*

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. https://www.understandingnano.com/
4. https://ras.ac.uk/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH3CC08	CORE-8: CONCEPTS OF MODERN PHYSICS	4	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	2	2	2	2	2.3
CO-2	3	3	3	2	2	3	2	2	2	1	2.3
CO-3	3	3	2	3	2	3	3	2	2	1	2.4
CO-4	3	3	3	3	2	3	3	2	2	1	2.5
CO-5	3	3	2	3	2	2	3	2	2	3	2.5
Mean Overall Score											2.4 (High)

Semester	Course Code	Title of the Course	Hours	Credits
V	21UPH53CP03	PHYSICS PRACTICAL – III	6	4

Any 16 Experiments

1. Spectrometer – grating – normal incidence.
2. Spectrometer – grating – minimum deviation.
3. Magnetic moment – using coil carrying current by Cu voltmeter.
4. Magnetic moment – using coil carrying current by ammeter.
5. Determination of Stefan's constant.
6. Earth inductor – magnetic field of the Earth.
7. Fresnel's biprism – wavelength, refractive index and thickness of transparent sheet.
8. B.G. - absolute Mutual Inductance.
9. B.G. – absolute Capacitance
10. Zener Diode - regulated power supply.
11. Clipping and clamping circuits – construction and performance study
12. Conversion of galvanometer into an ammeter.
13. Conversion of galvanometer into voltameter.
14. Transistor characteristics – CB mode.
15. Transistor characteristics – CE mode.
16. FET – characteristics.
17. Hartley oscillator using BJT – f and Inductance
18. Colpitt's oscillator using BJT – f and Inductance
19. Study the frequency response of transistor CE amplifier.
20. Study the frequency response of FET amplifier.
21. Logic gates using Diodes and Transistors – construction and operation.
22. De-Morgan's theorem and Boolean algebra – verification using logic gates
23. Specific Rotation of Sugar solution by Polarimeter.
24. Two port network analysis – admittance, transmission and h parameters.
25. PWM using IC555 – construction and performance study
26. Thevenin's and Norton theorems – verification and measurement
27. Study of transistor biasing
28. Solar Characteristics measurement
29. Study of Diamagnetism, Paramagnetism and Ferromagtism.
30. Verification of Biot-Savart's law
31. Faraday effect – rotation of the plane polarized light beam, Verdet constant and e/m
32. BH loop – Retentivity, Permeability, Residual Magnetism and Reluctance
33. Determination of Transistor h-parameter
34. Anderson's Bridge – self-inductance and inductive reactance.
35. Determination of Planck's constant using LED and Photo diode

Semester	Course Code	Title of the Course	Hours	Credits
V	21UPH53ES01A	DSE - 1: ANALOG AND DIGITAL ELECTRONICS	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe semiconductor devices and outline the concepts of analog and digital circuits	K1, K2
CO-2	understand the concepts and analyze the analog and digital circuits for various applications.	K2, K3
CO-3	examine real time problems, implement with analog and digital circuits by employing modern tools.	K3, K4
CO-4	assess the need of modern society with professional ethics in electronics and recommend solutions for the same	K5
CO-5	design and construct the electronic project to plan an eco-friendly environment.	K6

Unit - I: Diode Applications, BJT and FET Amplifier (15 Hours)

Review of diodes and transistors - LED - Tunnel Diode - Switching circuits: clipping and Clamping; Power supply: Linear Power Supply – SMPS. Amplifier: h-parameter - Frequency response of common emitter amplifier - MOSFET switch and amplifier - class-D amplifier.

Unit - II: Oscillators (15 Hours)

Positive Feedback - Barkhausen Criterion - classification of oscillators - Phase shift oscillator - Wien Bridge oscillator - Tuned oscillator - Hartley oscillator - Crystal oscillator - Clock generator; Modulation: PWM - PAM - PCM - ASK - FSK.

Unit - III: Operational Amplifiers (15 Hours)

Op-amp - Ideal Op-amp - Parameters of Op-amp - Practical Op-amp - Voltage transfer curve - Open loop configuration - Closed loop configuration - Comparator - Summing amplifier - Logarithmic amplifier - Error amplifier - Schmitt Trigger - fixed frequency, pulse width modulation control circuit (IC TL494).

Unit - IV: Combinational Logic Circuits (15 Hours)

Basic and Universal gates - K-map simplification - 4:1 and 16:1 Multiplexer - 1:4 and 1:16 Demultiplexer - Encoder - Decoder - Priority Encoder - Parity generator and checker; Electrical characteristics: TTL, CMOS, NMOS.

Unit - V: Sequential Logic Circuits **(15 Hours)**

Flip-Flops (RS, JK, D, T) - Shift Register - 4-bit Asynchronous Counter - 4-bit Synchronous Counter - Decade Counter – Presettable counter - Mod counter - EEPROM - Static and Dynamic RAM - Solid State Disc.

Book for Study

1. U A. Bakshi and A P Godse, *Analog and Digital Electronics*, Technical Publications Pune, 2009.

Unit	Book	Chapters	Sections
I	1	1, 2	1.2, 1.7, 2.3-2.6
II	1	4	4.2, 4.3, 4.4, 4.5.2, 4.6, 4.8, 4.9, 4.12, 4.13
III	1	9	9.1, 9.2, 9.3, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.14, 9.15
IV	1	5	5.2, 5.3, 5.4, 5.5, 5.6
V	1	6, 7, 8	6.4, 6.5, 6.6, 7.2, 7.3, 8.2, 8.5, 8.7, 8.8

Books for Reference

1. Jerry Luecke, *Analog and Digital Circuits for Electronic Control System Applications*, Elsevier, 2005.
2. Anil Kumar Maini, *Digital Electronics*, John Wiley & Sons Ltd, 2007.

Web References*

1. https://en.wikipedia.org/wiki/Digital_electronics
2. https://en.wikipedia.org/wiki/Analogue_electronics
3. https://www.elprocus.com/difference-between-analog-circuit-and-digital-circuit/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53ES01A	DSE - 1: ANALOG AND DIGITAL ELECTRONICS	5	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	2	3	3	2	3	2	2.6
CO-2	3	3	3	2	2	3	3	3	3	2	2.7
CO-3	3	3	3	2	2	3	3	3	3	2	2.7
CO-4	3	3	3	2	2	3	3	2	3	2	2.6
CO-5	3	3	2	2	2	3	3	3	2	2	2.5
Mean Overall Score											2.62 (High)

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53ES01B	DSE - 1: DESIGN OF ANALOG AND DIGITAL CIRCUITS	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of basic network concepts emphasizing series and parallel combination of passive components, discuss working principle and biasing concepts of JFET's and MOS FET's, and outline the concepts of op amp and its basic circuit operation.	K1, K2
CO-2	experimenting the configuration of Op-amp into its application to solve various circuit parameters.	K3
CO-3	examine the working principle of various analog and digital instruments and analyse them in the measurement of physical parameters	K3, K4
CO-4	assess the need of automatic electronics devices by the society and recommend solutions by inventing the circuits.	K5
CO-5	design and construct analog and digital circuits for social needs.	K6

Unit - I: Network Analysis (15 Hours)

Networks and Kirchhoff's law - Series resistors - Parallel resistors - Voltage - Thevenin's - Voltage Divider - Connected Circuits and Power Transfer - Matrix Solution of Resistor Networks - Matrix Form of the Resistance Network and Example - Solution for the Effective Resistance - CircuitPractice - Reflection-Symmetric Network - Series and Parallel Light Bulbs - Thevenin Circuit.

Unit - II: Design of Amplifiers and Oscillators (15 Hours)

Common - Emitter Amplifier - Bias Network (AC Coupling) - Transistor Differential Amplifier - Ebers - Moll Equation - JFET voltage amplifier - MOSFET - Transistor phase shift oscillator - JFET Wein's bridge oscillator - Transistor astable multivibrator.

Unit - III:Operational Amplifiers: Design of ADC, DAC and Analog Computer (15 Hours)

Op-amp basics - Op-amp circuits - Op-amp (closed and open loop) - Filters - Instrumentation amplifier - Finite gain analysis - Bandwidth - Comparator - PID Control - R-2R ladder DAC - Successive Approximation Register ADC - analog computation.

Unit - IV: Design of Combinational Logic Circuits (15 Hours)

K-map Simplification - Design of 4:1 and 16:1 Multiplexer - Design of 1:4 and 1:16 Demultiplexer - Encoder - Decoder - 1-bit full Adder - 1-bit full subtractor - Design of Multiplexer case study: thermocouple monitor.

Unit -V: Design of Sequential Logic Circuits **(15 Hours)**

Flip-flops - 4-bit Asynchronous Counter - 4-bit Synchronous Counter - Shift register - State machine programmable logic device - SRAM - DRAM - Design of pulse-area stabilizer - Design of counter divide by 2 and 3.

Book for Study

1. Daniel Adam Steck, "Analog and Digital Electronics", Department of Physics, University of Oregon, 2015.

Unit	Book	Chapters	Sections
I	1	1	All
II	1	4, 5	4.8, 4.9, 4.10, 4.11, 5.2, 5.4.3, 5.6
III	1	7, 8, 16	7.1, 7.3, 7.4, 7.5, 7.7, 7.8, 7.9, 8.1, 8.4, 16.1, 16.2
IV	1	10, 12	10.3, 10.4.2, 12.1-12.7
V	1	13	13.1-13.9

Books for Reference

1. Anant Agarwal and Jeffrey H. Lang, "Foundations of Analog and Digital Electronic Circuits", Elsevier, 2005.
2. Johan H. Huijsing, Michiel Steyaert and Arthur van Roermund, "Analog Circuit Design", Kluwer Academic Publishers, 2003.
3. Mark Balch, "Complete Digital design", McGraw-Hill, 2003.
4. John E. Ayers, "Digital Integrated Circuits", CRC Press, 2005.

Web Resources*

1. https://www.synopsys.com/glossary/what-is-analog-design.html
2. https://neurophysics.ucsd.edu/courses/physics_120/Agarwal%20and%20Lang%20(2005)%20Foundations%20of%20Analog%20and%20Digital.pdf
3. https://medium.com/@TeksunGroup/difference-between-analog-design-and-digital-design-18c5d1ce566a

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
V	**21UPH53ES01B**	**DSE - 1: DESIGN OF ANALOG AND DIGITAL CIRCUITS**	**5**	**3**

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	3	3	3	2	2.7
CO-2	3	3	3	2	2	3	3	2	3	2	2.6
CO-3	3	3	2	3	2	3	3	2	3	2	2.6
CO-4	3	3	3	2	2	3	3	2	3	2	2.6
CO-5	3	3	2	3	2	3	3	2	3	2	2.6
Mean Overall Score											**2.62 (High)**

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53ES02A	DSE – 2: CLASSICAL MECHANICS	5	3

CO No.	CO- Statements On the successful completion of the course, student will be able to	Cognitive Levels (K-Levels)
CO-1	acquire the knowledge of laws of motion, momentum, energy, Lagrange's Equations, and motion of rigid bodies.	K1
CO-2	understand the concept of momentum, energy and classify the laws of motion and the different systems of energy.	K2 & K3
CO-3	apply and explain the Lagrange's Equations for different energy systems and rotational motion of a rigid body.	K3 & K2
CO-4	analyze and discuss the conservation of momentum and angular momentum, variation and Hamilton's principles, and phase space.	K2 & K4
CO-5	discuss about the conservative forces, central forces, constrained systems and rotational motion of rigid bodies	K3

Unit - I: Laws of Motion and Momentum (15 Hours)

Classical Mechanic Space and Time - Mass and Force - Newton's First and Second Laws; Inertial Frame - The Third Law and Conservation of Momentum - Newton's Second Law in Cartesian Coordinates - Two-Dimensional Polar Coordinates - conservation of Momentum - Rocket - The Center of Mass - Angular Momentum for a Single Particle - Angular Momentum for several particles.

Unit - II: Energy (15 Hours)

Kinetic Energy and Work - Potential Energy and Conservative Forces - Force as the Gradient of Potential Energy - The Second Condition that Force be Conservative - Time-Dependent PotentialEnergy - Energy for Linear One-Dimensional Systems - Curvilinear One-Dimensional Systems - Central Forces - Energy of Interaction of Two Particles - The Energy of a Multiparticle System.

Unit - III: Lagrange's Equations (15 Hours)

Lagrange's Equations for Unconstrained Motion - Constrained Systems; Examples - Constrained Systems in General - Proof of Lagrange's Equations with Constraints - Examples of Lagrange Equations - Generalized Momenta and Ignorable Coordinates - Lagrange's Equations for Magnetic Forces - Lagrange Multipliers and Constraint Forces.

Unit - IV: The Calculus of Variations and Hamilton's Principle (15 Hours)

Some typical minimization problems - The Euler-Lagrange equation - Variational principles - Hamilton's principle - Systems of first order ODEs – Legendre transforms - Hamilton's equations - Hamiltonian phase space ((q, p)-space) - Liouville's theorem and recurrence.

Unit - V: Rotational Motion of Rigid Bodies (15 Hours)

Properties of the Center of Mass - Rotation about a Fixed Axis - Rotation about Any Axis: the Inertia Tensor - principal Axes of Inertia - finding the Principal Axes: Eigenvalue Equation - Precession of a Top due to a Weak Torque - Euler's Equations - Euler's Equations with Zero Torque - Euler Angles - Motion of a Spinning Top.

Books for Study

1. John R. Taylor, *Classical mechanics*, University Science Books, Edwards Brothers, Inc 2005.
2. R. Douglas Gregory, *Classical Mechanics an Undergraduate text*, Cambridge University Press, Cambridge, 2006.

Unit	Book	Chapters	Sections
I	1	1,3	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 3.1, 3.2, 3.3, 3.4, 3.5
II	1	4	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10
III	1	7	7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.9, 7.10
IV	2	13,14	13.1, 13.2, 13.3, 13.4, 14.1, 14.2, 14.3, 14.4, 14.5
V	1	10	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10

Books for References

1. H. Goldstein, C.P. Poole, J.L. Safko, *Classical Mechanics*, 3rd edition. 2002, Pearson Education.
2. P.S. Joag, N.C. Rana, *Classical Mechanics*, McGraw Hill, 1991.
3. A.K. Raychaudhuri, *Classical Mechanics: A Course of Lectures*, Oxford University Press, 1983.
4. J.C.Upadhaya, *Classical Mechanics*, second revised edition, Himalaya Publishing House.

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53ES02A	DSE – 2: CLASSICAL MECHANICS	5	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	3	2	3	2	1	2.3
CO-2	3	3	2	2	2	3	2	2	2	1	2.2
CO-3	3	2	2	3	2	2	3	3	2	1	2.3
CO-4	3	2	2	3	3	2	2	3	2	1	2.3
CO-5	3	3	2	2	3	2	2	3	2	1	2.3
Mean Overall Score											2.28 (High)

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53ES02B	DSE – 2: SOLID STATE PHYSICS	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge of fundamental principles, phenomena and concepts in solid state physics.	K1
CO-2	understand and describe the different experimental X-ray diffraction methods and lattice vibration, free-electron, band theories of solids.	K1, K2
CO-3	explain the theories underlying dielectric, optical, magnetic and superconductive properties.	K2
CO-4	classify the properties of semiconductors, dielectrics, optical, magnetic and superconductive materials.	K3
CO-5	apply the theories to explain the properties of solids.	K4

Unit - I: Crystal Structure and X-Ray Diffraction (15 Hours)

The Crystalline State – Basic definitions- Bravais lattices and crystal systems - Symmetry - Millerindices- Crystal structures: FCC, BCC, NaCl, Diamond - Interatomic Forces - Types of Bonding - Bragg's Law - The reciprocal lattice - first Brillouin zone - Experimental X-ray diffraction Techniques: The Rotating - Crystal Method, The Laue Method, The Powder Method.

Unit - II: Lattice Vibrations and Free-Electron Model (15 Hours)

Elastic waves - Density of states of a continuous medium – Specific heat: Einstein and Debye models - the phonon - The free electron theory: electrical conductivity – heat capacity of conduction electrons - the Fermi surface - Effects of fermi surface: electrical and thermal conductivity - The Hall effect - Failure of the free electron model.

Unit - III: Semiconductors (15 Hours)

Band theory of solids - The Bloch theorem: Bloch function, energy bands and energy gap, crystal potential - Brillouin zones - number of states in a band - Classification of solids - Effective mass - The Hole - Semiconductor band structure - Carrier concentration: Fermi-Dirac function, derivation - Impurity states - Semiconductor statistics: intrinsic and extrinsic regions - Electrical conductivity: mobility and temperature dependence- the Hall effect.

Unit - IV: Dielectric and Optical Properties (15 Hours)

Introduction - polarizability - the local field - Maxwell and Lorentz fields - Clausius-Mosotti relation - Sources of polarizability - Dipolar polarizability - Dipolar polarization in solids - Ionic polarizability - Electronic polarizability: Classical treatment - Piezoelectricity - Ferroelectricity: Curie-Weiss law - the microscopic model - Ferroelectric domains.

Unit - V: Magnetic Properties and Superconductivity (15 Hours)

Magnetic susceptibility - classification of materials - Langevin theory of diamagnetism - paramagnetism: classical theory - Ferromagnetism - antiferromagnetism and Ferrimagnetism - Ferromagnetic domains: magnetization process - Superconductivity - zero resistance - The Meissner effect - critical field - BCS theory - Josephson effect - Type I and II superconductors.

Book for Study

1. M. A. Omar, *Elementary Solid State Physics*, Pearson India, 2010.

Unit	Chapters	Sections
I	1 & 2	1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.9, 1.10, 2.3, 2.6, 2.9,
II	3 & 4	3.2, 3.3, 3.4, 3.5, 4.3, 4.4, 4.6, 4.7, 4.8, 4.9, 4.10, 4.13
III	5 & 6	5.2, 5.3, 5.4, 5.5, 5.10, 5.15, 5.17, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8
IV	8	8.2, 8.3, 8.4, 8.5, 8.7, 8.8, 8.9, 8.10, 8.11
V	9 & 10	9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.11, 10.2, 10.3, 10.4, 10.7, 10.8, 10.9

Books for Reference

1. N. W. Ashcroft, N. D. Mermin, *Solid State Physics*, Brooks/Cole; New edition, 1976.
2. C. Kittel, *Introduction to Solid State Physics*, India edition. Wiley, 2019.
3. S. H. Simon,*The Oxford Solid State Basics*, Oxford University Press, 2013.
4. S. A. Holgate, *Understanding solid state physics*, CRC Press, 2010.
5. S.O. Pillai, *Solid State Physics*, 5th edition, New Age International Publishers, 2002.
6. A. J. Dekkar, *Solid State Physics*, Campus book house, Indian Institute of Science (TBH).

Web Resources*

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html
4. http://www.umop.net/spectra/spectrum.php?elem=H&sw=430&lw=710

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53ES02B	DSE – 2: SOLID STATE PHYSICS	5	3

Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	2	2	2	2	2.3
CO-2	3	3	3	2	2	3	2	2	2	2	2.4
CO-3	3	3	2	2	2	3	3	2	2	1	2.3
CO-4	3	3	3	2	2	3	3	2	2	1	2.4
CO-5	3	3	2	2	2	3	3	2	1	1	2.2
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53SP01	Self Paced Learning: ASTRONOMY	-	2

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on the solar systems, Eclipses, Lunar and Solar calendars.	K1
CO-2	describe the features of an astronomical instruments, a variety of calendars and the planets in the solar systems	K1
CO-3	understand the various physical phenomena exercised in the astronomical instruments	K2
CO-4	apply astronomical telescopes to examine the features of Moon and plants in the solar systems	K3
CO-5	analyse the changes observed in the sky and understand the causes responsible for any observed changes.	K4

Unit - I: The Moon

Introduction - Sidereal month - Synodic month - daily motion of the moon - age of moon - phase of moon - position of moon at rising and setting.

Unit - II: Eclipses

Introduction - umbra and penumbra - lunar eclipse - solar eclipse - duration of lunar and solar eclipse - comparison of solar and lunar eclipses.

Unit - III: Astronomical Instruments

Sidereal clock - chronometer - gnomon - sun dual - the heliometers - the sextant - chronograph - radio telescope.

UNIT - IV: Solar System

Introduction - the Sun - Mercury - the Venus - Mars - Jupiter - Saturn - Uranus - Neptune - Pluto.

Unit - V: The Calendars

Lunar and Solar calendars - Egyptian - Mayan - Roman - Julian and Gregorian calendars - Indian National calendar - Tamil and Malayalam calendars.

Book for Study

1. S. Kumaravelu, Susheela Kumaravelu, Astronomy, Revised Edition 2013.

Books for References

1. V.B. Bhatia, Text book for Astronomy and Astrophysics with elements of Cosmology, 2nd Edition, Narosa Publishing House, New Delhi, 2001.
2. H. Karttunen, P. Kroger, H. Oja, M. Poutanen, K. J. Donner, Fundamental Astronomy, 5th Edition, Springer Berlin Heidelberg, New York, 2007.

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53SP01	Self Paced Learning: ASTRONOMY	-	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	3	2	2	3	3	2	2	2.5
CO-2	3	2	2	2	2	2	3	2	3	2	2.3
CO-3	3	2	2	2	2	3	3	2	2	2	2.3
CO-4	3	2	2	2	2	3	3	2	1	2	2.2
CO-5	3	3	3	3	2	3	3	3	1	2	2.6
Mean Overall Score											2.38 (High)

Semester	Course Code	Title of the Course	Hours	Credits
V	21USS54SE03	SEC-3: SOFT SKILLS	2	1

POs (Programme outcomes)

- To provide a focused training on soft skills for students in colleges for better job prospects
- To create and interface between industries and educational institutions in order to match the expectations of employers and abilities of the employees
- To bring a transformation in interpersonal and societal living guided by value laden principals
- To explore and analyze personal attributes that enhance the individual's Interactions, Job Performance and Career Prospects
- To foster teamwork (synergy) that increases productivity and brings benefits to the individuals and the society

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 Non- verbal 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**

Definition 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**

Text Book

1. Melchias G, Balaiah John, John Love Joy (Eds), 2018. *Straight from the Traits: Securing Soft Skills*, SJC, Trichy.

References

1. 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).
2. *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/Cole.
3. Khera ,Shiv 2003. *You Can Win.* Macmillan Books , Revised Edition.
4. Melchias G, Balaiah John, John Love Joy (Eds), 2018. Winners in the Making: A primer on soft skills. SJC, Trichy.

Other books

1. 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.
2. Trishna's 2006. *How to do well in GDs & Interviews*, Trishna Knowledge Systems.
3. Yate, Martin. 2005. H*iring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53EG01A	GE – 1: EVERYDAY PHYSICS	4	3

CO No.	CO- Statements	COGNITIVE LEVELS (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire knowledge and understand basic Physics and its Applications	K1,K2
CO-2	explain the Operation of the Human Ears and Eyes and its defects and methods to correct them.	K3,K4
CO-3	describe the function of the Electric Home Appliances and estimate their ratings, power consumptions and bill costs.	K5
CO-4	understand the requirement of Renewable energy resources and design of equipments for fruitful energy conversions	K2, K6
CO-5	acquire knowledge of Heat and temperature and conversion of Temperature among the different scales of temperature.	K1,K4

Unit - I: General Physics (12 Hours)

Mechanics: Newton's Laws of Motion – Work - Power and Energy - Rotational Motion – Torque – couple - Simple Machines - I, II & III orders - inclined plane – pulley - wheel and axle.

Gravity and Gravitation: Kepler's Laws - factors affecting 'g' - free fall.

Fluid Mechanics: Archimede's Principle - principle of floatation - centre of gravity and centre of buoyancy - Hydraulic machines.

Unit - II: Heat (12 Hours)

Temperature: Different scales of temperature – thermometers - expansion due to heating - anomalous expansion of water and its applications.

Calorimetry: Principle - specific heat capacity and its applications.

Transmission of heat: Conduction - Convection and Radiation of heat - Latent heat - Pressure Cooker - Black body and Green - House effect.

Unit - III: Sound and Light (12 Hours)

Sound: Waves and Vibrations: Important definitions - Propagation of sound - velocity of sound - Musical sound and noise – Beats - Echoes and Resonances - Musical instruments - human ear - Doppler Effect - Ultrasonics and Sonar.

Light: Important definitions - Umbra and Penumbra - Reflection – Mirrors - Refraction – Lenses - Dispersion – Prisms - Total internal reflection - Human eye and its defects - Simple Optical Devices - fibre optic cable - Colours and Pigments.

Unit - IV: Electricity and Domestic Appliances (12 Hours)

Definitions and units of Electrical Parameters - electric cells and their combinations - Household wiring and Earthing - Common electrical devices – fuse – switch – sockets – plugs – Heaters – Bulbs - electric iron – kettle - Turning Effect of Electricity - motors and fan, Magnetic Effect of Electric Current - transformers, electric bell and electric generators.

Unit - V: Energy Physics **(12 Hours)**

Different forms of Energy - Transformation of Energy - Need for New strategies regarding Energy - Different sources of Energy - Solar energy - Hydrostatic Energy - Thermal Energy - Electrical Energy – Biomass - Wind Energy - Ocean Energy - Nuclear Energy and its Hazards.

Book for Study

1. *Everyday Physics*, Dept. of Physics, St. Joseph's College, Trichy-2.

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

Semester	Course Code			Title of the Course				Hours		Credit
V	21UPH53EG01A			GE – 1: EVERYDAY PHYSICS				4		3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	3	2	3	2	1	2.3
CO-2	3	3	2	2	3	3	2	2	2	1	2.3
CO-3	3	2	2	3	3	2	3	3	2	1	24
CO-4	3	2	2	3	3	2	2	3	2	1	2.3
CO-5	3	3	2	3	3	2	2	3	2	1	2.3
Mean Overall Score											2.32 (High)

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53EG01B	GE -1: RENEWABLE ENERGY PHYSICS	4	3

CO No.	CO- Statements On the successful completion of the course, student will be able to	Cognitive Levels (K-Levels)
CO-1	understand the importance of energy to the society	K2
CO-2	acquire knowledge on wind, solar energy and their utilization	K1, K3
CO-3	recall and infer the hydro power and the photovoltaic solar energy	K1, K2
CO-4	acquire knowledge on energy conversion and efficiency of solar cells	K1
CO-5	analysis the solar photovoltaic system and the solar efficiency	K4

Unit - I: Introduction (12 Hours)

Importance of energy to society - New forms of energy and units of energy - Laws of thermodynamics - Energy sources - World's Energy problem - Green or renewable energy and conservation - World leaders in renewable energy - Energy future - Complexities in charting the best course for the future.

Unit - II: Wind Power (12 Hours)

Historical uses - Wind characteristics and resources - Power transfer to a Turbine - Turbine types and terms - Controlling and optimizing wind turbine performance - Electrical aspects and grid integration - Small wind - Offshore wind - Environmental impacts - Unusual design and applications.

Unit - III: Hydro Power (12 Hours)

Hydro power - Wave, Tidal and Ocean thermal power resources - Introduction to tidal power and cause of the tides - Ocean thermal energy conversion - Social and environmental impacts of hydro power.

Unit - IV: Photovoltaics (12 Hours)

Conductors, Insulators and semiconductors - Increasing the conductivity of semiconductors through doping - PN junction - Generic photovoltaic cell - Electrical property of a solar cell - Efficiency of solar cells and solar system - Grid connection and inverters - Other types of solar cells.

Unit - V: Energy Conversion and Efficiency (12 Hours)

Factors besides efficiency influencing energy related choices - Lowest of the low hanging fruit - Obstacles to efficiency and conversion - Problems.

Book for Study

Robert Ehrlich, *Renewable energy: A first course*, CRC press, by Taylor & Francis Group, LLC, 2013.

Unit	Book	Chapters	Sections
I	1	1	1.2-1.9, 1.13-1.15
II	1	7	7.1-7.10
III	1	8	8.1-8.5
IV	1	11	11.2-11.11
V	1	12	12.2-12.5 For problems: Page no: 369

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

Semester	Course Code	Title of the Course	Hours	Credit
V	21UPH53EG01B	GE -1: RENEWABLE ENERGY PHYSICS	4	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	3	1	3	3	3	2	1	2.4
CO-2	3	2	3	3	1	2	3	2	3	1	2.3
CO-3	3	3	2	3	1	3	2	3	3	1	2.4
CO-4	3	2	3	3	1	3	2	2	3	1	2.3
CO-5	3	3	3	3	1	2	3	2	2	1	2.3
Mean Overall Score											2.34 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63CC09	CORE-9: QUANTUM MECHANICS	4	2

CO No.	CO- Statements On the successful completion of the course, student will be able to	Cognitive Levels (K-Levels)
CO-1	describe the Schrodinger theory and the fundamental postulates of quantum mechanics and explain various quantum systems.	K1, K2
CO-2	interpret the wave function statistically and distinguish between the classical and quantum physics.	K2, K3
CO-3	apply the Schrodinger theory to study various one-dimensional quantum systems.	K3, K4
CO-4	apply the separation of variables technique to solve Hydrogen atom problem.	K3, K4
CO-5	analyse and compare the eigenvalues and eigen functions of various quantum systems.	K3, K4

Unit – I: The Time-Dependent Schrodinger Equation (12 Hours)

Schrodinger'**s** Equation: 1d equation for a free particle - Operators for momentum and energy - Extension to 3 dimensions - Inclusion of force - Born's Interpretation of Wave Functions: probability interpretation - Probability current density - Normalization - Expectation Value - The Ehrenfest Theorem.

Unit - II: The Time-Independent Schrodinger Equation and Formalism (12 Hours)

The Time - Independent Schrodinger equation - Stationary States - Conditions on the Wavefunction - Postulates of Quantum Mechanics: Wavefunction, operators, expectation value, Eigen values, time development of a quantum system - Simultaneous Measurability of Observables.

Unit - III: Exactly Solvable Quantum System – I (12 Hours)

The Zero Potential - The Step Potential (Energy less than step Height) - The Step Potential (Energy greater than step Height) - The Barrier Potential - Examples of Barrier Penetration by Particles

Unit - IV: Exactly Solvable Quantum System – II (12 Hours)

The Square Well Potential - Analytical Solution for square well potential - The Infinite Square Well Potential - The Simple Harmonic Oscillator Potential - Series Solution for a Simple Harmonic Oscillator Potential

Unit - V: The Hydrogen Atom (12 Hours)

Introduction - Development of the Schrodinger Equation - Separation of the Time - independent Equation - Solution of the Equations - Eigenvalues, Quantum Numbers and Degeneracy - Eigen functions - Probability Densities.

Books for Study

1. G. Aruldhas, *Quantum Mechanics*, 2nd Edition, PHI Learning Pvt. Ltd., 2008
2. R. Eisberg and R. Resnick, *Quantum physics of atoms, molecules, solids, nuclei, and particles*, 2nd Edition, Wiley, 2006.

Unit	Book	Chapters	Sections
I	1	2	2.5 (all sub sections), 2.6(all), 2.7(all)
II	1	2,3	2.8, 2.9, 2.10, 3.5, 3.6
III	2	6	6.1, 6.2, 6.3, EX. 6.1, EX 6.2, 6.4, EX 6.3, 6.5, 6.6
IV	2	6	6.7, AP.H, 6.8, EX. 6.5, EX 6.6, 6.9, AP.I, 6.10
V	2	7	7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7

EX: example, AP: appendix

Books for Reference

1. P.M. Mathews and K. Venkatesan, *A text book of Quantum mechanics*, 2nd Edition, Tata McGraw Hill, 2017.
2. B. Bransden, C. Joachain, *Quantum Mechanics*, 2nd Edition, Pearson, 2004.
3. David J. Griffiths and Darrell F. Schroeter, *Introduction to Quantum mechanics*, 3rd Edition, Cambridge University Press. 2019.

Web Resources *

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. http://www.quantumvisions.net/en/
4. https://vqm.uni-graz.at/

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UPH63CC09	CORE-9: QUANTUM MECHANICS	4	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	1	3	3	3	2	2	2.5
CO-2	3	3	3	2	1	3	3	3	2	2	2.5
CO-3	3	3	3	2	1	3	3	3	2	2	2.5
CO-4	3	3	3	2	1	3	3	3	2	2	2.5
CO-5	3	3	3	2	3	3	3	3	2	2	2.7
	Mean Overall Score										2.54 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63CC10	CORE-10: ATOMIC, NUCLEAR AND PARTICLE PHYSICS	4	2

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	understand and describe the structure of atom and nucleus using different models.	K1, K2
CO-2	explain the properties of atom under external field, radioactive decay, nuclear reactions, and experimental methods to detect and accelerate particles.	K1, K2
CO-3	interpret the atomic spectra and periodic table based on the atomic models.	K3
CO-4	classify elementary particles based on various physical properties.	K4
CO-5	examine the applications of atomic and nuclear physics.	K4

Unit- I: Atomic Structure **(12 Hours)**

The Nuclear Atom - Rutherford Scattering - Scattering Formula derivation - Electron Orbits - Atomic Spectra - Ritz combination principle - The Bohr Atom - Energy Levels and Spectra- Correspondence Principle - The Sommerfeld Atom - Nuclear Motion - Atomic Excitation.

Unit - II: Electronic Structure of Atoms **(12 Hours)**

Zeeman effect: EM moment - Magnetic energy - Bohr magnetron - Zeeman experiment - Paschen - Back effect - Stark effect - Electron spin - Exclusion Principle - Stern-Gerlach Experiment - The periodic table - Atomic structures - Spin orbit coupling - Total Angular Momentum - LS coupling - X-ray Spectra - Auger effect.

Unit - III: Nuclear Structure **(12 Hours)**

Nuclear composition - Nuclear Properties - Stable Nuclei - Binding Energy - the strong - interaction - Liquid drop model - Shell Model - Meson theory of nuclear forces - Nuclear Matter - two nucleon potential.

Unit - IV: Nuclear Transformations **(12 Hours)**

Radioactive decay - Half life - Radioactive series - Alpha decay: Tunnel theory (alpha decay constant derivation) - Beta decay - Gamma - decay - Cross section - Nuclear reactions - Nuclear fission - Nuclear reactors - Nuclear fusion in stars - Fusion reactors.

Unit - V: Particle Detectors, Particle Accelerators and Elementary Particles **(12 Hours)**

Particle Detectors: Wilson Cloud chamber - ionization chamber - Geiger Muller Counter - solid state detectors.

Particle Accelerators: Cyclotron - Betatron - Synchrotron - electron synchrotron and proton synchrotron.

Elementary Particles: Interactions and particles - Leptons - Hadrons - Elementary Particle Quantum numbers - Quarks - Field Bosons.

Books for Study

1. A. Besier, S. Mahajan and S. R. Choudhury, *Concepts of Modern Physics*, 7th Edition, Mcgraw Hill Education, 2017.
2. H. Kolanoski and N. Wermes, *Particle Detectors*, Oxford University Press, 2020.
3. Irving Kaplan, *Nuclear Physics*, 2nd Edition, Addison-Wesley, 1977.

Unit	Book	Chapters	Sections
I	1	4	4.1, 4.2, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9
II	1	6 7	6.10, 6.11 7.13, 7.14, 7.1, 7.2, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10
III	1	11	11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.9
IV	1	12	12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 12.10, 12.11, 12.12
V	2 3 1	6, 7, 8 21 13	6.1, 7.2.1, 7.2.2, 7.6.2, 8.1 21.3, 21.4, 21.5, 21.6 13.1, 13.2, 13.3, 13.4, 13.5, 13.6

Books for Reference

1. R. Eisberg and R. Resnick, *Quantum physics of atoms, molecules, solids, nuclei, and particles*, 2nd Edition, Wiley, 2006.
2. R. A. Serway, C. J. Moses and C. A. Moyer, *Modern Physics*, 3rd Edition, Brooks/Cole Publications 2004.
3. P.M. Mathews and K. Venkatesan, *A text book of Quantum mechanics*, 2nd Edition, Tata McGraw Hill, 2017.
4. H. Semat and J. R. Albright, *Introduction to Atomic and Nuclear Physics*, 5th Edition, Chapman and Hall, 1985.

Web Resources*

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html
4. http://www.umop.net/spectra/spectrum.php?elem=H&sw=430&lw=710

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63CC10	CORE-10: ATOMIC, NUCLEAR AND PARTICLE PHYSICS	4	2

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	2	2	2	2	2.4
CO-2	3	3	3	2	2	3	2	2	2	2	2.4
CO-3	3	3	3	2	2	3	3	2	2	2	2.4
CO-4	3	3	3	2	2	3	3	2	2	2	2.4
CO-5	3	3	3	2	2	3	3	2	2	2	2.4
Mean Overall Score											2.4 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63CP04	PHYSICS PRACTICAL – IV	6	4

Any 16 Experiments

1. Monostable and Bistable multivibrators – construction and study
2. Spectrometer – Cauchy's constant.
3. Spectrometer – Small angle prism.
4. B.G. – Inductance by Anderson's bridge.
5. B.G. – High resistance by leakage.
6. Potentiometer – EMF of a thermocouple.
7. Potentiometer – High range voltmeter.
8. Series and parallel resonance circuits.
9. NAND and NOR as universal building blocks.
10. Adders and Subtractors - construction and study
11. Op-amp – study of basic operations.
12. Astable multivibrator using Transistors - construction and study.
13. Simplification of Boolean expression using k map and implementation.
14. Encoder and Decoder - construction and study.
15. Binary adder and subtractor - construction and study.
16. Multiplexer and Demultiplexer - construction and study.
17. Flip Flops using logic gates - construction and study.
18. 4-bit Shift registers – SISO, SIPO and PISO - construction and study
19. 3 bit synchronous and asynchronous counters - construction and study.
20. V-I characteristics of Solar panel.
21. C Programs – Basics
22. C Program - Application to physics problem
23. Arduino basic programs
24. DC voltmeter using Arduino
25. Calculator using Arduino and 4x4 key pad
26. Stepper motor control using Arduino
27. Light intensity measurement using Arduino
28. Resistance measurement using Arduino
29. Capacitance measurement using Arduino
30. Study characteristics of sensors (any three like pressure, position, distance, motion, etc.,)
31. Wave length of laser using spectrometer
32. Determination of Boltzmann constant using V-I characteristic of PN diode
33. Determination of the Coupling Coefficient of a Piezoelectric crystal.
34. Diameter of a wire using laser
35. Study of AM and FM

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES03A	DSE – 3: STATISTICAL MECHANICS	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge about macroscopic and microscopic systems with a description of temperature, entropy and free energy and understand their probabilities	K1, K2
CO-2	obtain the knowledge of classical statistics and understand the applications of Maxwell-Boltzmann distributions	K1, K2
CO-3	acquire knowledge about the quantum statistics and understand its importance in macroscopic systems	K1, K2
CO-4	analysis the strength and limitations of the different microscopic models and be able to compare different microscopic models	K4
CO-5	apply the statistical laws to understand gases and solids	K3

Unit - I: Statistical Thermodynamics (15 Hours)

Macroscopic and Microscopic states - phase space - statistical interpretation of entropy - partition function and thermodynamic properties of systems -partition function for an ideal monoatomic gas: single particle and N-particle partition function, thermodynamic variables - mixing of two different ideal gases - Gibbs Paradox - Sackur Tetrode equation - Law of equipartition of energy - applications-specific heat and limitations.

Unit - II: Classical Statistics of Maxwell Boltzmann (15 Hours)

Maxwell - Boltzmann distribution law - distribution law of molecular speeds - specific heat capacity of gases - partition function of diatomic molecule: specific heat capacity of diatomic molecule, specific heat capacity of Hydrogen, thermodynamic functions of a two-energy levels system - negative temperature, Saha's Ionisation formula.

Unit - III: Quantum Statistics (15 Hours)

Gibbs factor: Carbon monoxide poisoning - Bosons and Fermions - Bose-Einstein distribution law - Fermi Dirac distribution law, degenerate Fermi gases - zero temperature - small non-zero temperature - density of states - Sommerfeld expansion, Blackbody radiation: ultraviolet catastrophe, Planck's distribution, Photons, summing over modes, Planck's spectrum, total energy, entropy of a photon gas, cosmic background radiation, photons escaping through a hole, radiation from other objects, Sun and Earth - Debye theory of solids

Unit - IV: Bose-Einstein Statistics (15 Hours)

Bose-Einstein distribution law, strongly degenerate Boson gas: Bose-Einstein condensation in ultra-cold atomic gases - Thermodynamic functions of photon gas, Applications of Bose - Einstein statistics to Blackbody radiation

Unit - V: Fermi-Dirac Statistics (15 Hours)

Fermi-Dirac distribution law - ideal quantum gases: particle distribution and internal energy, weakly degenerate quantum systems - completely and strongly degenerate Fermi gas - Fermi energy - electron gas in a metal, application of Fermi-Dirac statistics - thermionic emission, photoelectric emission ultra-cold atomic Fermi gases, White Dwarf Stars, Chandrasekhar mass limit.

Books for Study

1. S C Garg, R. K. Bansal, C. K. Ghosh, *Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics*, 2nd edition, McGraw Hill Education India, 2013.
2. Daniel V. Schroeder, *An introduction to thermal physics*, 1st edition, Pearson Education India, 2014.

Unit	Book	Chapters	Sections
I	1	1, 12, 13	12.1, 12.2, 12.3, 12.5, 12.8, 12.9, 13.2, 13.3, 13.4, 1, 4
II	1	12, 13	12.9, 13.4, 13.6, 13.6.1, 13.7
III	2	7	7.1, 7.2, 7.3, 7.4, 7.5, 7.6
IV	1	15	15.1, 15.2, 15.3
V	1	14	14.1, 14.2, 14.3, 14.4, 14.5

BOOKS FOR REFERENCE

1. R.K. Pathria, Butterworth Heinemann, *Statistical Mechanics*, 2nd Edition, Oxford University Press, 1996.
2. Berkeley Physics Course, F. Reif, *Statistical Physics*, Tata McGraw-Hill, 2008.
3. F. W. Sears and G. L. Salinger, *Thermodynamics, Kinetic Theory, and Statistical Thermodynamics*, 3rd edition, Addison-Wesley Publishing Company, 1982.

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

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES03A	DSE – 3: STATISTICAL MECHANICS	5	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	3	2	3	3	2	2	1	2.3
CO-2	2	3	2	3	2	3	3	2	3	1	2.4
CO-3	3	2	2	3	2	3	3	3	2	1	2.4
CO-4	3	3	2	3	2	2	2	3	2	1	2.2
CO-5	3	2	2	2	2	3	3	2	2	1	2.2
Mean Overall Score											2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES03B	DSE – 3: SPECTROSCOPY AND LASER	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	know the basic concepts in different spectroscopic methods and fundamental of laser.	K1
CO-2	understand the different physical phenomena in various spectroscopic techniques.	K2
CO-3	explain the theory, principles, different types and applications of laser.	K2
CO-4	describe the various experimental techniques in different spectroscopies.	K3
CO-5	differentiate spectroscopy methods based on interaction of light with matter and classify lasers and its application.	K4

Unit - I: Microwave and Infrared Spectroscopy (15 Hours)

Electromagnetic spectrum - Types of molecular energies - Different spectroscopic methods - Rotational spectra: Classification of molecules - Interaction of radiation with rotating molecule - Rigid diatomic molecules - Microwave spectrometer - Information derived from rotational spectra - IR Spectroscopy - Vibrational energy - IR spectra preliminaries - Vibrations of polyatomic molecules: Normal vibrations of CO_2 and H_2O molecules - Dipole moment - IR spectrometer

Unit - II: Raman and Laser Spectroscopy (15 Hours)

Raman Spectroscopy: Theory of Raman scattering: Classical and quantum - Mutual exclusion Principle - Raman spectrometer - Fourier transform Raman spectrometer - resonance Raman scattering - Laser spectroscopy - Nonlinear optical effects - frequency generation - Hyper Raman effect - stimulated Raman scattering - Inverse Raman scattering - Coherent anti-stoke Raman scattering – Multi-photon processes.

Unit - III: Electronic and Spin Resonance Spectroscopy (15 Hours)

Electronic spectroscopy: Introduction - Dissociation - Pre-dissociation - Electronic angular momentum - Photoelectron spectroscopy: Principle - Instrumentation - information from photoelectron spectra - Nuclear Magnetic Resonance: Magnetic properties of nuclei - Resonance condition - Instrumentation - relaxation process - Chemical shift - Electron spin resonance: Introduction - Principle - ESR spectrometer - Nuclear Quadrupole resonance (Principle).

Unit - IV: Principles of Laser (15 Hours)

Absorption and emission of light - Stimulated absorption - Spontaneous and stimulated emission - difference between spontaneous and stimulated emission - Einstein Relations - condition for stimulated emission - Condition for light amplification - Population inversion - Pumping methods and schemes - Metastable states - Optical resonator and its action - Characteristics of laser - Two level and three level laser systems.

Unit - V: Types and Applications of Lasers (15 Hours)

Classification of lasers - solid state lasers: Ruby - Nd:YAG - Gas lasers: He-Ne - CO_2 - Semiconductor lasers: population inversion - pn-junction - lasing condition - Homojunction laser - Heterojunction lasers - Applications: LIDAR - Holography: Principle and method - Bar code reader - Medical and engineering applications.

Books for Study

1. G. Aruldhas, *Molecular Structure and Spectroscopy*, 2nd ed., PHI learning, 2008.
2. M.N. Avadhanulu and P.S. Memne, *An introduction to Lasers*, S. Chand 2012.

Unit	Book	Chapters	Sections
I	1	1, 6 & 7	1.1, 1.2, 1.3, 6.1, 6.2, 6.3, 6.14, 6.15, 7.1, 7.2, 7.7, 7.7.1, 7.7.2, 7.16
II	1	8 & 15	8.1, 8.2, 8.5, 8.6, 8.9, 8.16, 15.1, 15.2, 15.5, 15.6, 15.7, 15.8, 15.10
III	1	9, 10, 11 & 12	9.1, 9.9, 9.10, 9.11, 9.12, 10.1, 10.2, 10.3, 10.5, 10.8, 11.1, 11.2, 11.3, 12.1, 12.2
IV	2	1	1.18, 1.20, 1.21, 1.22, 1.23, 1.27, 1.28, 1.29, 1.31, 1.32, 1.35, 1.36
V	2	2 & 5	2.2, 2.3, 2.3.1, 2.3.2, 2.4, 2.4.1, 2.4.3, 2.7, 2.7.3, 2.7.4, 2.7.5, 2.7.13, 2.7.14, 5.17, 5.20, 5.21.1

Books for Reference

1. Atomic and Molecular Spectroscopy, S. Svanberg, Springer-Verlag, 2004.
2. Basic Atomic and Molecular Spectroscopy, J M. Hollas, Royal Society of Chemistry, 2002.
3. Fundamentals of Molecular Spectroscopy, C. Banwell, 4th ed. McGraw Hill Education, 2017.
4. Lasers, K. Thyagarajan and Ajoy Ghatak, 2nd ed., Springer, 2010.

Web Resources*

1. https://oyc.yale.edu/physics
2. https://ocw.mit.edu/courses/physics/
3. https://edu.rsc.org/resources/analysis
4. https://www.rp-photonics.com/laser_physics.html

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code			Title of the Course				Hours		Credit
VI	21UPH63ES03B			DSE – 3: SPECTROSCOPY AND LASER				5		3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	2	3	2	2	1	2	2.2
CO-2	3	3	3	2	2	3	2	2	1	1	2.2
CO-3	3	3	2	2	2	3	3	2	1	1	2.2
CO-4	3	3	3	2	2	3	3	2	1	1	2.3
CO-5	3	3	2	2	2	3	3	2	1	2	2.3
Mean Overall Score											2.24 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES04A	DSE - 4: EMBDED SYSTEM AND MICROCONTROLLER	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	acquire the knowledge on fundamentals of c-programming and explain C programs for embedded systems and microcontrollers	K1, K2
CO-2	predict the automatic solutions and complete the embedded system for day-to-day activities.	K2, K3
CO-3	identify the suitable microcontroller along with appropriate interfacing circuits and use the same for an application with C program.	K3, K4
CO-4	assess the global need of the embedded system and recommend solutions by inventing the circuits.	K5
CO-5	find the features of microcontrollers, design and construct the embedded system for social needs.	K1, K6

Unit - I: C Language **(15 Hours)**

Structure of C language - C character set - constants - keywords - variables - data types and sizes - Arithmetic operators - relational operators - logical operators - assignment operators - increment and decrement operators - conditional operator - bitwise operators - special operators - arithmetic expressions - evaluation of expressions - precedence of arithmetic operators - variable declaration - labels - statements - input functions - output functions - formatted input/output - Unconditional control - bidirectional conditional control - multi conditional control - loop control structures - Arrays - Functions - simple programs.

Unit - II: The AVR Microcontroller **(15 Hours)**

AVR Atmega328P - Features - Block diagram - architecture - CPU core - ALU - Status register - General purpose register - Stack pointer - Instruction execution timing - Reset and Interrupt handling - AVR memories - In-System Reprogrammable Flash Program Memory - SRAM Data Memory - EEPROM Data Memory - I/O Memory - Register Description - Fuse bits - System Clock and Clock Options - Low Power Crystal Oscillator - Calibrated Internal RC Oscillator - Power Management and Sleep Modes.

Unit - III: Arduino IDE and AVR Programming **(15 Hours)**

Embedded System - Boot Loader - Arduino IDE - Installing IDE - Description - Commands - LOAD - interfacing and programming LED, LCD, Keypad and Relay.

Unit - IV: AVR Peripheral Programming **(15 Hours)**

Analog Comparator - ADC - Interrupts - Timers - Volt, Current, Resistance, Capacitance and conductivity measurement - light intensity measurement - interrupt program - delay using timer - counter using timer/counter

Unit - V: Communication Protocols **(15 Hours)**

SPI - Serial Peripheral Interface - USART - 2-wire Serial Interface (I2C) - Simple programs: serial monitor - I2C LCD.

Books for Study

1. Easy Programming Publisher, *The C Programming Language*, 2016.
2. ATmega328P DATASHEET, 2019.
3. Text Prepared by the Department (Arduino Reference)

Unit	Book	Chapters	Sections
I	1	2-9	All
II	2	1-5	All
III	3	1	All
IV	3	2	All
V	3	3	All

Book for Reference

1. Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, "The AVR Microcontroller and Embedded System", Pearson Prentice Hall, 2012.

Web Resources*

1. https://www.arduino.cc/
2. https://www.totalphase.com/blog/2020/12/differences-between-embedded-system-vs-microcontroller/
3. https://www.tutorialspoint.com/embedded_systems/es_microcontroller.htm

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES04A	DSE - 4: EMBDED SYSTEM AND MICROCONTROLLER	5	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	3	3	3	2	2.7
CO-2	3	3	3	2	2	3	3	3	3	2	2.7
CO-3	3	3	3	2	2	3	3	3	3	2	2.7
CO-4	3	3	2	2	2	3	3	3	3	2	2.6
CO-5	3	3	2	2	2	3	3	3	3	2	2.6
Mean Overall Score											2.66 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES04B	DSE - 4B: SENSOR, TRANSDUCERS AND IoT	5	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe and discuss the analog and digital sensors, its applications, IOT Architecture and Platforms.	K1, K2
CO-2	classify the sensors and transducers and identify its applications.	K3, K4
CO-3	list various sensors and use them to identify different physical parameters.	K1, K3, K4
CO-4	assess the global need of the IoT system and recommend solutions by designing the circuits.	K5
CO-5	find the suitable sensors and transducers, design and construct the IoT projects.	K6

Unit - I: Analog and Digital Sensor (15 Hours)

Resistive - Capacitive - Voltage-Generating - Hall effect Sensor - LVDT - Load cell - Ionizing Radiation Sensors - Electrochemical Sensors - Mechano-Optical Sensors - Temperature sensor - DS1820.

Unit - II: Strain, Pressure, Position, Distance and Motion Transducers (15 Hours)

Accelerometer - Magnetometer - Gyro Sensor - Pressure Sensor - Rotation - Smart sensor - Sound - Gravitational Sensing - Sensor Fusion.

Unit - III: Sensor, Transducer Application Circuit Design (15 Hours)

Digital filters - Volt, Current, Resistance, Capacitance, Inductance, magnetic Field, Distance, Position, Temperature meters.

Unit - IV: IoT Architecture and Platforms (15 Hours)

Internet of Things - Importance - Architecture - IoT data - MQTT protocols - Industrial IoT - Security - Applications.

Unit - V: IoT Weather Forecasting Station - Case Study (15 Hours)

Temperature and humidity by using the DHT11 sensor - Wind speed using an Anemometer - Light intensity using an LDR - Carbon monoxide levels in the air using MQ7 - Soil moisture using Hygrometer - Ultrasonic sensor for rain water level - Raindrop sensor for detecting rainfall or snow fall - System Architecture - Analysis.

Books for Study

1. M.J. Usher and D.A. Keating, *Sensors and Transducers*, Second Edition, Palgrave Macmillan; 1996.
2. Dimitrios Serpanos, Marilyn Wolf, *Internet of Things (IoT) Systems*, Springer International Publishing, First Edition, 2018.
3. Text Prepared by Department.

Unit	Book	Chapters	Sections
I	1	1, 2, 3, 5, 6	1.3-1.6, 2.2, 2.5, 3.2, 5.2, 5.3, 5.4, 6.2, 7.2
II	1	11	Relevant sections
III	1	8	Relevant sections
IV	2	1, 2, 5	1.1-1.6, 2.1-2.6, 5.1-5.6
V	3		All

Books for Reference

1. Ian Sinclair, *Sensors and Transducers*, Third Edition, Newnes, 2000.
2. IFSA Publishing, *Sensors & Transducer*, S.L., Barcelona Toronto, 2000.

WEB RESOURCES*

1. https://www.electronics-tutorials.ws/io/io_1.html
2. https://www.variohm.com/news-media/technical-blog-archive/difference-between-a-sensor-and-a-transducer
3. https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63ES04B	DSE - 4: SENSOR, TRANSDUCERS AND IoT	5	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	2	3	3	2	2	2	2.5
CO-2	3	3	2	2	2	3	3	3	3	2	2.6
CO-3	3	3	2	2	2	3	3	3	2	2	2.5
CO-4	3	3	2	2	2	3	3	3	2	2	2.5
CO-5	3	3	2	2	2	3	3	3	2	2	2.5
Mean Overall Score											2.52 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63CE01	COMPREHENSIVE EXAM	-	2

Unit - I: Mechanics and Properties of Matter

Kinematics and Dynamics - Work and Energy - Conservation of Linear and Angular momentum - Dynamics of rigid bodies - Inverse square law force - Elasticity - Viscosity - Surface tension – Diffusion - osmosis and low pressure.

Unit - II: Mathematical Physics

Matrices - Vector calculus - Differential equation - Multiple integrals - Fourier series - Errors, approximations and extremum of functions - Special functions - Laplace transforms and its applications - Complex analysis - Numerical methods.

Unit - III: Electromagnetism and Thermal Physics

Electrostatics - Electric field in matter - Magnetostatics - Magnetostatic field in matter - Electrodynamics - Laws of thermodynamics - Thermodynamic potential and phase transitions - Thermal properties of solids - Thermodynamical behavior of real gas - Advanced thermodynamics.

Unit - IV: Concepts of Modern Physics and Quantum Mechanics

Special theory of relativity - Particle properties of waves - Wave properties of particles - Cosmology and nano science - Time dependent Schrodinger equation - Time independent Schrodinger equation and formalism - Exactly solvable quantum system - The hydrogen atom.

Unit - V: Optics, Atomic Nuclear and Particle Physics

Geometrical optics - The matrix method - Wave optics - Diffraction and Polarization - Optical fiber - Atomic structure - Electronic structure of atoms - Nuclear structure - Nuclear transformations - Detectors, accelerators and elementary particles.

Book for Study

Text by the Department

Books for Reference

1. Satyendra Nath Maithi, Debi Prasath Raychaudhuri - *Classical mechanics and general properties of Matter* - New Age International Publishers, 2008.
2. Kleppner and Kolenkow, *An Introduction to Mechanics*, 1ST Edition, McGraw Hill Education, 2017.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th edition, Wiley; by 2010.

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH64SE04A	SEC - 4 (WS): RADIATION PHYSICS AND SAFETY	2	1

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	list and relate fundamental concepts in Radiation Physics and apply them to overcome radiation hazards.	K1
CO-2	compare radiation detection and measuring devices.	K2
CO-3	illustrate various nuclear radiations produced by various reactors and other sources and categorize them based on principles	K3, K4
CO-4	analyse the importance of radiation safety management, biological effects and ICRP principles.	K4
CO-5	adapt better solutions for dosimetry standards in a human society.	K3

Unit - I: Nuclear Physics and Accelerators (6 Hours)

X-rays - characteristics and production - concept of Bremsstrahlung and Auger electron, Radioactivity - General Properties of radioactive rays (alpha, beta and gamma) - Laws of Radioactivity - Internal Conversion - Orbiting electron capture - Isomerism - Artificial Radioactivity.

Elementary ideas on fission and reactors - Particle Accelerators for industrial - medical and research application - Details of Accelerator facilities in India.

Unit - II: Interaction of Radiation with Matter (6 Hours)

Interaction of Photons with matter: Mechanisms - Photo electric effect - Compton Effect - pair production - Photo-nuclear reactions - attenuation coefficients.

Interaction of electron particles: Energy Loss Mechanisms - Collision Stopping Power - Radiation Stopping power and yield - Range - Continuous slowing-down time - Example of Electrons tracks in Water

Unit - III: Radiation Detection and Measurement (6 Hours)

Principles of Radiation detection - Gas Filled radiation detectors - Scintillation (Inorganic and Organic Scintillators) and Semiconducting radiation measuring devices - Slow Neutron detection - Other types: Cerenkov Detectors, Optically Stimulated Luminescence

Unit - IV: Radiation Dosimetry and Standards (6 Hours)

Free-Air Ionization Chamber - The Air-Wall Chamber - Measurement of Absorbed Dose - Measurement of X - and Gamma - Ray Dose - Neutron Dosimetry - Dose Measurements for Charged - Particle Beams - Linear Energy Transfer: Determination - Dose Calculations - Alpha and Low energy Beta Emitters Distributed in Tissue Charged - Particle Beams - Point Source of Gamma Rays.

Unit -V: Radiation Effects And Safety: Justification, Optimizationand Dose Limits(6 Hours)

External Dosimetry: Distance, time and Shielding - X-ray and Neutron Shielding.

Internal Dosimetry: Biological Effects - Radiation Syndrome - Somatic effects - Dose-response relationship and factors affecting it - references values of ICRP Publication 89 - ICRP 30 Model.

General Radiation injuries - Radioactive Waste Classification and Disposal in medical - industrial - agricultural and research labs - Guide on Medical Management of Persons Exposed in Radiation Accidents.

Book for Study

Text by the Department

Books for Reference

1. W.J. Meredith and J.B. Massey (Auth.), *Fundamental Physics of Radiology*, Butterworth-Heinemann Ltd, 1977.
2. *W.E. Burcham, M. Jobes, Nuclear and Particle Physics, John Wiley & Sons Inc, 1995.*
3. *James E. Turner, Atoms, Radiation, and Radiation Protection, Third Edition, Wiley-VCH Verlag GmbH & Co. KGaA, 2007.*
4. *AERB reports on* Guide on Medical Management of Persons Exposed in Radiation Accidents, 1989.

Web References*

1. https://www.healthcareers.nhs.uk/
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6580815/
3. https://www.ncnr.nist.gov/summerschool/ss03/lectures/health_physics.pdf

(* subject to availability - not to be used for exam purpose)

Unit	Book	Chapters	Sections
I	1	1,2,5	1.5.3, 2.4, 2.5, 5.1.1, 5.2.1, 5.2.4, 5.3.1
	2	1,2,3,4	1.1, 1.2, 2.11, 3.6, 4.3, 4.5
II	2	6,8	8.1, 8.2, 8.4, 8.5, 8.6, 8.7; 6.1-6.7
III	2	10	10.1, 10.3, 10.2*, 10.6*, 10.7*
IV	2	12	12.1-12.5*, 12.6-12.10
V	2	13,15,16	15.1, 15.3, 15.5*; 13.6, 13.9, 13.13, 13.14, 16.1, 16.6
	3		General radiation injuries and safety*

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

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH64SE04A	SEC - 4 (WS): RADIATION PHYSICS AND SAFETY	2	1

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	2	2	3	3	2	3	2	2.4
CO-2	3	1	3	1	2	3	2	3	3	2	2.3
CO-3	3	2	2	2	2	3	2	3	2	2	2.3
CO-4	3	2	3	2	2	3	3	2	2	2	2.4
CO-5	2	2	2	2	2	3	3	2	3	2	2.3
Mean Overall Score											2.34 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH64SE04B	SEC - 4 (WS): NON-DESTRUCTIVE TESTING	2	1

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe and discuss different NDT techniques as per requirements.	K1, K2
CO-2	use modern tools to examine flaw in the materials.	K3
CO-3	solve various manufacturing defects by comparing thew results of tests.	K3, K4
CO-4	apply accurate testing method for materials using NDT.	K3
CO-5	examine and explain environment friendly solutions to achieve organizational sustainability with ethical values.	K3, K4

Unit - I: Visual Inspection and Acoustic Emission Testing (6 Hours)

Fundamentals - Vision and light - Ambient Conditions - Test object characteristics - EquipmentAccessories - Magnifiers/microscopes - Mirrors - Dimensional - Borescopes - Video Systems -Machine Vision - Replication - Temperature indicating devices and materials - Chemical aids - Surface Comparators - Raw Materials - Primary process materials - Determination of dimensions (depth, width, length, etc.) - Process for reporting visual discontinuities.

Instrumentation and Signal Processing - Cables - Signal Conditioning - Signal Detection - Source Location Techniques - Acoustic emission test systems - Accessory Techniques - Advanced signal processing techniques - Acoustic Emission Test Techniques - Factors affecting test equipment selection - Applications of Acoustic Emission Testing.

Unit - II: Thermography and Electromagnetic Testing (6 Hours)

Principles/Theory - Conduction - Convection - Radiation - The nature of heat and heat flow - Temperature measurement principles - Proper selection of Thermal/Infrared testing - Heat flux indicators - Performance parameters of non-contact devices - Contact temperature indicators - Non-contact pyrometers - Infrared line scanners - Thermal/Infrared imaging - Heat flux indicators - Exothermic or endothermic investigations - Friction investigations - Fluid Flow investigations - Thermal resistance - Thermal capacitance investigations - Interpretation - Procedures -Safety and health.

Principles/Theory - Equipment - Materials - Techniques - Interpretation - Procedures - Remote Field Testing (RFT) Principles & Theories - Principles and Theory - Equipment and Materials - Interpretation and Evaluation of Signals - Procedures.

Unit - III: Leak Testing and Liquid Penetrant Testing (6 Hours)

Principles and theory - Physical principles in leak testing - Principles of gas flow-Proper selection of LT as method of choice - Leak testing standards - Detector/instrument performance factors - Vacuum Pumps - Bubble testing practices and techniques - Absolute pressure testing equipment - Absolute pressure hold testing of containers - Absolute pressure leakage rate testing of containers - Bubble Test - Pressure change/measurement test - Leak interpretation evaluation - procedures - Safety precautions.

Principles/Theory - Principles of liquid penetrant process - Theory - Proper selection of PT as method of choice - Liquid penetrant processing - Equipment/Materials - Liquid penetrant test

units - Methods of measurement - Lighting for liquid penetrant testing - Materials for liquid penetrant testing - Testing and maintenance of materials - Interpretation - Factor affecting indications - Indications from discontinuities - Relevant and Non-relevant indications - Liquid penetrant testing procedures - specifications - Safety and Health.

Unit - IV: Magnetic Flux Leakage and Magnetic Particle Testing (6 Hours)

Principles/Theory - Flux leakage theory - Forster and other theories - Finite element methods - DC/AC flux leakage - Equipment/Materials - Detectors - Coils - Factors affecting choice of sensing elements - Read out selection - Instrument design considerations Techniques - Consideration affecting choice of test - Coupling - Field Strength - Standardization - Interpretation - Flaw Detection - Process control - Defect Characterization - Standards.

Principles/Theory - Principles of magnets and magnetic fields - Characteristics of magnetic fields - Equipment/Materials - Magnetic particle test equipment - Inspection Materials - Techniques - Magnetization by means if electric current - Selecting the proper method of magnetization - Demagnetization - Interpretation - Safety and Health.

Unit - V: Radiographic Testing and Ultrasonic Testing (6 Hours)

Principles and Theory - Equipment/Materials - Electrically generated sources - Particulate radiation sources - Radiation Detectors - Techniques - Imaging Considerations - Film Processing - Viewing of radiographs - Judging radiographic quality - Exposure Calculations - Radiographic Techniques - Interpretation and Evaluation - Procedures - Safety and Health Exposure Hazards - Methods of controlling radiation exposure - Operational and emergency procedures - Dosimetry and Film Badges.

Principles/Theory - Equipment/Materials - Techniques - Contact - Immersion - Comparison of contact and immersion methods - Remote Monitoring - Interpretation - Evaluation of base metal product forms - Evaluation of weldments - Evaluation of bonded structures - Variables affecting test results - Evaluation - Procedures - Specific Applications - Codes - Safety and Health.

Book for Study

Text by the Department.

Book for Reference

1. Dr. Baldev Raj, Jayakumar and M. Thavasimuthu, “Practical Non- Destructive testing”, Narosa Publications, New Delhi, 2009.

Web Resources*

1. https://www.flyability.com/ndt
2. https://www.asnt.org/MajorSiteSections/About/Introduction_to_Nondestructive_Testing.aspx
3. https://www.asnt.org/MajorSiteSections/About/Introduction_to_Nondestructive_Testing.aspx

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code			Title of the Course				Hours		Credit
VI	21UPH64SE04B			SEC - 4 (WS): NON-DESTRUCTIVE TESTING				2		1
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	2	2	3	3	3	2	2	2	2.4
CO-2	3	2	3	2	3	3	3	2	2	2	2.5
CO-3	3	3	2	2	2	3	3	2	2	2	2.4
CO-4	3	2	3	2	2	3	3	2	2	3	2.5
CO-5	3	2	2	3	3	3	3	2	3	3	2.7
Mean Overall Score											2.5 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63EG02A	GE – 2: LASER TECHNOLOGY AND ITS APPLICATION	4	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	describe the fundamentals of light and their properties, Explain the basic principle of Laser emission	K1, K2
CO-2	illustrate and explain the principles and design considerations of various lasers, Categorize modes of their operation.	K2, K4
CO-3	describe the applications of laser in industries, Execute the obtained knowledge in various technology of applications of Lasers.	K1, K3
CO-4	compare the different types of lasers, Check the work ethics and work place safety.	K4
CO-5	implement the significance of modern lasers in communication networking system. Develop the knowledge in production of laser of various types.	K3

Unit - I: Fundamentals of Laser **(12 Hours)**

Absorption and emission of light - spontaneous emission , stimulated emission - Einstein's relation - Condition for light amplification - Population inversion - Pumping methods - Active medium - Metastable states – Laser Beam characteristics.

Unit - II: Production of Laser **(12 Hours)**

Classification of LASERs - solid state Lasers - Ruby Laser - Nd:YAG Laser - Fiber Lasers – Gas Lasers - Helium - Neon Laser - Argon Laser - CO_2 Laser - Tunable dye Lasers - Semi conductor Lasers.

Unit – III: Industrial Applications of Laser **(12 Hours)**

Lasers in material processing - The surface treatments - Drilling - Cutting - Welding - Heat treating - Lasers in Electronics industry - Lasers in nuclear energy - Holography - Recording and reconstruction of hologram.

Unit - IV: Laser in Communication **(12 Hours)**

Optical data storage - Optic fibre communication - Types of optical fiber - Block diagram of Laser communication system - advantages of fibre optic communication - Optical computer - LASER Rangers - LIDAR.

Unit - V: Laser in Medicine **(12 Hours)**

LASER in Medicine and Surgery - LASER in ophthalmology - LASER endoscopy - photocoagulation - LASER safety and hazard.

Books for Study

1. Avadhanulu M.N. Hemne P.S, *An introduction to LASERS theory and applications*. (Second Edition). S. Chand & Company, New Delhi, 2012.
2. N. Subrahmanyam Brijlal, M. N. Avadhanulu, *A Textbook of Optics*, 2008.

Unit	Book	Chapters	Sections
I	1 2	1,22	1.18-1.21, 1.22-1.24, 1.25, 1.27, 1.29, 1.30, 1.31 22.19
II	1	2	2.2, 2.3, 2.3.1, 2.3.2, 2.3.5, 2.4, 2.4.1, 2.4.2.1, 2.4.3, 2.5, 2.7
III	1 2	5,23	5.3, 5.3.1, 5.3.2, 5.3.3, 5.2.3, 5.3.5, 5.4, 5.20 23.2
IV	1 2	5,24	5.21.3, 5.22, 5.23, 5.17, 5.1.6.2 24.8, 24.13
V	1	5	5.6, 5.7, 5.8, 5.9

Books for Reference

1. Nambiyar K.R. *LASER: Principles, Types and Applications*.2004.
2. S. Nagabhushana, N. Sathyanarayana. *Lasers and optical instrumentation*, Reprint. 2013.

Web Resources*

1. https://www.eriesd.org/cms/lib/PA01001942/Centricity/Domain/691/Science-Resource-Guide.pdf
2. https://www.fisica.net/optica/Laser-and-its-Applications.pdf

(* subject to availability - not to be used for exam purpose)

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

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63EG02A	GE – 2: LASER TECHNOLOGY AND ITS APPLICATION	4	3

Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	1	3	3	3	2	1	2.3
CO-2	3	3	3	2	1	3	3	2	2	1	2.3
CO-3	3	3	3	2	1	3	2	3	2	1	2.3
CO-4	3	3	2	2	1	3	3	3	2	1	2.3
CO-5	3	3	2	2	1	3	3	2	2	1	2.3
Mean Overall Score											2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credit
VI	21UPH63EG02B	GE - 2: PHYSICS OF EARTH	4	3

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO-1	envisage and frame the whole earth structure with its subsystem's atmosphere, biosphere, hydrosphere, lithosphere, mantle and core.	K1
CO-2	explore their physical characteristics and geological functions of macro earth in scientific method.	K4
CO-3	estimate the earth's age and temperature by applying the laws of thermodynamics	K2, K3
CO-4	understand the gravity, electric and magnetic fields of the earth	K2
CO-5	predict the events like earthquake, landslide, Valona through geophysical techniques and to step to save life.	K2

Unit- I: The Earth System **(12 Hours)**

The scientific method - Geology as a science - Earth's shape and surface - Earth's density - The Mantle and core - The crust - The inner core Chemical Composition of Earth's Major Layers - The plate tectonic system - Continental drift - seafloor spreading - divergent Boundaries - Convergent Boundaries - Seismic Waves - measuring earthquakes - Exploring Earth's Interior with Seismic Waves - Layering and Composition of Earth's Interior.

Unit - II: Geothermics and Geochronology **(12 Hours)**

Geothermics: Earth's Internal Temperature: Heat flow through Earth's interior - Conduction through the Lithosphere - Convection through the Mantle and the Core - Temperature inside the Earth - Volcanism - Volcanoes and its types - Geochronology: Estimating the Earth's age - Cooling of the Sun - cooling of the Earth - Increase of the Earth - Moon separation - Oceanic salinity and Sedimentary accumulation.

Unit - III: Geomechanics **(12 Hours)**

Kepler's Law of planetary motion - Orbital parameters - Earth's Size and Earth's shape - Gravitation: The law of universal gravitation - Gravitational acceleration - Gravitational potential - The Earth's Rotation: Centripetal and centrifugal acceleration - Changes in the earth rotation.

Unit - IV: Geoelectricity and Geomagnetism **(12 Hours)**

Geoelectricity: Electrical properties of the Earth - Electrical surveying - Natural potentials and currents - self potential - Telluric currents - Electrical conductivity in the Earth - Geodynamo - Geomagnetism: Introduction - The magnetic field of external origin - The magnetic field of internal origin.

Unit - V: Ground Water and Climate System **(12 Hours)**

Components of the climate system: Atmosphere – hydrosphere – cryosphere - lithosphere and biosphere. The green house effect: A Planet without Greenhouse Gases - Earth's Greenhouse Atmosphere - Geologic cycling of water - Hydrology of ground water - Hydrology and climate.

Books for Study

1. J.P. Grotzinger, *Understanding Earth*, 7th Edition, W.H. Freeman and Company, 2014.
2. William Lowrie, *Fundamentals of Geophysics*, 2nd Edition, Cambridge University Press, 2007.
3. J.S. Monroe, *Physical Geology*, 6th Edition, Thomson Corporation, 2007.

Books for References

1. F.D. Stacey, P.M. Davis, *Physics of the Earth*, 4th Edition, Cambridge University Press, 2008.
2. A.E. Mussett, *Looking into the Earth*, 1st Edition (2000), Cambridge University Press, Reprint 2009.

Unit	Book	Chapters	Sections
I	1	1, 2, 13, 14	Page No. 4-17, 28-38, 356-361, 383-390.
II	1 2 3	14 4 5	Page No. 390-394. 4.1.1, 4.1.2 5.1, 5.2, 5.3
III	1 2	1 4,5	Page No. 17-18. 4.3.3.1, 4.3.4, 4.3.7, 5.4.1, 5.4.3, 5.4.4
IV	2	1, 2	1.1.1, 2.1, 2.2, 2.3
V	1	15, 17	Page No. 407-414, 469-488.

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

Semester	Course Code			Title of the Course					Hours	Credit
VI	21UPH63EG02B			GE - 2: PHYSICS OF EARTH					4	3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	2	2	2	2	3	2.3
CO-2	2	2	1	2	3	3	2	3	2	2	2.2
CO-3	3	3	3	2	3	2	2	2	2	2	2.4
CO-4	3	2	2	2	3	2	2	3	2	2	2.3
CO-5	2	3	2	2	2	3	2	2	3	2	2.3
Mean Overall Score											2.3 (High)

B.Sc. PHYSICS

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**
II	I-IV	**General English**	4	20	12	**12**
III	I-VI	**Core**				
		Theory	11-16			
		Practicals	3-6			
	V-VI	Project Work	1	90	60	
	IV-VI	**Core Electives**	3	12	12	
	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**
1V		**Skilled Based Electives:**				
	V	Between Schools (BS)	1	2	2	
	VI	Within School (WS)	1	2	2	
	V	**Inter Departmental Courses (IDC)** Soft Skills / NCC	1	2	2	
		Non-Major Courses (NMC)				
	I	Communicative English	1	-	5	
	II	Computer Literacy	1	2	2	
	III	Environmental Studies (Partial Online Course)	1	2	2	
	I-IV	**Value Education**	4	8	8	**23**
V	I-V	**SHEPHERD & Gender Studies**	-	-		
	I-V	**AICUF, Fine Arts, Nature Club, NCC, NSS**	-	-	-	
	V	**Career Guidance & Training**	**-**	**-**	**-**	**5**
		TOTAL		**180**	**150**	**150 (+4 extra 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 Revision	UG Code of the Dept	Semester	Specification of the Part	Subject Category	Running no. in that part
↓	↓	↓	↓	↓	↓
17	U##	*x*	*x*	*xx*	*xx*
17	**UPH**	**1**	**3**	**2**	**1**

For Example :

I B.Sc. Physics, first semester **Mechanics and Properties of Matter**
The code of the paper is 17UPH130201.
Thus, the subject code is fixed for other subjects.

Subject Category

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)

UG - Distribution of CIA Marks	
Passing Minimum: 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 x 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:

$$\text{GPA} = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i}, \qquad \text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^{n} C_i M_i}{\sum_{i=1}^{n} C_i}$$

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	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
40 and above but below 50	5	C
Below 40	0	RA

Table-2: Final Result

CGPA	Classification of Final Results	Corresponding Grade
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	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. Physics

Course Pattern - 2017 Set

Sem.	Part		Code	Course	Hr	Cr
I	I	Language	17UGT110001	Language– I (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE120101	General English – I	5	3
	III	Core	17UPH130201	Core1:Mechanics &Properties of Matter	7	5
			@	Physics Practical-I	3	-
			@	Basic Workshop Practice	3	-
		Allied	17UPH130401	Allied I (mandatory)-Mathematics-I	6	5
	IV	NMC	17UPH140801	Communicative English	-	5
		V. Edn	17UFC141001	Essentials of Humanity	2	2
				Total for Semester-I	**30**	**23**
II	I	Language	17UGT210002	Language – II (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE220102	General English – II	5	3
	III	Core	17UPH230202	Core 2: Sound, Thermal & Statistical Physics	5	4
			17UPH230203	Core 3: Physics Practical-I	3	3
			17UPH230204	Core 4: Basic Workshop Practice	3	3
		Allied	17UPH230402	Allied I (mandatory)-Mathematics-II	6	5
	IV	NMC	17UCE240802	Computer Literacy	2	2
		V. Edn	17UFC241002	Fundamentals of Human rights	2	2
				Total for Semester-II	**30**	**25**
III	I	Language	17UGT310003	Language – III (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE320103	General English – III	5	3
	III	Core	17UPH330205	Core5:Mathematical Physics	8	6
			@	Physics Practical –II	3	-
		Extra Credit Course	17UPH330501	Massive Open Online Course	-	(2)
		Allied	17UPH330403A	Allied II (optional) Chemistry-I	4	4
			17UPH330403B	Computer Science-I		
		Allied	@	Allied: Chemistry Practical / Computer Practical	2	-
	IV	NMC	17UCE340901	Environmental Studies	2	2
		V. Edn.	17UFC341003A	Formation of youth - I OR	2	2
			17UFC341003B	Religious Doctrine - I		
				Total for Semester-III	**30**	**20+(2)**

Sem	Part		Code	Subject Title	Hr	Cr
IV	I	Language	17UGT410004	Language-IV (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE420104	General English-IV	5	3
	III	Core	17UPH430206	Core 6: Electricity & Magnetism	6	4
			17UPH430207	Core 7: Physics Practical-II	3	3
		Allied	17UPH430404A 17UPH430404B	Allied-II (optional): Chemistry-II / Computer Science-II	4	4
			17UPH430405A 17UPH430405B	Allied: Chemistry Practical / Allied: Computer Practical	2	2
		Core Elec.1 WS	17UPH430301A 17UPH430301B 17UPH430301C	Energy Physics (or) Physics of Material (or) Fundamentals of Electricity & Magnetism	4	4
	IV	V. Edn	17UFC441004A	Formation of youth-II (or)	2	2
			17UFC441004B	Religious Doctrine-II		
				Total for Semester IV	**30**	**25**
V	III	Core	17UPH530208	Core 8: C programming for physics	5	4
			17UPH530209	Core 9: Atomic Solid State & Nuclear Physics	6	4
			17UPH530210	Core 10: Analog Electronics	5	4
			17UPH530211	Core 11: Physics Practical-III	6	3
		Extra Credit Course	17UPH530502	Extra Credit Course	-	(2)
		Core Elec.2 WD	17UPH530302A	Photography and Videography (or)	4	4
			17UPH530302B	Biomedical Instrumentation		
	IV	SB Elec.	17UPH540601	Electrical Wiring (BS)	2	2
		SPL	17UPH530212	Astronomy (Partial on-line)	-	2
	IV	IDC	17USS540701A	Soft Skills	2	2
			17USS540701B	National Cadet Corps (NCC)		
				Total for Semester V	**30**	**25+2**
VI	III	Core	17UPH630213	Internship	-	2
			17UPH630214	Core 12: Optics, Spectroscopy and Laser	5	4
			17UPH630215	Core 13: Quantum Mechanics & Relativity	5	4
			17UPH630216	Core 14: Digital Electronics & Microprocessor	5	4
			17UPH630217	Core 15: Physics Practical – IV	6	3
			17UPH630218	Project Work	3	2
			17UPH630219	Comprehensive Examination	-	2
		Core Elec.3 WD	17UPH630303A	Communication systems (or)	4	4
			17UPH630303B	Astrophysics		
	IV	SB Elec.WS	17UPH640602	Cell Phone Servicing	2	2
				Total for Semester VI	**30**	**27**
I–V	V	SHEPHERD	17UCW651101	Community service Work (SHEPHERD) & Gender Studies	-	5
				Total for All Semesters	**180**	**150+4**

* Compulsory Internship Programme for UG will be arranged during the Summer Vacation before the Vth Semester.

Note:

Comprehensive Examination will be conducted as online objective type test based on the question bank given to the students.

Skill Based Elective (partly online)

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. Enhancing conceptual knowledge
2. Awareness on impact of physics
3. Observational, measuring and computational techniques
4. Imparting experimental skills
5. Problem analyzing, logical thinking, reasoning, troubleshooting and solving skill
6. Hands on training in workshop and Information Technology/Techniques
7. Ethics, Social Responsibility, Leadership and Entrepreneurial Skills Research Orientation and Internship and Employability Enhancement.

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பருவம்: 1 **மணி நேரம்: 4**

17UGT110001 **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 சிறுகதைகள்
உரைநடை- 4முதல் 6 முடிய உள்ள கட்டுரைகள்
(10 மணிநேரம்)

பாடநூல்

1. பொதுத்தமிழ்- செய்யுள் திரட்டு- தமிழாய்வுத்துறை வெளியீடு-2017-2020
2. சமூகவியல் நோக்கில் தமிழ் இலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2
3. உரைநடை நூல் - தமிழாய்வுத்துறை வெளியீடு.
4. சிறுகதைத்தொகுப்பு : (நாட்டுடைமையாக்கப்பட்ட படைப்பாளர்களின் சிறுகதைகள்), தமிழாய்வுத்துறை வெளியீடு.

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

Semester I	Course Code 17UGT110001			Title of the Paper பொதுத்தமிழ்-1									Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	5	4	3	5	5	4	4	4	3	3	4	5	4.2
CO2	5	5	5	3	4	5	4	5	4	3	3	4	5	4.2
CO3	4	4	5	4	3	4	3	5	4	3	3	4	5	3.9
CO4	5	5	4	4	4	5	5	5	4	3	5	5	5	4.5
CO5	5	5	5	4	4	4	4	5	4	3	4	5	5	4.0
CO6	5	5	5	3	4	4	4	4	4	5	4	3	5	3.8
													Mean Overall Score	4.1

Result: The Score for this Course is 4.1 (Very 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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	**Mean Overall Score for COs** = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

Semestre: I **Hours/Week: 4**
17UGH110001 **Credits : 3**

HINDI-I

Course Outcomes

At the end of the course, a student should be able to demonstrate…

* 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**

Veer Shivaji, Pronoun, Danush Yagna, Baathcheeth-Maidaan mein

Unit-V **14 hours**

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.

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

Semester I	Course Code 17UGH110001					Title of the Paper Hindi-I						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	3	4	2	2	2	3	4	4	3.2	
CO2	3	3	2	3	2	4	4	4	3	3	2	3.0	
CO3	3	2	2	3	4	2	2	2	3	4	4	2.8	
CO4	3	2	2	3	2	4	4	4	4	2	2	2.9	
CO5	3	3	3	3	3	3	4	4	3	3	3	3.2	
CO6	4	4	4	4	3	4	3	2	4	3	3	3.4	
											Mean Overall Score	3.1	

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: I **Heures /Semaine: 4**
17UGF110001 **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 **(10 heures)**

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)**

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.

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

Semester 1	Course Code 17UGF110001					Title of the Paper French-I					Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	4	4	2	3	4	4	4	2	2	3	3	3.2
CO2	3	3	3	3	4	4	4	3	3	3	2	3.2
CO3	3	2	3	2	4	3	2	4	4	3	3	3.0
CO4	3	3	4	3	4	2	2	3	3	2	2	2.8
CO5	3	3	4	3	4	3	3	3	4	5	2	3.4
CO6	3	4	3	3	3	3	3	3	2	4	3	3.1
									Mean Overall Score			3.1

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: I **Hours/Week: 4**

17UGS110001 **Credits : 3**

SANSKRIT-I

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
* Introduction of the writing skills
* Introduction of Sanskrit Aksharas.
* Introduction of Present tense forms
* Implementation of good thoughts from Subashitani

Unit-I **8 hours**

Akharavivaranam – Svaras & Vyanjanaani – Samyukta Aksharani.

Unit-II **12 hours**

Shabdadayah – Aakaaraanta, ikaar aantah. ukaaraantah.

Shabdadayah – Aakaaraanta, iikaar aantah. uukaaraantah.

Unit-III **12 hours**

Anuvaada Prayogah.

Unit- IV **14 hours**

Lat Lakarh – Parasmai – Pada Prayogah = Vakyarupah.

Unit-V **14 hours**

Subhaashitaani

Books Recommended

1. Kulapathy, K. M., Saral Sanskrit Balabodh, Bharathiya Vidya Bhavan, Munshimarg, Mumbai-400 007, 2014
2. R.S. Vadhyar & Sons, Book-Sellers and Publishers, Kalpathi, Palghat-678003, Kerala, SOuth India, Shabdha Manjari, 2014
3. Balasubramaniam R., Samskrita Akshara Siksha, Vangals Publication, 14th Main Road, JP Nagar, Bangalore -78, 2015.

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

Semester I	Course Code 17UGS110001	Title of the Paper Sanskrit-I										Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	5	3	5	4	4	3	3	3	3	3	4		3.1
CO2	4	3	4	4	4	4	4	4	4	3	4		3.3
CO3	4	3	3	4	4	3	4	4	3	3	4		3.1
CO4	4	3	3	4	3	3	4	4	3	3	4		3.0
CO5	4	4	4	3	4	4	3	3	3	4	4		3.1
CO6	5	4	4	4	4	3	3	3	3	3	4		3.1
									Mean Overall Score				3.1

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: I **Hours/Week: 5**
17UGE120101 **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)

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

Semester I	Course Code 17UGE120101					Title of the Paper General English-I								Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	4	4	4	5	4	4	4	3	3	4	4		3.80
CO2	4	3	4	4	4	5	5	4	4	4	4	4	4		4.10
CO3	4	3	4	4	4	3	3	4	4	3	3	4	4		3.60
CO4	4	3	2	4	4	4	4	3	3	5	5	4	4		3.80
CO5	4	3	4	4	4	4	4	3	3	4	4	5	5		3.90
CO6	5	4	4	3	3	4	4	3	4	4	5	4	4		3.90
												Mean Overall Score			3.85

Result: The Score for this Course is 3.85 (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

***Values Scaling*:**

$$\textbf{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \textbf{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester I **Hours/Week: 7**
17UPH130201 **Credits: 5**

MECHANICS AND PROPERTIES OF MATTER

Course Outcomes:

1. The concepts of statics, hydrostatics, hydrodynamics and the rigid body dynamics in terms of Moments of Inertia.
2. Learn to solve problems in statics
3. Gravitation at various situations and its applications
4. Acquire a knowledge of variations of acceleration due to gravity and its importance
5. The basics of Elasticity and its importance in beams, girders
6. Acquire the knowledge of experimental ideas of finding elasticity
7. The concepts of viscosity, surface tension and the various methods
8. Acquire the knowledge of experimental ideas of finding viscosity and Surface tension

UNIT I: STATICS (12 Hrs)

Friction-Laws of friction-Equilibrium on a rough inclined plane-two body problem and the reduced mass-impulse of a force- Collision – oblique impact of a smooth sphere on a fixed smooth plane- Direct impact of two smooth spheres – loss of kinetic energy due to direct impact and oblique impact of two smooth spheres.

UNIT II: HYDROSTATICS AND HYDRODYNAMICS (12 Hrs)

Centre of pressure – centre of pressure of a rectangular lamina and triangular lamina – Atmospheric pressure – Variation of atmospheric pressure with altitude – Equation of continuity – Energy of liquid –Euler's equation – Bernoulli's theorem –Applications.

UNIT III: DYNAMICS OF RIGID BODIES (12 Hrs)

Moment of inertia - Radius of gyration - Theorems of M .I - M.I of circular disc, solid cylinder , hollow cylinder , solid sphere and hollow sphere - K.E of a rotating body – M.I of a diatomic molecule – Rotational energy state of a rigid diatomic molecule - centre of mass – conservation of linear momentum – Relation between Torque and angular momentum.

UNIT IV: GRAVITATION AND ELASTICITY (12 Hrs)

Newton's law – Kepler's law – G by Boy's method – Gravitational field and potential – potential and field due to a spherical shell and solid sphere –

Compound pendulum – Modulli of elasticity – work done in a strain – Rigidity modulus by static torsion (scale & telescope) Torsional oscillation of a body - Bending of beams – bending moment – cantilever – Y - Uniform and non- uniform bending.

UNIT V: VISCOSITY AND SURFACE TENSION (12 Hrs)

Critical velocity – Poiseullie's formula – coefficient of viscosity - h by variable pressure head – Terminal velocity and Stoke's formula – Stokes method – variation of viscosity with temperature and pressure – viscosity of gases – Rankine's method – Surface tension – work done – Angle of contact – Quincke's method –Drop weight method.

BOOKS FOR STUDY:

1. R. Murugeshan , Mechanics and Mathematical Physics , S. Chand & Company Ltd New Delhi (Third Revised Edition 2008).
2. R. Murugeshan, Properties of Matter, S. Chand & company Ltd, New Delhi (2016).

Unit	Book	Sections
I	1	14.1-14.3,14.5,2.4
	2	8.1 – 8.6
II	1	4.1-4.6, 4.8, 5.1-5.4
III	2	7.1-7.3,7.5-7.7, 7.9, 7.10, 10.5,10.6
	1	13.1, 13.3,13.4,13.5.
IV	2	6.1-6.6, 6.10, 1.1,1.2, 1.5, 1.11,1.13 -1.16, 1.21 .
V	2	2.1-2.3,2.5,2.7 -2.10, 2.13,2.14, 3.1,3.3,3.6,3.13,3.15,3.17

BOOKS FOR REFERENCE:

1. Mechanics, D.S. Mathur , S.Chand& Company Ltd, New Delhi(2000)
2. Properties of matter by BrijLal and N. Subramaniam, S. Chand & Co, New Delhi(1994)
3. Fundamentals of Physics D. Halliday, R. Resnick and J. Walker, 6th edition, Wiley, NY.

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

Semester I	Course Code 17UPH130201				Title of the Paper: MECHANICS AND PROPERTIES OF MATTER								Hours 7	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	3	1	3	5	5	4	4	4	3	1	1	2	3.2
CO2	3	3	1	3	4	3	2	4	4	5	3	2	4	3.2
CO3	4	3	1	2	4	4	3	4	4	3	2	2	4	3.1
CO4	4	3	2	3	4	3	3	4	4	4	1	3	5	3.3
CO5	5	2	2	3	3	4	3	3	3	3	2	3	4	3.1
CO6	4	3	1	3	4	3	2	3	3	4	3	2	4	3.0
CO7	5	3	2	3	4	5	4	3	4	3	2	1	2	3.2
CO8	4	3	2	3	4	4	2	3	3	4	1	2	4	3.2
												Mean Overall Score		3.1

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester I **Hours/Week: 6**
17UPH130401 **Credits: 5**

Allied: MATHEMATICS-I

Course Outcomes:

1. Basic Properties of Integration and Differentiation.
2. Derivation of Reduction Formulas.
3. Solving Differential Equations
4. Expansions of Trigonometric functions
5. Basic concepts of Matrix
6. Properties of Matrices and Eigen Values and vectors.
7. Concept of limit of a sequence and series.
8. Techniques in Series

Unit - I: Differential and Integral Calculus

Higher derivatives - Leibnitz's formula for the nth derivatives of a product (No proof) - Integration by parts. (Book 1 : Chapter 6 - Sec 6.1, pp: 266-281, Book 2 : Chapter 1 - Sec 12, pp: 68-72)

Unit - II: Reduction formula

Properties of definite integrals - Reduction formula for cosnx, sinnx, xneax, cosnx sinnx and tannx.

(Book 2 : Chapter 1 - Sec 11, 13.1,13.3 - 13.6, pp: 61-67, 73-82)

Unit - III: Differential equations

First order differential equations - Variable separable - Homogenous equations - Non-homogenous equations - Linear equation - Bernoulli's equation. Second order differential equations - linear equation with constant co-efficients. (Book 3 : Differential equations - Chapter 2 - Sec 1-5, pp: 7-18, Chapter 3 - Sec 1-4, pp: 42-60)

Unit - IV: Algebra

Matrices - Rank of a matrix - Solving simultaneous linear equations in three unknowns using elementary operations method - Eigen values and Eigen vectors - Verification of Cayley's Hamilton theorem. (Book 1 : Chapter 3 - Sec 3.2 - 3.4, pp: 137 - 160).

Unit - V: Convergence of Series

Concept of limit of a sequence - limit of a function - Simple problems - Convergence, divergence and oscillation of a series - geometric series -

tests of convergence and divergence, comparison, ratio and root tests (without proof). (Book 4 : Chapter 6 - Sec1-14)

Books for Study

1. Ancillary Mathematics, Vol-I, 2009 Edition, S. Narayanan, R.Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy.
2. Ancillary Mathematics, Vol-II, 2010 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy.
3. Ancillary Maths, Book II, 1999 Edition, S. Narayanan and T.K. Manickavasagam pillai.
4. Higher Mathematics for Engineering and Science, Third Edition, The National Publishing Co., Madras, 1986, M.K.Venkataraman

REFERENCES

1. S.Narayanan, R.Hanumantha Rao, T.K.Manicavachagom Pillay," Ancillary Mathematics" Volume-I-2009 edition.
2. S.Narayanan & T.K.Manichavachagom Pillay," Differential equation and its applications", S.Viswanathan Pvt. Ltd., 2001

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

Semester I	Course Code 17UPH130401	Title of the Paper: Allied: MATHEMATICS-I											Hours 6	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	3	3	5	4	4	4	3	2	4	3	2	2	3.3
CO2	4	4	2	4	4	4	4	2	3	4	3	2	2	3.2
CO3	3	4	2	4	5	4	4	2	3	4	3	2	3	3.3
CO4	4	3	2	4	4	4	4	3	2	4	3	2	2	3.2
CO5	4	4	2	4	4	4	3	2	3	4	4	2	2	3.2
CO6	3	3	3	4	4	3	3	3	3	4	3	3	3	3.2
CO7	3	4	2	4	5	4	4	2	3	4	2	2	3	3.2
CO8	3	4	2	4	5	4	4	2	3	4	2	2	3	3.2
												Mean Overall Score		3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester I **Hours/Week:2**
17UFC141001 **Credits: 2**

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.

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

Semester I	Course Code 17UFC141001					Title of the Paper ESSENTIALS OF HUMANITY								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	1	5	4	3	5	4	5	5	5	5	4	3	4.0	
CO2	2	1	5	5	3	5	4	5	5	5	5	4	3	4.0	
CO3	2	1	5	5	4	5	4	4	5	5	5	5	3	4.1	
CO4	2	2	5	4	2	5	4	4	5	4	5	5	5	4.0	
CO5	5	2	5	5	2	5	4	4	5	5	4	4	4	4.2	
CO6	2	1	5	5	4	4	4	5	5	4	4	4	3	3.8	
												Mean Overall Score		4.0	

Result: The Score for this Course is 4.0 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

பருவம்: 2 **மணி நேரம்: 4**

17UGT210002 **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, தமிழாய்வுத்துறை வெளியீடு, 2017-10
2. சமூகவியல் நோக்கில் தமிழ் இலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2
3. உரைநடை நூல் - தமிழாய்வுத்துறை வெளியீடு.

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

Semester II	Course Code 17UGT210002					Title of the Paper பொதுத்தமிழ்-II								Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	4	4	4	4	5	5	5	4	4	2	4	4		4.2
CO2	4	5	5	4	5	5	5	5	5	4	3	4	3		4.4
CO3	5	5	4	4	5	5	5	5	4	3	3	4	3		4.3
CO4	5	5	4	3	4	5	5	5	4	3	3	4	3		4.1
CO5	5	5	4	3	4	5	5	5	4	3	3	4	3		4.1
CO6	5	5	5	5	4	5	5	5	4	3	3	4	3		4.1
													Mean Overall Score		4.2

Result: The Score for this Course is 4.2 (Very 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

Values Scaling:

$$\textbf{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \textbf{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: II **Hours/Week: 4**
17UGH210002 **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**

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 **12 hours**

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.

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

Semester II	Course Code 17UGH210002						Title of the Paper Hindi-II						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)							
	PO1	PO2	PO3	PO4	PO5		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	Mean Score of COs	
CO1	4	4	4	3	4		3	2	3	4	4	4	3.5	
CO2	3	3	2	3	2		4	4	3	3	2	2	2.8	
CO3	3	2	2	3	4		2	4	4	2	3	4	3.0	
CO4	3	2	2	3	3		4	3	3	4	3	3	3.0	
CO5	3	3	3	3	3		3	3	4	3	4	3	3.1	
CO6	4	4	4	4	3		4	3	3	3	3	2	3.3	
											Mean Overall Score		3.1	

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: II **Heures /Semaine: 4**
17UGF210002 **Credits: 3**

FRANÇAIS-II

Course Outcomes:

* 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)**

Montrer son inquiétude, s'excuser, exprimer son appréciation, décrire quelqu'un, décrire quelque chose

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

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

Semester II	Course Code 17UGF210002					Title of the Paper French-II						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	2	3	4	3	3	2	2	3	3	3.0	
CO2	3	3	3	3	4	3	3	2	2	2	3	2.8	
CO3	3	2	3	2	4	3	3	2	2	3	3	2.7	
CO4	3	3	4	3	4	3	3	3	3	3	3	3.2	
CO5	3	3	4	3	4	2	4	4	4	4	5	3.6	
CO6	3	4	3	3	3	3	4	4	3	4	4	3.5	
										Mean Overall Score		3.1	

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: II **Hours/Week: 4**

17UGS210002 **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-I **8 hours**

Visheshanaah
Saravanaama shabdas.

Unit-II **12 hours**

Sandhi Niyamaah Abhyaasah.(Guna, Visarga, Dirgha, Vrddhi)

Unit-III **12 hours**

Lang lakaarah. Kriyapadaani

Unit-IV **14 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

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

Semester II	Course Code 17UGS210002					Title of the Paper Sanskrit-II						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	5	3	5	4	4	3	3	3	4	4	3		3.2
CO2	4	3	4	4	4	3	3	3	3	4	3		3.0
CO3	4	3	3	4	4	3	3	3	4	4	3		3.0
CO4	4	3	3	4	3	3	3	4	4	4	3		3.0
CO5	4	4	4	3	4	3	4	4	4	3	4		3.2
CO6	5	4	4	4	4	3	3	3	4	4	3		3.2
											Mean Overall Score		3.1

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: II **Hours/Week: 5**
17UGE220102 **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)

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

Semester II	Course Code 17UGE12010**2**					Title of the Paper General English-II								Hours 5	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	4	4	4	4	5	4	4	3	3	3	4	4		3.9
CO2	4	3	4	4	4	5	5	4	4	4	4	4	3		4.0
CO3	4	3	4	4	4	3	3	4	4	3	3	4	4		3.6
CO4	4	3	3	4	4	4	4	3	3	5	5	4	4		3.8
CO5	4	3	4	4	4	4	4	3	3	4	4	5	5		3.9
CO6	5	4	4	3	3	4	4	3	4	4	5	4	4		3.9
													Mean Overall Score		**3.8**

Result: The Score for this Course is 3.8 (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

Values Scaling:

$$\textbf{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \textbf{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester II **Hours/Week: 5**

17UPH230202 **Credits: 4**

SOUND, THERMAL AND STATISTICAL PHYSICS

Course Outcomes:

1. To know and understand the physics of sound and its applications
2. To know principles of ultrasonics and its applications
3. To learn the nature and transmission of heat by different mechanisms
4. To learn experimental methods to determine the transmission of heat.
5. To understand the laws of thermodynamics and their applications.
6. To Know and analze Maxwell's thermo dynamical relations and their importance.

UNIT-I: SOUND (12 Hrs)

Wave motion – characteristics of wave motion – transverse, longitudinal wave motion – Newton's formula for velocity of sound – effect of temperature, pressure, density of the medium, humidity and wind – stationary waves – Helmholtz resonator, theory of resonator, vibrations in rods - Kundt's tube -Doppler effect – applications, Acoustics of buildings – Reverberation – Sabine formula for reverberation- Ultrasonics – production and detection of ultrasonic waves – applications of ultrasonic waves.

UNIT-II: TRANSMISSION OF HEAT (12 Hrs)

Coefficient of thermal conductivity- rectilinear flow of heat along a bar – Forbes method – Lee's method for bad conductors and liquids– convection and its applications – Black body – Stefan Boltzmann law – Wien's displacement law – Rayleigh- Jeans law - derivation and experimental verification of Stefan's law – Newton's law of cooling from Stefen's law – solar constant – temperature of the Sun - Angstrom's Pyroheliometer.

UNIT-III: THERMODYNAMICS I (12 Hrs)

Thermodynamic system – zeroth law of thermodynamics – internal energy - I law of thermodynamics – reversible and irreversible process – Carnot's ideal heat engine – Carnot's cycle – internal combustion engine – Otto and diesel engine - second law of thermodynamics – entropy – change in entropy during reversible and irreversible process – entropy and second law of thermodynamics – third law of thermodynamics

UNIT- IV: THERMODYNAMICS II (12 Hrs)

Thermodynamic variable – Maxwell's thermodynamic relations –applications – Joule Thomson cooling – temperature of inversion – Clausius Claperon's

latent heat equation – thermodynamic potential – T.dS equation – Joule Thomson porous plug experiment – Joule Thomson expansion – liquefaction of gases – liquefaction of hydrogen and Helium – adiabatic demagnetization – refrigerator.

UNIT-V: STATISTICAL THERMODYNAMICS (12 Hrs)

Statistical equilibrium – probability theorems in statistical thermodynamics – Maxwell Boltzmann distribution law – Maxwell - Boltzmann distribution in terms of temperature –Phase space – Fermi-Dirac distribution law – application to electron gas – Bose-Einstein distribution law – application to photon gas - radiation laws – comparison of the three statistics.

BOOKS FOR STUDY:

1. Brijlal and Subramanyam, Sound, S. Chand and Co., 1994.
2. Brijlal and Subramanyam, Heat and thermodynamics, S. Chand and Co., 2016.

Unit	Book	Sections
I	1	Chapter 4: 4.1,4.3-4.5, Chapter 5: 5.4 – 5.9, Chapter 6: 6.1, 6.16, 6.17, Chapter 7: 7.12, 7.13 Chapter 8:8.1 -8.3, 8.6 Chapter 10: 10.14 – 10.16, 10.23 – 10.25, 10.27
II	2	Chapter 15; 15.1, 15.2, 15.9, 15.10, 15.12, 15.22, 15.23 Chapter 8; 8.8, 8.12, 8.14, 8.15, 8.20, 8.22, 8.21, 8.26, 8.27, 8.28
III	2	Chapter 4; 4.1, 4.2, 4.6, 4.7, 4.20, 4.23, 4.24, 4.31, 4.33, 4.28 Chapter 5; 5, 5.4, 5.6, 5.15 Chapter 6; 6.15
IV	2	Chapter 6; 6.1, 6.3, 6.4.2, 6.4.4, 6.4.7, 6.5, 6.9 Chapter 2; 2.21 Chapter 7; 7.5, 7.6, 7.10, 7.11, 7.16, 7.21
V	2	Chapter 9; 9.8 Chapter 11; 11.3, 11.4 Chapter 10; 10.4 Chapter 12; 12.8, 12.9, 12.5, 12.6, 12.7, 12.15

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

Semester II	Course Code 17UPH230202				Title of the Paper: SOUND, THERMAL AND STATISTICAL PHYSICS								Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	3	2	3	4	4	3	2	4	3	3	3	1	3.00
CO2	3	2	1	2	4	4	4	3	4	4	4	3	2	3.08
CO3	4	3	3	3	4	3	3	3	3	3	4	4	1	3.15
CO4	3	3	1	4	3	3	4	2	3	3	4	3	1	2.84
CO5	3	3	1	4	3	3	3	3	3	3	3	3	2	2.84
CO6	4	4	1	3	3	3	3	3	3	4	3	4	3	3.15
											Mean Overall Score			3.01

Result: The Score for this Course is 3.0 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester II **Hours/Week: 6**
17UPH230203 **Credits: 3**

PHYSICS PRACTICAL-I

Any 20 Experiments

1. Surface Tension – drop weight method.
2. Surface Tension – capillary rise method.
3. Viscosity – constant pressure head.
4. Viscosity – variable pressure head.
5. Viscosity – stokes method.
6. Young's modulus – cantilever / stretching.
7. Young's modulus – non uniform bending (pin and microscope).
8. Sonometer – frequency of the tuning fork – RD of solid.
9. Sonometer – AC frequency determination.
10. Spectrometer – refractive index of a solid prism.
11. Spectrometer – dispersive power of a prism.
12. Potentiometer – internal resistance.
13. Potentiometer – low range voltmeter.
14. P.O Box – temperature coefficient.
15. Carey Fosters bridge – R and ñ.
16. Convex lens – f, R and μ.
17. Concave lens – f, R and μ.
18. Field along the axis of a coil – deflection magnetometer.
19. M1/M2- Tan A Tan B simultaneously.
20. M1/M2 – vibration magnetometer.
21. Air wedge.
22. Newton's rings.
23. B.G. – Figure of merit.
24. B.G. comparison of EMF's and capacitance.
25. Resonators.
26. g – by fall plate.
27. Specific heat by cooling.
28. Specific heat capacity of solid by the method of mixture.

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Semester II **Hours/Week: 6**
17UPH230204 **Credits: 3**

BASIC WORKSHOP PRACTICE

1. Paper Weight
2. Pen Stand
3. Letter box
4. Wood Carving
5. Electroplating
6. Assembling the Extension board
7. Tube light assembling.

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Semester II **Hours/Week: 6**
17UPH230402 **Credits: 5**

Allied: MATHEMATICS-II

Course Outcomes

1. Applications of Mathematics to Physics
2. Problem Solving Skills.
3. Meaning and Properties of Vectors
4. Concepts of Vector integration
5. Trigonometrical functions and their properties
6. Techniques in numerical methods
7. Complex functions and Integration
8. Applications of Complex integration

Unit - I: NUMERICAL METHODS

Solution of simultaneous linear equations - Gauss Elimination - Gauss Seidal Methods -Numerical Solutions to O.D.E - Solution by Taylor's Methods - Euler's Method - Runge-Kutta Method (4th Order) (Book 4 : Chapter 4 Section 4.2, Chapter 6 Section 6.2 and Chapter 11 - Section 11.6, 11.10, 11.14 and 11.16)

Unit - II: PARTIAL DIFFERENTIAL EQUATIONS

Derivation of p.d.e - By elimination of arbitrary functions - Different Integrals of p.d.e - Standard type of first order equations - Lagrange's equation (Book 2 : Chapter 6-Sec 1-6, pp: 252-273).

Unit - III: VECTORS

Gradient - divergence and curl - Gauss Divergence Theorem - Green Theorem - Stokes Theorem (No proofs of theorem, only simple applications) (Book 2 : Chapter 8 - Sec 1.17-1.20, 6, 8 and 9, pp: 335-350, 381-389, 393-407).

Unit - IV: TRIGONOMETRY

Expansion of Sinnq and Cosnq - Powers of Sines and Cosines of q in terms of function of multiple of q - Hyperbolic functions - Inverse hyperbolic functions (Book 1 : Chapter 5 - Sec 5.1, 5.2 and 5.4, pp: 220-232, 242-256).

Unit - V: COMPLEX ANALYSIS

Analytic function - Cauchy Riemann equations (No derivation, only simple applications) - Residues - Evaluation of definite integrals (Integral over the unit circle only) (Book 3 : Chapter 1 - Sec 11, pp : 43-57, Chapter 5 - Sec 1-3, pp : 185-196).

Books for Study

1. Ancillary Mathematics, Vol-I, 2009 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy.
2. Ancillary Mathematics, Vol-II, 2010 Edition, S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay and Kandaswamy.
3. Complex Analysis, 1997 Edition, S. Narayanan and T.K.Manickavasagam Pillai.
4. Numerical methods for Science and Engineering, M.K.Venkataraman.

References

1. Ancillary Maths, Book II, 1999 Edition, S. Narayanan and T.K. Manickavasagam pillai.
2. Higher Mathematics for Engineering and Science, Third Edition, The National Publishing Co., Madras, 1986, M.K.Venkataraman

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

Semester II	Course Code 17UPH230402				Title of the Paper: Allied: MATHEMATICS-II								Hours 6	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	3	4	4	3	3	3	2	4	4	3	3	3	4	3.3
CO2	4	4	2	4	4	4	4	2	3	4	3	2	2	3.2
CO3	3	4	2	4	5	4	4	2	3	4	3	2	3	3.3
CO4	4	3	2	4	4	4	4	3	2	4	3	2	2	3.2
CO5	4	3	3	5	4	4	4	3	2	4	3	2	2	3.3
CO6	3	3	3	4	4	3	3	3	3	4	3	3	3	3.2
CO7	3	4	2	4	5	4	4	2	3	4	2	2	3	3.2
CO8	4	4	2	4	4	4	4	2	3	4	3	2	2	3.2
												Mean Overall Score		3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester II **Hours/Week: 2**
17UCE240802A **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.

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

Semester II	Course Code 17UCE240802A					Title of the Paper COMPUTER LITERACY							Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	5	4	4	5	5	4	3	4	3	4	4	4	4.15
CO2	5	5	4	4	4	4	4	4	4	3	4	4	4	4.08
CO3	4	3	3	4	4	4	4	4	4	3	4	4	4	3.77
CO4	5	5	4	4	4	5	4	4	4	3	4	4	4	4.15
CO5	4	4	3	4	4	4	4	4	4	3	4	4	4	4.15
CO6	5	5	5	4	4	5	4	4	4	4	4	4	4	4.31
												Mean Overall Score		4.10

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester II **Hours/Week: 2**
17UFC241002 **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 21st Century.

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.

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

Semester II	Course Code 17UFC241002					Title of the Paper FUNDAMENTALS OF HUMAN RIGHTS								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	1	5	5	2	4	4	5	5	4	4	5	5	4.2	
CO2	4	1	5	4	2	4	4	4	4	5	5	5	5	4.0	
CO3	5	1	5	5	2	5	5	4	4	4	5	5	5	4.2	
CO4	4	1	5	5	2	2	4	3	5	5	4	4	5	3.8	
CO5	5	1	5	4	1	5	5	5	5	5	4	4	4	4.1	
CO6	3	1	5	4	1	4	3	5	5	3	4	4	5	3.6	
												Mean Overall Score		3.9	

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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

பருவம்: 3 **மணி நேரம்: 4**

17UGT310003 **புள்ளிகள்: 3**

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 அறிதல்.
- தமிழர்களின் ஈகையும் வீரமும் எடுத்துரைக்கும் புறச்செய்திகளை அறிதல்
- நீதிநூல்கள் மனித வாழ்வை செம்மைப்படுத்தும் பாங்கினை உணர்த்துதல்.

அலகு: 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, முல்லைக்கலி-07)
இலக்கிய வரலாறு - முதற்பாகம் ('தமிழ் மொழியின் தொன்மையும சிறப்பும்' முதல் 'சங்க தொகை நூல்கள்' முடிய) புதினம்.

அலகு: 4 **(12 மணி நேரம்)**

பதிற்றுப்பத்து - பாடல்கள் (12, 24,)
புறநானூறு - பாடல்கள் (46, 86, 122, 214, 246)
அணியிலக்கணம்

அலகு: 5 **(12 மணி நேரம்)**

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

பாடநூல்கள்:

1. செய்யுள் திரட்டு, தமிழாய்வுத் துறை வெளியீடு (2017-2020).
2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, 2014.
3. புதினம் (ஒவ்வொரு கல்வியாண்டும் ஒவ்வொரு புதினம்). காணாமல் போன கவிதை (2017-18).

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

Semester III	Course Code 17UGT310003					Title of the Paper பொதுத்தமிழ்-III								Hours 5	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	5	5	4	5	5	4	5	5	5	4	4	5	4.6	
CO2	5	5	4	3	4	5	4	5	5	5	4	4	5	4.4	
CO3	5	5	5	3	4	5	5	5	5	5	4	3	5	4.5	
CO4	5	5	5	5	4	5	5	5	5	5	4	5	5	4.8	
CO5	5	4	4	4	4	5	5	5	5	5	3	3	5	4.3	
CO6	5	5	5	3	4	5	5	5	5	5	4	3	5	4.5	
													Mean Overall Score	**4.5**	

Result: The Score for this Course is 4.5 (Very 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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: III **Hours/Week: 4**
17UGH310003 **Credits: 3**

HINDI-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**

Ek boondh, Tera Sneh Na Kho oon kavitha kee manovygnaik stiti, Chutti Patra, Sandhi

Unit-III **12 hours**

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 **14 hours**

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.

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

Semester III	Course Code 17UGH310003	Title of the Paper Hindi-III										Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	4	3	4	3	3	3	4	4	4		3.6
CO2	3	3	2	3	2	3	3	3	5	3	5		3.0
CO3	3	3	3	3	4	3	3	4	3	3	3		3.2
CO4	3	2	2	3	3	3	3	3	3	3	4		2.9
CO5	3	3	3	3	3	3	4	3	3	3	4		3.2
CO6	4	4	4	4	3	3	3	3	3	3	3		3.3
										Mean Overall Score			3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: III **Heures /Semaine: 4**
17UGF310003 **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.

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

Semester III	Course Code 17UGF310003					Title of the Paper French-III						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	2	3	4	4	2	3	3	2	2		3.0
CO2	3	3	3	3	4	4	2	3	4	2	3		3.1
CO3	3	2	3	2	4	3	4	3	3	3	3		3.0
CO4	3	3	4	3	4	2	3	3	3	4	4		3.3
CO5	3	3	4	3	4	2	3	3	4	4	4		3.4
CO6	3	4	3	3	3	3	3	3	4	4	4		3.4
											Mean Overall Score		3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: III **Hours/Week: 4**
17UGS310001 **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.

Unit-I **8 hours**

Romodantam. Balakandam. 1-15

Unit-II **12 hours**

Romodantam. Balakandam. 15-30

Unit-III **12 hours**

Vedas – Vedangas. vivaranam.

Unit-IV **14 hours**

Puranas. Upanishads.

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.

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

Semester III	Course Code 17UGS310003	Title of the Paper Sanskrit-III									Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	Mean Score of COs
CO1	5	3	5	4	4	3	3	3	3	3	4	3.1
CO2	4	3	4	4	4	4	3	3	3	4	4	3.1
CO3	4	3	3	4	4	4	4	4	3	3	4	3.1
CO4	4	3	3	4	3	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
										Mean Overall Score		3.1

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	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*:**

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	**Mean Overall Score for COs** = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

Semester: III **Hours/Week: 5**

17UGE320103 **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
1.1 Objectives
1.2 Listening and Reading Skills through Teacher-led Reading Practice
1.3 Glossary
1.3.1 Words
1.3.2 Phrases
1.4 Reading Comprehension
1.5 Critical Analysis
1.6 Creative Task
1.7 General Writing Skill: Letter Writing: Informal
1.8 Grammar: Simple Present Tense
1.9 **Non-Detailed Text:** Dickens, Charles. *Hard Times.*

Unit-II: *The Secret of Success: An Anecdote

2.0 Introduction
2.1 Objectives
2.2 Listening and Reading Skills through Teacher-led Reading Practice
2.3 Glossary
2.3.1 Words
2.3.2 Phrases
2.4 Reading Comprehension
2.5 Critical Analysis
2.6 Creative Task
2.7 General Writing Skills: Letter Writing: Formal

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.

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

Semester III	Course Code 17UGE320103					Title of the Paper General English-III								Hours 5	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	5	5	5	4	5	5	5	5	5	5	5	4	4.84	
CO2	5	5	5	5	5	5	5	5	5	5	5	5	4	4.92	
CO3	5	5	5	5	5	5	5	5	5	5	5	5	4	4.92	
CO4	5	5	5	5	4	5	5	5	5	5	5	5	4	4.84	
CO5	5	5	5	5	4	5	5	5	5	5	5	5	4	4.84	
CO6	5	5	5	5	4	5	5	5	5	5	5	5	4	4.84	
												Mean Overall Score		4.86	

Result: The Score for this Course is 4.86 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester III **Hours/Week: 8**
17UPH330205 **Credits: 6**

MATHEMATICAL PHYSICS

Course Outcomes:

1. The mathematical knowledge for the description of physical phenomena
2. Basic skills and appreciate physics through mathematics
3. Various numerical methods have been used to solve physics problems
4. Understanding the importance of line, surface and volume integrals and applies to solve physics problems
5. Understand the importance of Fourier Series and Fourier Transform
6. Applying the knowledge of Fourier Series and Fourier Transform to solve various wave functions
7. Acquire a knowledge of Beta and Gamma Functions
8. Learn to solve the differential equations of Legendre and Hermite polynomials of different order

UNIT I: MULTIPLE INTEGRALS (12 Hrs)

Double Integrals – Properties – Evaluation – Change of variables: Double, triple integrals- Change of order of integration - Application of multiple integrals: (1) Area enclosed by plane curves (2) Volume and surface area as double integrals (3) volume as a triple integrals

UNIT II: VECTOR CALCULUS (12 Hrs)

Differentiation of vector – Partial derivatives of a vector function – Grad, Div and curl – Physical significance – Line , surface and volume integrals – Gauss Theorem - Stokes Theorem - Green's Theorem - Physical Interpretation - Applications.

UNIT III: FOURIER SERIES AND FOURIER TRANSFORM (12 Hrs)

Trignometric series – Fourier Formulae – periodic extension of a function – Fourier cosine and sine series – Properties of Fourier coefficients – Dirichlet's kernel – Convergence theorem - Applications (Half wave, Full wave, square wave, saw tooth and triangular wave) - Fourier Transform - Definition - Theorems -simple problems.

UNIT IV: SPECIAL FUNCTIONS (12 Hrs)

Definitions - simple properties of Gamma, Beta functions - series solutions of Legendre and Hermite differential equations - Orthogonality properties, Generating functions and Rodrigue's Formula (Expressions only).

UNIT V: NUMERICAL METHODS (12 Hrs)

Transcendental Equation - Solving by Graphical Method - Newton Raphson method - Numerical Integration - Trapezoidal and Simpson's 1/3 rule-Numerical Method of solving differential equation - Euler's Method – Runge Kutta IV order method - applications.

BOOKS FOR STUDY

1. Babu Ram, Engineering Mathematics, Dorling Kindersley, Pearson Education, New Delhi, 2010
2. R. Murugeshan, Mechanics and Mathematical Physics, S.Chand, New Delhi, 3rd edition, 2008.
3. Sathiya Prakash, Mathematical Physics, S.Chand, New Delhi, 2nd edition, 2004.

Unit	Book	Sections
I	1	Chapter 9
II	1	Chapter 10
III	1	17.1-17.4, 17.7, 17.8, 17.10,17.15, 18.2, 18.4,18.5
IV	2	9.1-9.6, 9.8,9.11,9.12
V	3	13.6(a), 13.4(a, b), 13.5(a, e)

BOOKS FOR REFERENCE

1. Demidowich, Problems inMathematical Analysis, MIR publications, Moscow 1976
2. Schaum's outline of vector Analysis, 2nd Edn. By Murray Spiegel, Seymour Lipschutz (McGraw-Hill 2009)
3. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 2000.
4. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Limited , 1985)

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

Semester III	Course Code 17UPH330205				Title of the Paper: MATHEMATICAL PHYSICS								Hours 8	Credits 6
Course Outcomes (COs)	Programme Outcomes (POs)				Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	3	2	3	4	5	3	4	1	5	5	1	3	3.3
CO2	4	3	4	3	4	5	4	2	2	5	1	1	5	3.3
CO3	4	5	4	4	2	4	3	5	2	5	1	3	4	3.5
CO4	5	5	3	4	3	4	3	5	1	4	1	3	5	3.5
CO5	5	5	4	3	5	4	3	3	1	4	1	4	5	3.5
CO6	4	5	4	4	2	3	1	3	1	5	1	3	5	3.7
CO7	5	5	4	2	2	5	3	3	1	5	1	3	4	3.4
CO8	4	5	4	4	2	3	4	2	1	5	1	3	4	3.3
											Mean Overall Score			3.4

Result: The Score for this Course is 3.4 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester III **Hours/Week: 4**
17UCH330403A **Credits: 4**

Allied:
CHEMISTRY-I

Course Outcomes

1. Students learn the nomenclature, hybridization and isomerism
2. Students learn the intermediates of organic compounds
3. Students study the preparation, properties and mechanisms of alkanes and alkenes
4. Students understand the chemistry of hydrogen, some boron, silicon compounds, halogens and inter-halogen compounds
5. Students understand the principles of chemical kinetics
6. Students understand the principles of photochemistry

Unit I: Hydrocarbons and Isomerism (12 Hours)

Nomenclature of simple hydrocarbons. Hybridization – sp, sp^2, sp^3 (examples: acetylene, ethylene and methane). Bond length, bond angle, dipole moment, inductive effect, mesomeric effect and hyperconjugation effect. Solubility – protic and aprotic solvents. Isomerism – geometrical and optical isomerism, asymmetry, (R, S notation not necessary). Reactive intermediates – carbocation, carbanion and carbon free radicals (generation, structure and stability).

Unit II: Alkanes and Alkenes (12 Hours)

Methods of preparation of alkanes (Wurtz method, Kolbe's method, using Grignard reagent, Using HI/P), Chemical properties of alkanes - substitution reaction only (example: only halogenation of alkanes with free radical mechanism), conformation analysis of ethane, n-butane and cyclohexane.

Methods of preparations of alkenes (Kolbe's method, Hoffman degradation, using Lindlar's catalyst, Dehydration of alcohols, Dehydrohalogenation of alkyl halides), stereochemistry of dehydrohalogenation (E_1, E_2, E_1CB mechanisms), Chemical properties of alkenes – electrophilic addition mechanism (example: only mechanisms of bromination of alkenes, hydrohalogenation of alkenes, hydration of alkenes and addition of diborane to alkenes)

Unit III: Chemistry of Hydrogen, Halogen, Silicon and metals (12 Hours)

Occurrence, extraction and chemical properties of iron, cobalt, nickel and copper. Electrochemical theory of rusting. Position of hydrogen in periodic table, atomic hydrogen and isotopes of hydrogen. Preparation and structure

of borozole, SiO_2, SiC and $SiCl_4$. General characteristics of halogens. Structures of inter halogens (XY, XY_3, XY_5, XY_7 type).

Unit IV: Chemical Kinetics (12 Hours)

Rate of reaction, factors affecting rate of the reaction, average and instantaneous rate, order, molecularity, pseudo first order reaction. Rate expression for first order and second order reactions. Expression of rate constant and half-life period for first order, second order (two molecules of same reactant), zero order reactions. Arrhenius and collision theories – assumption, derivation, demerits – experimental determination of order of reactions.

Unit V: Photochemistry (12 Hours)

Difference between photochemical reactions and dark reactions. Laws of photochemistry –Beer - Lambert's Law – Derivation and applications. Einstein law of photochemical equivalence. quantum yield. Kinetics of Hydrogen-chlorine reaction, Hydrogen-bromine reaction and decomposition of HI. Fluorescence, phosphorescence and chemi-luminescence.

TEXT BOOK:

1. Bahl B. R and ArunBahl. Organic Chemistry (12th edition), New Delhi, Sultan Chand & Co (1997)
2. Puri B. R.; Sharma L. R and Kalia K. K. Principles of Inorganic Chemistry, (23rd edition), New Delhi, ShobanLalNagin Chand & Co (1993)
3. Puri B. R.; Sharma L. R and Pathania M. S. Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLalNagin Chand & Co (1993)

REFERENCES:

1. Atkins P.W., Physical Chemistry, (7th edition) Oxford University Press, London (2009).
2. FinarI.L,Organic Chemistry, Vol 1&2, (6thedition) England, Addison WesleyLongmanLtd.(1996).
3. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).

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

Semester III	Course Code 17UCH330403A					Title of the Paper Allied: CHEMISTRY-I								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	3	2	3	5	5	3	3	3	3	1	2	3		3.15
CO2	4	3	3	2	5	4	4	3	3	4	1	2	3		3.15
CO3	4	3	1	3	5	5	4	3	3	4	1	2	3		3.15
CO4	5	3	2	2	5	5	5	3	3	4	1	2	3		3.31
CO5	4	3	2	3	5	5	5	3	3	3	1	2	4		3.31
CO6	5	3	2	3	5	4	5	4	3	4	2	2	3		3.46
												Mean Overall Score			3.25

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester III **Hours/Week: 4**
17UCS330403A **Credits: 4**

Allied: Computer Science-I
INTERNET AND DATABASE CONCEPTS

Course Outcomes

1. Know the concept behind the web and working of internet
2. Acquire the basic knowledge of designing web pages
3. Design colourful webpages and is able to create a basic website
4. Create web forms and fetch data meaningfully on the web
5. Learn the essence of Databases
6. Infer the skills to fetch and manipulate data through queries

UNIT-I **(12 hr)**

Introduction to the Internet : Computers in Business - Networking - Internet-Email - Resource Sharing -Gopher - WWW - Usenet - Telnet – BulletinBoard Service - Wide Area Information Service.

UNIT-II **(12)**

Introduction to HTML: Designing a home page - HTML document – Anchortag - Hyperlinks - Head and Body sections: Header section - Title – Prologue- links - colourful pages - comments - Body Section: Heading – Horizontalruler - Paragraph - Tabs - Images and pictures - Lists and their types - Nested lists - Table handling.

UNIT-III **(12)**

Frames - Frameset definition - Frame definition - Nested framesets. Formsand form elements.

UNIT-IV **(12)**

Database System Applications - Database Systems versus File Systems - View of Data - Data Models - Database Languages - Database Users andAdministrators - Transaction Management - Database System Structure -Application Architectures - History of Database Systems.

UNIT-V **(12)**

SQL Statements: Data Retrieval: SELECT, Data Definition Languages:CREATE, ALTER, DROP, RENAME, and TRUNCATE, Data ManipulationLanguage: INSERT - UPDATE, DELETE - MERGE. Transactional Control:COMMIT, ROLLBACK, SAVEPOINT, and Data Control Language: GRANT,REVOKE, SELECT ORDER BY - SELECT GROUP BY.

BOOKS FOR STUDY

1. C. Xavier, "World Wide Web Design with HTML", Tata McGraw Hill,2000.
2. Henry F. Korth Abraham Silberschatz , Database System Concepts,Fourth Edition McGraw Hill International Editions 2002.

BOOKS FOR REFERENCE

1. Wendy Willard, "Web Design - A beginners Guide", Tata McGraw Hill.
2. Thomas A. Powell, "The Complete Reference Web Design", Tata McGrawHill.
3. C.J. Date, An Introduction to Database System , seventh edition, PearsonEducation, New Delhi, 2002.

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

Semester III	Course Code 17UCS330403B					Title of the Paper Allied: COMPUTER SCIENCE-I								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	3	4	4	3	3	3	4	4	4	3	4		3.6
CO2	5	4	4	4	4	3	4	4	5	4	4	4	4		4.0
CO3	4	4	4	4	4	4	4	4	3	4	4	4	4		3.9
CO4	4	3	4	4	3	3	4	3	4	3	4	4	3		3.5
CO5	4	4	3	4	3	3	3	3	3	3	3	4	3		3.3
CO6	4	4	4	4	4	3	3	4	4	3	4	4	4		3.7
													Mean Overall Score		3.7

Result: The Score for this Course is 3.7 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester III **Hours/Week: 2**
17UFC340901 **Credits: 2**

ENVIRONMENTAL STUDIES

Course Outcome

1. To ensure understanding the significance of environment in which we live.
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.

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

Semester III	Course Code 17UFC340901					Title of the Paper ENVIRONMENTAL STUDIES								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	5	5	5	3	5	4	4	4	5	3	4	3	4.0	
CO2	5	4	5	5	4	4	5	5	5	4	4	4	4	4.5	
CO3	5	4	5	5	3	5	4	4	5	3	3	4	2	4.0	
CO4	5	4	4	4	4	4	4	5	4	5	4	4	3	4.2	
CO5	5	5	4	5	4	3	5	5	4	4	5	3	4	4.3	
CO6	5	5	4	4	3	4	4	3	3	4	3	2	4	3.7	
													Mean Overall Score		4.1

Result: The Score for this Course is 4.1 (Very 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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 2**
17UFC441004A **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.

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

Semester IV	Course Code 17UFC441004A				Title of the Paper FORMATION OF YOUTH-II								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	4	5	4	5	5	3	4	5	5	4	5	4	4.4
CO2	4	4	4	4	4	5	4	3	4	4	4	5	5	4.2
CO3	5	3	5	4	5	4	4	3	4	4	4	5	5	4.2
CO4	3	4	5	4	4	5	4	4	4	4	4	3	4	4.0
CO5	2	4	4	4	5	5	4	4	5	5	5	4	5	4.3
CO6	4	3	4	4	5	3	4	5	5	4	5	5	4	4.2
											Mean Overall Score			4.2

Result: The Score for this Course is 4.2 (Very 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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

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.

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

Semester IV	Course Code 17UFC441004B					Title of the Paper RELIGIOUS DOCTRINE-II								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	1	4	3	3	4	4	4	5	4	5	5	5	3.9	
CO2	4	1	4	3	3	4	4	4	5	4	5	5	5	3.9	
CO3	4	3	4	4	3	4	4	5	4	4	5	5	5	4.2	
CO4	4	1	4	3	3	4	4	4	5	4	5	5	5	3.9	
CO5	4	1	4	3	3	4	4	4	5	4	4	4	5	3.8	
CO6	4	1	4	3	3	5	5	5	5	4	5	4	4	4.0	
												Mean Overall Score		3.9	

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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

பருவம்: 4 **மணி நேரம்: 4**

17UGT410004 **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.

அலகு-1 **(12 மணி நேரம்)**

மனோன்மணீயம், பாயிரம், அங்கம் - 1, களம் 1 - 5 வரை.

அலகு-2 **(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)**

மனோன்மணீயம், அங்கம் - 3, களம் 1 - 4 வரை.

உரைநடை நாடகம் (கௌதம புத்தர்)

அலகு-4 **(12 மணி நேரம்)**

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.

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

Semester IV	Course Code 17UGT410004					Title of the Paper பொதுத்தமிழ்-IV								Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	4	5	5	5	5	5	4	4	5	5	5		4.5
CO2	5	4	3	5	4	5	5	4	4	3	4	5	5		4.3
CO3	4	3	3	5	4	3	3	4	3	3	4	5	5		3.7
CO4	5	5	4	5	5	5	5	5	5	4	5	5	5		4.8
CO5	3	4	4	5	5	4	4	4	5	4	4	4	4		4.1
CO6	4	3	4	5	5	4	3	3	4	3	2	2	3		3.4
													Mean Overall Score		4.1

Result: The Score for this Course is 4.1 (Very 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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: IV **Hours/Week: 4**
17UGH410004 **Credits: 3**

HINDI-IV

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
* 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**

Pusthakalaya, Nemikaryalaya Tippaniyan, Anuvadak, Anuvad lesson-2, Bakthikal-Gyan Marg, Mahadevivarma

Unit-III **12 hours**

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.

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

Semester IV	Course Code 17UGH410004	Title of the Paper Hindi-IV									Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	4	4	4	3	4	3	3	4	5	4	4	3.5
CO2	3	3	2	3	3	3	5	3	4	3	3	3.1
CO3	3	3	3	3	4	3	3	3	4	3	3	3.1
CO4	3	2	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
CO6	4	4	4	4	3	5	3	5	4	4	3	3.9
Mean Overall Score												3.3

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semestre: IV **Heures /Semaine: 4**
17UGF410004 **Credits : 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)**

Exprimer l'inquiétude, le regret, le souhait, l'obligation, la sympathie.

Grammaire : Le subjonctif, verbe craindre

Unit-II : Retrouvailles **(10 heures)**

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.

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

Semester IV	Course Code 17UGF410004					Title of the Paper French-IV						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	4	4	2	3	4	4	2	3	2	2	3		3.0
CO2	3	3	3	3	4	4	2	4	3	2	3		3.1
CO3	3	2	3	2	4	3	4	3	3	3	4		3.1
CO4	3	3	4	3	4	1	2	2	4	3	3		2.9
CO5	3	3	4	3	4	3	2	2	4	4	5		3.4
CO6	3	4	3	3	3	4	4	2	4	3	4		3.4
										Mean Overall Score			3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: IV **Hours/Week: 4**
17UGS410004 **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.

Unit-I **8 hours**

Paataah – Asta, Nava Dasha, Sankhya prayogah.

Unit-II **12 hours**

Lot lakaarah. Prqayaogah. Kartari Vaakyaani

Unit-III **12 hours**

Naatakasya Itihaasah.

Unit-IV **14 hours**

Karnabhaaram. Naatakam.

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.

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

Semester IV	Course Code 17UGS410004					Title of the Paper Sanskrit-IV						Hours 4	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
CO1	5	3	5	4	4	3	3	3	3	3	4		3.1
CO2	4	3	4	4	4	3	3	4	3	4	3		3.1
CO3	4	3	3	4	4	3	4	4	4	4	4		3.2
CO4	4	3	3	4	3	3	3	4	4	4	4		3.1
CO5	4	4	4	3	4	3	4	3	4	4	4		3.0
CO6	5	4	4	4	4	3	3	3	3	3	4		3.2
										Mean Overall Score			3.1

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester: IV **Hours/Week: 5**
17UGE420104 **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.

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

Semester IV	Course Code 17UGE420104					Title of the Paper General English-IV								Hours 5	Credits 3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	4	5	5	4	4	4	5	5	5	4	5	5		4.61
CO2	5	4	5	5	3	4	5	5	5	5	5	5	5		4.69
CO3	4	4	5	4	4	3	4	4	5	5	4	4	5		4.23
CO4	4	4	5	4	4	3	4	5	5	5	4	4	5		4.30
CO5	5	4	5	4	4	4	4	4	5	5	4	4	5		4.38
CO6	5	5	5	5	4	4	4	5	5	5	4	4	5		4.61
													Mean Overall Score		4.47

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 6**
17UPH430206 **Credits: 4**

ELECTRICITY AND MAGNETISM

Course Outcomes

1. Understand the fundamental principles of electrostatics, able to employ methods of calculus to calculate electric field from a distribution of charges.
2. Learn mathematical methods of Gauss' and Poisson, to calculate electric field for problems involving symmetry.
3. Acquire knowledge of magnetic field through the understanding of Ampere's law and apply it to compute the field in problems.
4. Understand Biot-Savart law and use to compute the field due to current carrying conductors.
5. Study Kirchoff's law and use it to analyze DC circuits.
6. To apply the basic knowledge of electromagnetic induction to explain observational phenomenon.

UNIT-I: ELECTROSTATICS (12 hr)

Point charge – Rest charge – charge distributions – coulomb's law- vector form – Principle of superposition- electric field strength – Electric field due to a charged ring at an axial point- Electric dipole – The concept of a solid angle – Gauss theorem and its differential form – conservative nature of electric field – Potential difference –Evaluation of the field from potential- Potential due to a point charge- uniformly charged disc, spherical conductor - Poisson's and Laplace equations.

UNIT-II: MAGNETO STATICS (12 hr)

Definition of B – Lorentz force – magnetic field intensity H – magnetic shell– Hall effect – Cyclotron – Ampere's circuital theorem – applications (Field at a point inside a long wire) – magnetic vector potential- magnetic susceptibility and relative permeability - classification of magnetic materials- Properties of magnetic materials – susceptibility determination (Gouy's method) – Experimental determination of hysteresis loop (Magnetometer method).

UNIT-III: MAGNETIC EFFECTS OF CURRENT (12 hr)

Biot and Savart law – field due to a straight wire - field on the axis of a circular coil – field due to a solenoid- Torque on a current loop in a uniform field – force on a current carrying conductor in a magnetic field – Theory of

moving coil galvanometer – Applications of BG - Figure of merit – comparison of e.m.f of two cells and capacitances.

UNIT-IV: CURRENT ELECTRICITY (12 hr)

Current and current density – equation of continuity – resistance – Ohm's law – combination of resistance- star- Delta transformations – grouping of cells – Kirchoff's laws – Wheatstone Bridge – Carry–Foster's Bridge - Potentiometer – uses –Low resistance – growth and decay of current in inductor – charge and discharge of a capacitor through a resistance – Measurement of high resistance by leakage method – Physics of the LC Oscillator.

UNIT-V: ELECTRO MAGNETIC INDUCTION & AC CIRCUITS (12 hr)

Faraday's laws – differential form – induced current – charge – self inductance – self inductance of a long straight solenoid – Rayleigh's method of self-inductance– Mutual inductance – coefficient of coupling – Determination of mutual inductance using B.G – Earth inductor – Measurement of horizontal , vertical component of B and angle of dip – Dynamo – D.C generator - D.C Motor.

BOOK FOR STUDY:

1. Sehgal – Chopra- Sehgal, Electricity and magnetism, Sultan Chand and sons Ltd, New Delhi, 6th edition reprint, 2010.

Unit	Book	Sections
I	1	3.8 – 3.11, 3.15, 4.2, 4.4, 4.5, 4.9, 4.17, 4.20, 4.21. 5.2, 5.5, 5.8, 5.10, 5.14, 5.15, 5.22
II	1	13.19, - 13.21, 13.17, 13.23, 13.24, 13.29, 13.31, 13.33, 24.8, 24.9, 24.12 - 24.14.
III	1 2	13.3, 13.5, 13.8, 13.9, 13.15, 14.4, 14.10, 9.10, 9.14, ------
IV	1	12.1, 12.3, 12.4, 12.6, 12.8, 12.10, 12.12 – 12.15, 12.17, 15.4, 15.9, 15.11.3, 20.3 – 20.6.
V	1	19.3, 19.16, 19.17, 19.19, 19.22, 19.24, 19.25, 19.27, 19.28, 19.32, 19.35 – 19.37, 19.39-19.41.

BOOKS FOR REFERENCE:

1. Introduction to electrodynamics David J Griffiths, Prentice Hall NJ (2000).
2. K KTewari, Electricity and magnetism, S. Chand & Co Ltd., NewDelhi, Reprint 2003.
3. Fundamentals of Physics David Halliday, Robert Resnick and Jearl Walker, Wiley NY (2015).

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

Semester IV	Course Code 17UPH430206					Title of the Paper: ELECTRICITY AND MAGNETISM							Hours 6	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	2	3	4	3	4	4	1	1	4	2	4	3	3.00
CO2	4	2	2	2	4	4	4	4	3	4	3	2	3	3.07
CO3	3	3	4	3	4	3	4	4	3	4	3	2	3	3.38
CO4	3	4	3	3	3	4	3	4	4	3	4	2	3	3.31
CO5	4	3	3	4	2	3	4	3	4	4	3	2	3	3.23
CO6	3	4	4	3	3	4	3	4	3	3	4	2	3	3.30
												Mean Overall Score		3.21

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 3**
17UPH430207 **Credits: 3**

PHYSICS PRACTICAL-2

Any 16 Experiments:

1. Jollys bulb – pressure coefficient
2. K- Lees disc.
3. K- Forbes method.
4. y, n, ó – Searles method.
5. n and M.I – torsional pendulum.
6. Compound pendulum.
7. Kater's pendulum
8. Kundts tube.
9. Frequency – Melde's apparatus.
10. Young's modulus – uniform bending (scale and telescope).
11. Young's modulus – Koenig's method.
12. n- static method.
13. ç – Rankines method.
14. Spectrometer – i-d curve.
15. Spectrometer – i-i' curve.
16. Field along the axis of a coil – vibration magnetometer.
17. Potentiometer – ammeter calibration.
18. Potentiometer – R and ñ.
19. B.G. – comparison of mutual inductance.
20. B.G. – Resistance and figure of merit (condenser method).
21. Absolute M and H.
22. Junction diode and Zener diode characteristics.
23. Study of basic and universal gates (IC's).

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Semester IV **Hours/Week: 4**
17UCH430404A **Credits: 4**

Allied:
CHEMISTRY-II

Course Outcomes

1. Students learn the chemistry of carbohydrates
2. Students learn the chemistry of amino acids, proteins and benzene
3. Students study the theories of co-ordination compounds
4. Students study the applications of industrially important compounds
5. Students understand phase rule and adsorption
6. Students understand the principles and applications of electrochemistry

Unit-I: Carbohydrates, amino acids, Proteins and Benzene (12 Hrs)

Synthesis of carbohydrates - Photosynthesis, Classification of carbohydrates (based on hydrolysis and reducing nature), Characteristic reactions of the open chain aldehyde form and cyclic form of glucose, Characteristic reactions of the open chain ketone form and cyclic form of fructose, Uses of glucose and fructose, inter conversion of glucose to fructose, mutarotation.

Amino acids – Classification (based on acidic, basic groups), essential and non-essential amino acids, preparations (Gabriel synthesis, strecker synthesis, koop synthesis), zwitter ion formation, isoelectric point and its important in the separation of aminoacids, Chemical properties (reactions involving both amine group and carboxyl group) of glycine and alanine only, Proteins – Peptide linkage – primary, secondary and tertiary structure of proteins.

Unit-II: Coordination Chemistry (12 Hrs)

Nomenclature and isomerism of coordination compounds. EAN rule, VB and crystal field theories of octahedral, tetrahedral and square planar complexes. Chelation and its industrial applications. Magnetic studies – magnetic susceptibility, ferromagnetism and anti- ferromagnetism.

Unit-III: Industrial Chemistry (12 Hrs)

Silicones – preparation, properties and uses. Glass – manufacture and types. Cement – composition, manufacture and setting of cement. Ceramics – composition, types and preparation. Noble gases – hydrides, clathrates, structures of Xenon compounds (XeF_2, XeF_4, XeF_6, $XeOF_2$, XeO_3). Solutions – concentration of solutions (normality, molality and molarity definition only).

Unit-IV: Phase rule and adsorption **(12 Hrs)**

Phase rule – phase diagram of H_2O, CO_2, S, Pb-Ag systems. Adsorption – Langmuir and Frendluich adsorption isotherms (Derivation only). Applications of adsorption, only the principles of paper, TLC and column chromatography.

UnitV: Electrochemistry **(12 Hrs)**

Difference between Galvanic cell and Electrolytic cell; Types of electrodes - Metal – metal ion electrode, Gas electrode (hydrogen electrode), Metal – insoluble metal salt electrodes (calomel electrode), Oxidation – reduction electrode (quinhydrone electrode); Single electrode potential, Oxidation potential and reduction potential; Sign of electrode potential, Nernst equation (Derivation only); Reference electrode, Electrochemical series. Electromotive force (EMF), Potentiometric titrations – acid - base titrations, Redox titrations, precipitation titrations.

TEXT BOOKS:

1. Bahl B. R and ArunBahl. Organic Chemistry (12th edition), New Delhi, Sultan Chand & Co (1997)
2. Puri B. R.; Sharma L. R and Kalia K. K. Principles of Inorganic Chemistry, (23rd edition), New Delhi, ShobanLalNagin Chand & Co (1993)
3. Puri B. R.; Sharma L. R and Pathania M. S. Principles of Physical Chemistry, (23rd edition), New Delhi, ShobanLalNagin Chand & Co (1993)

REFERENCES:

1. Atkins P.W., Physical Chemistry, (7th edition) Oxford University Press, London (2009).
2. FinarI.L, OrganicChemistry, Vol1&2, (6th edition) England, Addison Wesley LongmanLtd.(1996).
3. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).

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

Semester IV	Course Code 17UCH430404A					Title of the Paper Allied: CHEMISTRY-II							Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	2	4	4	5	3	3	4	3	1	2	2	3.23
CO2	5	4	1	5	5	4	4	3	3	4	1	2	2	3.31
CO3	5	4	2	4	5	5	4	3	3	4	1	2	2	3.38
CO4	5	4	1	4	4	5	5	3	3	4	1	2	3	3.38
CO5	5	4	1	5	4	5	5	3	3	4	1	2	3	3.46
CO6	5	4	2	5	5	4	5	4	3	4	2	2	2	3.62
												Mean Overall Score		3.39

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester III & IV **Hours/Week: 2**
17UPH430405A **Credits: 2**

Allied:

CHEMISTRY PRACTICAL FOR PHYSICS

Course Outcomes:

Students understand the principles of titrimetric analysis and organic qualitative analysis

I. Volumetric Analysis

1. Estimation of HCl (Std. oxalic acid x NaOH x HCl)
2. Estimation of NaOH (Std. Na_2CO_3 x HCl x NaOH)
3. Estimation of oxalic acid (Std. FAS x $KMnO_4$ x oxalic acid)
4. Estimation of FAS (Std. oxalic acid x $KMnO_4$ x FAS)
5. Estimation of $KMnO_4$ (Std. $K_2Cr_2O_7$ x FAS x $KMnO_4$)
6. Estimation of zinc (EDTA titration)
7. Estimation of magnesium (EDTA titration)
8. Estimation of hardness of water (EDTA titration)

II. Organic Analysis

a. Identification of acidic, basic, phenolic and neutral organic substances
b. Test for aliphatic and aromatic nature
c. Test for saturation and unsaturation
d. Detection of N, S and halogens.

Reference:

1. J. N. Gurtu and Kapoor.,*Experimental Chemistry*, S. Chand and Co. 1987.
2. N. S. Gnanapragasam and G. Ramamurthy, *Organic Chemistry – Lab Manual*, S. Viswanathan & Co. Pvt.Ltd., 1998.

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Semester IV **Hours/Week: 4**
17UCS430404B **Credits: 4**

Allied: Computer Science-II

DATA AND COMMUNICATION NETWORKS

Course Outcomes:

After learning this course, the learner would have

1. Familiarizethe students to understand the basic concepts of Data Communication
2. Understand the Classification of computer networks
3. Acquire the knowledge of Topology
4. Gets to know about the various types of networks
5. Learns the different transmission media
6. Infers the concept used in Mobile Communication technology

Unit-I: **(12 Hours)**

Data Communication Fundamentals: Analog Signal Transmission – Digital Signal Transmission. Data Transmission: Serial and Parallel Transmission – Communication Modes – Transmission Modes. Transmission Media: Twisted Pair – Coaxial Cable – Optical Fibers – Unguided Transmission Media.

Unit-II: **(12 Hours)**

Classification of Computer Networks: Classification by Geographical Spread – Topological Classification – Classification by Ownership. Switching and Routing: Circuit Switching – Message Switching – Packet Switching – Routing. Multiplexing and Concentration: Frequency Division Multiplexing – Time Division Multiplexing – Terminal Handling – Components of Computer Network.

Unit-III: **(12 Hours)**

Local Area Network: The Evolution of LAN – LAN Architecture: The OSI Model and LAN Access – LAN advantages and Services – Characteristics of LAN: The Server – Workstations – The Transmission Media for LAN – Communication Equipments. LAN Topologies: Bus and Tree – Ring Topology – Star Topology.

Unit-IV: **(12 Hours)**

Wireless LANs: Advantages of Wireless LANs – Components of Wireless LAN: Mobile Clients – Special Units – Working of Wireless LANs – Transmission Media: Radio Wave Technologies – Narrowband Technology.

Infrared Technology: Direct Modulation – Operating Modes – Benefits and Drawbacks – Wireless LAN Types: Ad hoc Wireless LAN – Infrastructure Wireless LAN.

Unit-V: **(12 Hours)**

Digital Cellular Radio: Global Systems for Mobile Communications – Cellular Digital Packet Data – Code Division Multiple Access. Bluetooth Technology: The Evolution – Goals and Features – Bluetooth products – Network Architecture – Hardware and Software Architecture – Applications.

Book for Study:

1. Rajesh, Eswarakumar, Balasubramanian, "Computer Networks, Fundamentals and Applications", Vikas Publishing House Pvt. Ltd., 2002.

Book for Reference:

1. William Stallings, "Data and Computer Communications", Prentice Hall of India, Seventh Edition, 2004.

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Semester III & IV **Hours/Week: 2**
17UPH430405B **Credits: 2**

Allied:

COMPUTER SCIENCE PRACTICALS
(Software Lab - Web Design using HTML)

Course Outcomes:

1. Simple web page with all the Text Formatting tags
2. Adding Images to WebPages
3. Creating Lists (Ordered and Unordered List)
4. Adding Links to Web Pages
5. Creating Tables using various attributes
6. Creating Frames
7. Designing forms using simple form elements
8. Implementation of Data Definition language commands
9. Implementation of DML, TCL and DCL commands

Simple Projects using HTML

1. Creating Web blocks consists of personal details
2. Creating Website for the Department/College

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

Semester IV	Course Code 17UCS430404B					Title of the Paper Allied: COMPUTER SCIENCE-I							Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	3	4	4	2	2	2	2	3	4	5	3	3	3.15
CO2	5	2	4	5	4	2	2	2	4	4	4	4	2	3.3
CO3	5	4	5	4	4	2	4	2	4	3	4	5	2	3.6
CO4	4	2	5	4	2	2	2	2	5	3	4	4	2	3.1
CO5	4	4	4	4	2	2	3	2	4	3	3	4	2	3.1
CO6	4	4	4	4	4	2	3	2	4	3	3	5	3	3.4
												Mean Overall Score		3.3

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 4**
17UPH430301A **Credits: 4**

Core Elective-I (WS): ENERGY PHYSICS

Course Outcomes:

1. Ability to know the power potential of the sun and its utility.
2. Understanding the experimental procedure of collecting solar energy.
3. Knowing various types of storage methods involving.
4. Knowing the other alternative sources for energy production.
5. Applying knowledge to fabricate solar cells for energy storage purpose.
6. Knowing other forms of energy which are existing in the nature.

Unit I: Solar - Thermal Conversion (12 Hrs)

An overview of thermal application and solar radiation – energy alternatives – devices for thermal collection and storage – thermal applications – Water heating – Space heating – Power generation – instruments for measuring solar radiation and sun shine

Unit II: Performance of Flat-Plate Collectors (12 Hrs)

Performance analysis - -Transmissivity of the cover system based on reflection - Refraction - Absorption - Transimissivity for diffuse radiation - Transmissivity - Absorptive product

Unit III: Concentrating Collectors and Energy Storage (12 Hrs)

General characteristics - Definitions - Methods of classifications - Thermal energy storage - Sensible heat storage - Liquids - Solids - Latent heat storage - Thermal chemical storage

Unit IV: Photo Conversion (12 Hrs)

Photovoltaic conversion - Single crystal silicon cell - Principle and working insular cells - Conversion efficiency - Single crystal silicon - Polycrystalline and amorphous silicon -Cadmium sulphide - Cadmium telluride - copper indium diselenide

Unit V: Other Forms of Energy (12 Hrs)

Wind energy - Recent developments - Energy from biomass - Direct methods - Indirect methods ~ Wave energy – Vegetation for fuel - Bio-diesel – Plants for Bio-diesel- Physical and chemical properties of Bio-diesel .

Book for Study:

1. P. Sukhatme, Solar energy (Second edition), Tata McGraw-Hill Publishing Co. Ltd. (New Delhi)

Book for Reference:

1. G.D.Rai, Solar Energy Utilization, Khanna publishers (New Delhi)

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

Semester IV	Course Code 17UPH430301A					Title of the Paper: Core Elective-I (WS): ENERGY PHYSICS								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	2	3	4	4	4	3	3	2	3	3	1	3.00	
CO2	4	2	1	2	3	4	3	4	2	1	4	3	2	2.69	
CO3	4	3	3	3	4	4	3	4	3	3	4	4	1	3.30	
CO4	3	4	3	3	3	4	4	4	4	1	4	3	1	3.15	
CO5	3	4	2	3	3	3	4	3	4	2	3	3	2	3.00	
CO6	3	3	3	4	4	3	3	3	3	3	3	4	3	3.23	
													Mean Overall Score		3.06

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 4**
17UPH430301B **Credits: 4**

Core Elective-I (WS): PHYSICS OF MATERIALS

Course Outcomes:

1. Understanding the concept of materialclassifications based on the physical mechanism of energy conduction process and its associated theoretical knowledge.
2. Idea to form new materials for specific needs under controlled conduction of electric and thermal energies.
3. Inculcating the fundamentals ofoptics and specific use photo conducting behaviorwith an application towards renewable energy resources.
4. Conceptual idea of magnetic material clarifications.
5. Introducing the nanophase of materials with the knowledge of synthesis procedures and its need for modern applications.
6. Conceptual idea of nonlinearity, various nonlinear materials and their nonlinear behaviors towards modern optical communication.

UNIT I: CONDUCTORS AND SUPERCONDUCTORS (12 Hrs)

Electrical conduction - classification of conducting materials - free electron theory-expression for electrical conductivity - thermal conductivity - expression for thermal conductivity - Wiedemann Franz law - Introduction about superconductivity - general properties – types - applications.

UNIT II: SEMICONDUCTORS AND DIELECTRICS (12 Hrs)

Classification based on band theory - classification of semiconductors - elemental and compound semiconductors - structure and bonding in Si and Ge-applications - Introduction about dielectrics – definitions - different types of polarizations - types.

UNIT III: OPTICAL PROPERTIES & PHOTOCONDUCTIVITY (12 Hrs)

Introduction about optical properties - fundemental terms - classification – absorption – traps – excitons - colour centres - introduction about photoconductivity – charecteristics - photoconductor bias circuit – performance - applications.

UNIT IV: MAGNETIC MATERIALS AND NANOPHASE MATERIALS (12 Hrs)

Introduction about magnetic materials – definitions - types of magnetic materials - introduction about Nanophase materials – synthesis – charecteristics – properties - applications.

UNIT V: NONLINEAR MATERIALS (12 Hrs)

Introduction - basic principle – classification of nonlinear materials - nonlinear properties – polarization, higher harmonic generation, optical mixing, optical phase conjucation, optical rectification and phase matching – nonlinear materials - applications.

BOOK FOR STUDY:

1. Materials Science, V. Rajendran and A , Marikani Tata McGraw-Hill, New Delhi, Eleventh Reprint, 2010.

Unit	Section
Unit I	7.1-7.8,12.1-12.3,12.7
Unit II	9.1-9.6,6.1-6.3,6.5
Unit III	13.1-13.6,16.1-16.7
Unit IV	11.1-11.3,18.1-18.5
Unit V	24.1-24.5

BOOKS FOR REFERENCE:

1. V. Raghavan, Material Science and engineering, A first course, Prentice Hall Pvt.Ltd, New Delhi, 1989.
2. Dharmendra Kumar, SK Jain, AK Bhargava, Materials Science and Manufacturing Processes, Vikas Publishing

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

Semester IV	Course Code 17UPH430301B			Core Elective-I (WS): PHYSICS OF MATERIALS								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	3	3	2	3	4	4	3	3	4	3	3	2	4	3.15
CO2	5	4	5	4	3	4	4	2	4	4	2	4	4	3.77
CO3	4	5	5	3	4	4	4	2	2	3	2	3	4	3.46
CO4	2	1	1	1	1	2	1	1	1	1	1	1	1	1.15
CO5	4	4	4	4	4	4	4	3	4	2	3	4	5	3.77
CO6	4	4	4	3	4	4	4	4	3	2	2	4	4	3.54
												Mean Overall Score		3.14

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 4**
17UPH430301C **Credits: 4**

Core Elective-I (WS):
FUNDAMENTALS OF ELECTRICITY AND MAGNETISM

Course Outcomes:

1. Understand the fundamental principles of electrostatics, able to employ methods of calculus to calculate electric field from a distribution of charges.
2. Learn mathematical methods of Gauss' and Poisson, to calculate electric field for problems involving symmetry.
3. Acquire knowledge of magnetic field through the understanding of Ampere's law and apply it to compute the field in problems.
4. Understand the working of Multimeter, wattmeter and TG for measuring voltage and current.
5. Study Kirchoff's law and use it to analyze DC circuits.
6. To apply the basic knowledge of Maxwell's equation to explain observational phenomenon.

UNIT-I: ELECTROSTATICS (12 Hrs)

Conductors and Insulators-Electric charge-properties-quantization-conversation-Millikan's experiment-coulomb's law-dielectric constant-electric field strength-units of electric field-electric field due to uniform line charge-electric dipole-electric field and charge within a conductor that has a static charge-capacitance and its units-energy of a charged capacitor

UNIT-II: MAGNETIC EFFECTS OF CURRENT (12 Hrs)

Biot-Savart's law – experiments - applications - field along the axis of a circular coil-magnetic field due to solenoid-Determination of the sign of charge carriers: the Hall Effect

UNIT-III: ELECTRICAL INSTRUMENTS (12 Hrs)

Tangent Galvanometer-force on a current carrying conductor in a uniform magnetic field-moving coil galvanometer-voltmeter-ammeter-multimeter-siemann's wattmeter-watt-hour meter

UNIT-IV: ELECTROMAGNETIC INDUCTION (12 Hrs)

Faraday's experiments-faraday's laws of electromagnetic induction-Lenz's law-Fleming's right-hand rule-motional EMF-eddy currents-self-inductance-energy associated with an inductor-mutual inductance-motor-series and shunt motors.

UNIT-V: MAXWELL'S EQUATIONS **(12 Hrs)**

Introduction-fundamental laws of electromagnetism-Maxwell's equations-physical significance of Maxwell's equations-energy in electromagnetic waves: the poynting vector-waves in a conducting medium: the skin effect.

BOOK FOR STUDY:

1. Sehgal – Chopra- Sehgal, Electricity and magnetism, Sultan Chand and sons Ltd, New Delhi, 6th edition reprint, 2005

Unit	Section
I	3.1,3.2,3.4-3.7,3.10,3.12,4.2,4.4,4.9,4.28,6.7,7.5
II	13.2-13.5, 13.8, 13.9, 13.23
III	14.1, 14.2, 14.4-14.7, 14.13-14.15, 14.26, 14.27
IV	19.1-19.5, 19.7, 19.18-19.20, 19.25, 19.41, 19.42.
V	26.1, 26.2, 26.6, 26.7, 26.9, 26.12.

BOOKS FOR REFERENCE

1. K K.Tewari, Electricity and magnetism, S. Chand & Co Ltd., New Delhi, Reprint 2003.
2. Introduction to electrodynamics David J Griffiths, Prentice Hall of India Pvt. Ltd., New Delhi, 3rd Edition
3. Fundamentals of Physics David Holliday, Robert Resnick and Jearl Walker, Wiley NY(2015).

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

Semester IV	Course Code 17UPH43030IC	Title of the Paper Core Elective-I (WS): FUNDAMENTALS OF ELECTRICITY AND MAGNETISM											Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	2	3	4	3	4	4	1	1	4	3	4	3	3.07
CO2	4	2	2	2	4	4	4	4	3	4	3	3	3	3.23
CO3	3	3	4	3	4	3	4	4	3	4	3	2	3	3.38
CO4	3	4	3	3	3	4	3	4	4	3	4	2	2	3.23
CO5	4	3	3	4	2	3	4	3	4	4	3	2	3	3.23
CO6	3	4	4	3	3	4	3	4	3	3	4	2	3	3.30
											Mean Overall Score			3.24

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester IV **Hours/Week: 2**
17UFC441004A **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.

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

Semester IV	Course Code 17UFC441004A					Title of the Paper FORMATION OF YOUTH-II								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	4	5	4	5	5	3	4	5	5	4	5	4		4.4
CO2	4	4	4	4	4	5	4	3	4	4	4	5	5		4.2
CO3	5	3	5	4	5	4	4	3	4	4	4	5	5		4.2
CO4	3	4	5	4	4	5	4	4	4	4	4	3	4		4.0
CO5	2	4	4	4	5	5	4	4	5	5	5	4	5		4.3
CO6	4	3	4	4	5	3	4	5	5	4	5	5	4		4.2
													Mean Overall Score		4.2

Result: The Score for this Course is 4.2 (Very 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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

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.

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

Semester IV	Course Code 17UFC441004B				Title of the Paper RELIGIOUS DOCTRINE-II								Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	1	4	3	3	4	4	4	5	4	5	5	5	3.9
CO2	4	1	4	3	3	4	4	4	5	4	5	5	5	3.9
CO3	4	3	4	4	3	4	4	5	4	4	5	5	5	4.2
CO4	4	1	4	3	3	4	4	4	5	4	5	5	5	3.9
CO5	4	1	4	3	3	4	4	4	5	4	4	4	5	3.8
CO6	4	1	4	3	3	5	5	5	5	4	5	4	4	4.0
												Mean Overall Score		3.9

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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **Hours/Week: 5**

17UPH530208 **Credits: 4**

'C' PROGRAMMING FOR PHYSICS

Course Outcomes:

1. Understand the lexical elements in 'c'- programming.
2. Be aware of different types of operators and expressions in c language.
3. Choose the loops and decision making statements to solve the problem
4. Implement different operation an arrays.
5. Use function to solve the given problems
6. Understand pointers, structures and unions.

UNIT-I: DATA TYPES, OPERATORS AND EXPRESSIONS (12 Hrs)

Structure of C language – Lexical elements of C language: C character set – constants – keywords – delimeters – variables – data types and sizes – variable declaration – labels – expressions – statements. Operators and Expressions: Arithmetic operators– relational operators – logical operators – assignment operators – increment and decrement operators-conditional operator-bitwise operators-special operators-arithmetic expressions-evaluation of expressions-precedence of arithmetic operators-type conversions in expressions-operator precedence and associativity.

G	Temperature conversion from Centigrade to Fahrenheit, Kelvin scales	Assignment statements
P	Period of Oscillations of Simple pendulum inside a lift up-down	-Do -
M	Computation of mathematical quantity for a given radius value	-Do -

UNIT-II: I/O AND CONTROL STATEMENTS (12 Hrs)

Input / Output in C: input functions – output functions – formatted input / output.Controlstructures: Unconditional control – bidirectional conditional control – multi conditional control – loop control structures.

G	Cost of operating electrical devices	for structure
P	Young's and Rigidity Modulus	do- while structure
M	Solution to the general Quadratic equation Preparation of Multiplication Table Newton-Raphson method applied to Physics Problem	If – else structure for structure any loop structure

UNIT-III: ARRAYS, STRINGS AND FUNCTIONS (12 Hrs)

Arrays declaration – multidimensional array - array initialization – rules to initialize an array – strings/character arrays – rules.

C functions: Library functions – user defined functions – advantages of the functions – arguments – function declaration – recursive functions – storage class specifiers - scope of the variables – scope rules for identifiers

G	Conversion of all small case letters in to capital letters	Use of strings
P	Field along the axis of the coil	Use of arrays
M	Matrix: Addition, Subtraction, Multiplication and Inverse of any order	Use of arrays
G	Arranging a series of numbers into ascending / descending order	Use of function
P	Trapezoidal Rule applied to Physics Problem	Use of function
M	To find the value of e up to n terms To find the function value f(x) with 3 boundary conditions To find the factorial of a given number	- Do -

UNIT-IV: STRUCTURES AND UNIONS (12 Hrs)

Structure: declaration and period operator – structure initialization – arrays of structures – arrays within structures– structure within structure-structures and functions. Union: Rules to use union

G	Construct of structure with Hour, Minute, Second as structure member - Convert to Military time	Use of Structure
P	Sum, Difference and Modulus of two complex numbers	Use of Structure

UNIT-V: POINTERS AND FILES (12 Hrs)

Pointers: declaring a pointer variable – address operator – pointer arithmetic – pointers as function parameters – passing parameters by reference – pointers and arrays.

Files: data types – with fopen(), modes in fopen(), with fclose() – random access

M	Sort n numbers in ascending order using Bubble Sort technique	Use of Pointers
P	Input/Output operations on files	Use of fi;es

BOOK FOR STUDY:

1. E. Balagurusamy, Programming in ANSI C, Sixth Edition, McGraw Hill Education(India)Private Limited, New Delhi.

Unit	Section
I	1.8, 1.9, 2.1 –2.13, 3.1 – 3.12, 3.14, 3.15
II	4.1 - 4.5, 5.1-5.9, 6.1 – 6.6
III	7.1 – 7.7, 8.1-8.8, 9.1 - 9.19
IV	10.1-10.12
V	11.1 – 11.17, 12.1 – 12.6

BOOKS FOR REFERENCE:

1. Schaum's Outlines : Programming with C , Byron S. Gottfried, Tata McGraw Hill Pub. Co Ltd., New Delhi, 5/e, 2007
2. Yashvant Kanetkar, Programming with C,2nd edition, Tata McGraw Hill, New Delhi,1998.

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

Semester V	Course Code 17UPH530208					Title of the Paper 'C' PROGRAMMING FOR PHYSICS								Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	5	2	4	5	5	3	3	3	3	3	2	2		3.3
CO2	4	4	2	3	3	4	4	4	5	4	4	3	3		3.6
CO3	4	5	2	4	4	4	3	4	5	4	4	2	4		3.7
CO4	4	3	2	4	3	4	3	4	5	4	4	2	4		3.3
CO5	4	3	2	4	3	4	3	3	3	4	3	3	3		3.2
CO6	4	4	2	3	3	3	3	4	4	4	4	2	3		3.3
													Mean Overall Score		3.4

Result: The Score for this Course is 3.4 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **Hours/Week: 6**
17UPH530209 **Credits: 4**

ATOMIC, SOLID STATE AND NUCLEAR PHYSICS

Course Outcomes:

1. Understand the evolution of different atomic models and their merits and limitations.
2. Ability to analysis the effect of applied magnetic and electric fields of atomic spectra.
3. Understand the basic knowledge of crystals and superconductors.
4. Ability to analysis the different types of crystals systems.
5. Understand the basic properties of nuclei and different nuclear models
6. Acquiring the knowledge of different accelerators and their advantages and their limitations.

UNIT -I: ATOMIC PHYSICS (12 Hrs)

Bohr atom model-hydrogen spectrum - Sommerfeld's relativistic atom model - vector atom model - quantum numbers associated with the vector atom model - coupling schemes - Pauli exclusion principle - periodic classification of elements - magnetic dipole moment (due to orbital motion of the electron and due to spin) - Stern and Gerlach experiment - spin orbit coupling - Optical spectra - Zeeman effect - Lorentz classical theory of normal effect, shift, experiment - Larmor's theorem - quantum mechanical explanation of the normal and anomalous effect - Paschen Back effect - Stark effect.

UNIT - II: SOLID STATE PHYSICS (12 Hrs)

Periodicity - Lattice, Basis, Unit cell, crystal structure –Elements of symmetry, bravais lattices –miller indices- symmetry elements - 2D and 3D Bravais lattices - bonding in crystals - different types and their properties - band theory of solids - specific heat capacity: Einstein's theory and Debye's theory - Superconductivity - experimental facts - persistent current - Type I - Type II - Meissner effect - BCS theory - applications.

UNIT - III: NUCLEUS AND RADIOACITIVITY (12 Hrs)

Classification of nuclei - General properties - binding energy - nuclear stability - theories of nuclear composition - nuclear forces - models of nuclear structure - liquid drop model and shell model - Alpha particle spectra - Beta ray spectra - origin of the line and continuous spectrum - neutrino theory of beta decay - origin of gamma ray spectra - Nuclear isomerism- internal conversion - law

of successive disintegration - radioactivity dating - Biological effect of nuclear radiations.

UNIT-IV: PARTICLE DETECTORS, ACCELERATORS AND COSMIC RAYS (12 Hrs)

Particle detectors - interaction between energetic particles and matter - Wilson Cloud chamber – ionization chamber, solid state detectors, proportional counter -Geiger Muller Counter - nuclear emulsion technique – Particle accelerators - Cyclotron - Betatron - Synchrotron - electron synchrotron and proton synchrotron - Discovery - Cosmic Rays - latitude, azimuth, altitude and longitude effects - primary and secondary cosmic rays - showers - positron - mesons - Van Allen belts - origin of cosmic rays.

UNIT-V: ELEMENTARY PARTICLE PHYSICS (12 Hrs)

Classification-Particles and anti particles-Antimatter-Fundamental interaction -Elementary particle Quantum numbers-Conservation laws and symmentry-Quarks model

BOOK FOR STUDY:

1. R. Murugeshan., Kiruthiga Sivapasath. Modern Physics, S. Chand & Co., Sevententh Revised Multicoloured Edition, New Delhi, 2014.

Unit	Book	Sections
I	1	6.11-6.28
II	1	7.16-7.19,41.1-41.6,41.10-41.15
III	1	27.2,31.13-31.14,31.19-31.27,31.34-31.36
IV	1	29.3,29.7,29.11,30.6-30.8,37.1-37.11
V	1	38.1-38.7

BOOKS FOR REFERENCE:

1. Arthur Beiser, Concepts of Physics, Tata McGraw - Hill - Sixth Edition, 2003.
2. Sehgal Chopra Sehgal - Modern Physics, Sultan Chand Sons, New Delhi, 2004.
3. Sanjiv and Puri, Modern Physics Concepts and Application, Narosa Publication, New Delhi-2004.

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

Semester V	Course Code 17UPH530209					Title of the Paper ATOMIC, SOLID STATE AND NUCLEAR PHYSICS								Hours 6	Credits 5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	5	2	2	4	5	4	3	2	3	2	2	2		3.2
CO2	5	3	2	2	4	5	4	3	3	3	2	2	2		3.1
CO3	4	4	2	3	4	5	4	3	3	3	2	2	2		3.2
CO4	4	5	2	5	4	4	4	3	4	4	2	2	5		3.5
CO5	5	3	3	3	4	5	4	3	3	3	2	2	3		3.3
CO6	4	4	3	3	4	4	4	3	3	3	2	2	2		3.2
												Mean Overall Score			3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **Hours/Week: 5**
17UPH530210 **Credits: 4**

ANALOG ELECTRONICS

Course Outcomes:

1. Acquire basic knowledge of p-n junction diode, different rectification process, filtering techniques
2. Understanding Thevenine's theorem and procedure for finding Thevenin equivalent circuit and to gain knowledge of Maximum Power theorem
3. Acquiring Knowledge on Fabricationof a transistor, different configuration, Biasing, h parameters and Finding different applications of FET
4. Studying the amplitude and frequency response of common amplification circuits
5. Applying theories for different classes of amplifiers, observation of Band width, understanding different coupling networks
6. Understanding negative and positive feed backs

UNIT-I: Diode Characteristics and Applications (12 Hrs)

Constant voltage source - constant current source - Maximum power transfer theorem - Thevenine's theorem - procedure for finding Thevenin Equivalent circuit - PN junction theory - V-I characteristics of a PN junction diode - Half wave rectifier - Bridge rectifier - Efficiency - filters - Shunt capacitor filter – pi filter - Zener diode - equivalent circuit - voltage regulator - LED - V-I characteristics – advantages - applications - photo diode - characteristics - applications.

UNIT-II: Transistor Characteristics and Biasing Techniques (12 Hrs)

Junction transistor structure –transistor action - transistor as an amplifier– transistor connections and characteristics : CB, CE, CC - comparison- basic CE amplifier - operating point – biasing- stabilization - requirements of a biasing circuit –stability factor-base resistor method - voltage divider bias method– h parameter equivalent circuits –performance of linear circiuts - JFET – principle and working - symbol - comparison with bipolar transistor - output characteristics - shorted gate drain current, pinch off voltage and gate source cut off voltage - JFET parameters.

UNIT-III: Ingle Stage, Multistage and Power Amplifiers (12 Hrs)

Single stage CE transistor amplifier - JFET amplifier - multistage amplifier – gain-frequency response –decible gain-bandwidth-RC and transformer

coupled amplifier-direct coupled amplifier-comparison-o/p power of amplifier-performance quantities- classification of power amplifiers –collector efficiency–series fed class Aamplifier- push pull amplifier.

UNIT-IV: Feedback Amplifiers and Oscillators (12 Hrs)

Feedback - Types - voltage and current feedback in amplifiers –principles-gain - advantages –Emitter follower- classification of oscillators - positive feedback amplifier as an oscillator - Hartley oscillator Colpittsoscillator - Phase shift and Wien's bridge - Crystal oscillators – Astable-Bistable multivibrator.

UNIT-V: Switching Circuits & Integrated Circuits (12 Hrs)

Clipping and clamping circuits - SCR: working - equivalent circuit - important terms - V-I characteristics –switching- Integrated circuits - advantages and disadvantages –classification-making monolithic IC -fabrication of components on monolithic IC- Operational amplifier - differential amplifier - basic circuit - operation - common mode and differential mode signals - voltage gains - CMRR- Schematic symbol of OP AMP - output voltage - OP-AMP with negative feedback - inverting amplifier - Non inverting amplifier - Voltage follower - summing amplifiers and applications - Integrator and differentiator

Books for Study:

1. V.K. Mehta and Rohit Mehta, Principles of Electronics, S. Chand & Co. Ltd, New Delhi, 2016.

Unit	Sections
I	1.9, 1.10, 1.12-1.14, 5.14-5.19, 6.8-6.15, 6.18-6.21, 6.25-6.27, 7.2-7.10
II	8.1-8.14, 8.16-8.18, 8.20, 9.2, 9.4-9.6, 9.8, 9.12, 24.1-24.4, 19.1-19.6, 19.8-19.10, 19.12, 19.13
III	10.1-10.9, 11.1, 11.3, 11.5-11.8, 12.1, 12.3,12.5-12.8, 12.17, 12.18, 19.21-19.24
IV	13.1-13.11, 14.1-14.3, 14.5-14.7, 14.10-14.20, 18.10,18.11, 18.12, 18.14
V	18.18, 18.20, 18.21-18.23, 20.1-20.5, 20.7, 20.8, 23.1, 23.2,23.4-23.6, 25.1-25.5, 25.7, 25.8, 25.15, 25.16, 25.17,25.22, 25.24, 25.25, 25.26, 25.26, 25.32, 25.33, 25.34, 25.35, 25.37

Book for Reference:

1. Bhargava N.N, Kulshreshtha D.C and S.C Gupta - Basic electronics and linear circuits, Tata McGraw Hill Publishing Company Limited, 2007.

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

Semester V	Course Code 17UPH530210			Title of the Paper ANALOG ELECTRONICS									Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	1	2	1	4	5	5	4	4	3	4	2	1	1	3.08
CO2	1	1	1	4	5	3	4	2	3	5	1	1	2	2.66
CO3	2	2	1	5	5	5	4	4	3	3	3	1	3	3.42
CO4	3	5	1	5	5	5	4	3	3	4	5	1	4	4.00
CO5	2	4	1	5	5	4	5	5	4	3	2	1	3	3.66
CO6	1	4	1	4	5	4	5	3	3	3	2	1	3	3.25
												Mean Overall Score		3.34

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	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*:**

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	**Mean Overall Score for COs** = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

Semester V **Hours/Week: 6**
17UPH530211 **Credits: 3**

PHYSICS PRACTICAL-III

Any 16 Experiments:

1. Spectrometer – grating – normal incidence.
2. Spectrometer – grating – minimum deviation.
3. M – using coil carrying current – Cu voltammeter.
4. M – using coil carrying current – ammeter.
5. Determination of Stefan's constant.
6. Earth inductor.
7. Fresnel's biprism.
8. B.G. - absolute M.
9. B.G – absolute C
10. Zener regulated power supply.
11. Clipping and clamping.
12. Conversion of galvanometer into an ammeter.
13. Conversion of galvanometer into voltmeter.
14. Transistor characteristics – CB.
15. Transistor characteristics – CE.
16. FET – characteristics.
17. Hartley oscillator.
18. Colpitts oscillator.
19. Study of transistor CE amplifier.
20. Study of FET amplifier.
21. Logic gates – by discrete components.
22. De-Morgans theorem and Boolean algebra.
23. Specific Rotation of Sugar solution by Polarimeter.

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Semester V **Hours/Week: 4**
17UPH530302A **Credits: 4**

Core Elective-2 (WD):
PHOTOGRAPHY AND VIDEOGRAPHY

Course Outcomes

1. Students acquire knowledge of parts of cameras and types of cameras
2. Students understands the importance of exposure and pictorial composition
3. Students create, select, and apply appropriate techniques and editing tools for editing and printing
4. Students learn to produce a good quality photo using adope photo software
5. Students acquire the knowledge of different parts of video cameras and its accessories
6. should have the capability to comprehend the technological advancements in the usage of modern design tools to edit ,print and design for variety of applications.

UNIT-I: FUNDAMENTALS OF PHOTOGRAPHY & CAMERA (12 Hrs)

Film and Digital Photography - Basic parts of the camera, types ofcamera-Box camera, simple miniature camera, Modern reflex camera-TLR, SLR andDigital cameras

UNIT-II: EXPOSURE AND PICTORIAL COMPOSITION (12 Hrs)

Exposure for photographing in artificial light, depth of field, depth of focus,exposure for taking photographs of moving subjects -shutter speed formoving objects-panning-practical hints for exposing.

UNIT-III: EDITINGAND PRINTING (12 Hrs)

Photo editing software – Photoshop – size of the photo – adjustments – layers – filters - selection - cropping – healing – red eye removal – clone – dodge and burn – tittle - panoramas - file formats – saving the photos.

UNIT IV : VIDEO CAMERA (12 Hrs)

Principle of Television - Colour composite Video signal - Colour Televisionsystems(PAL,SECAM,NTSC) - Charge Couple Device-CCD - Electronic Shutter - Video camera ACCESSORIES: Zoom lens - Microphone -Battery - AC adapter - Camera cable - Care and handling of the Equipment - Functions and Controls of Video Camera: Power on/off - VTR on/off –

Zoomcontrol - Iris Control auto/ manual/ - Viewfinder - Earphone – CameraConnector.

UNIT V : VIDEO EDITING SOFTWARES (12 Hrs)

Software overview (Windows Movie Maker, Adobe premiere, Pinnacle VideoStudio, Ulead Video Studio) - Video editing using Ulead Video Studio - Create video file and Disk (DVD and Blue Ray).

BOOK FOR STUDY:

Course material prepared by the Department.

BOOKS FOR REFERENCE:

1. O.P. Sharma, Practical photography.
2. Lee Forst - Hodder & Stoughton, Teach yourself Photography, U.K.
3. Video Production Handbook, Fourth EditionGerald MillersonJim Owens, Asbury College, Focal Press.

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

Semester V	Course Code 17UPH530302A				Title of the Paper PHOTOGRAPHY AND VIDEOGRAPHY								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	3	4	3	4	4	4	3	4	4	4	4	4	3.69
CO2	3	3	3	4	4	3	4	4	3	4	4	4	4	3.62
CO3	4	3	4	3	4	3	4	4	3	4	3	4	4	3.62
CO4	4	3	4	3	4	3	3	4	3	3	3	4	4	3.46
CO5	4	3	4	3	4	3	3	4	3	4	3	3	3	3.38
CO6	4	4	4	4	4	4	4	4	4	4	4	4	4	4.00
													Mean Overall Score	3.62

Result: The Score for this Course is 3.6 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **Hours/Week: 4**
17UPH530302B **Credits: 4**

Core Elective-2 (WD): BIOMEDICAL INSTRUMENTATION

Course Outcomes:

1. Study the function of bioelectric potentials and its importance and understand the different types of waveforms generated by organs.
2. Learn the fundamental knowledge of the electrodes to sense bio potentials.
3. Learn the basic concepts and interpretations of ECG and BP.
4. Understand the anatomy of the nervous system and its signal measurements (EMG, CAT).
5. Analyze and understand the applications of the imaging techniques transmission(x- ray and ultrasound)
6. Updating the knowledge in recent trends of measuring bio-signals

UNIT-I: BIOELECTRIC POTENTIALS (12 Hrs)

Resting and action potentials – Propagation of action potentials – Bioelectric potentials: The electrocardiogram (ECG) – The electroencephalogram (EEG) – The Electromyogram (EMG) – Other Bioelectric potentials

UNIT-II: BIOPOTENTIAL ELECTRODES (12 Hrs)

Electrode theory – Microelectrodes – Body surface electrodes – Needle electrodes- reference electrodes – pH electrode – Blood gas electrode – Specific ion electrode

UNIT-III: CARDIOVASCULAR MEASUREMENTS (12 Hrs)

Electrocardiography – ECG amplifiers – Electrodes & leads – ECG Recorder principles – Measurement of Blood pressure: Indirect measurement – Measurement of Blood flow and cardiac output

UNIT-IV: NERVOUS MEASUREMENTS (12 Hrs)

Anatomy – Neuronal communication – Neuronal Receptors – Measurements from the nervous system – Neuronal firing measurements – EMG measurements – Computerized Axial Tomography

UNIT-V: ULTROSONIC AND X RAY MEASUREMENTS (12 Hrs)

Basic modes of transmission – Ultrasonic Imaging – Ultrasonic diagnosis – Ultrasonic transducers – Ophthalmic scans – Instrumentation for diagnosis – X rays – Special techniques

BOOK FOR STUDY:

1. Biomedical Instrumentation and measurements by Leslie Cromwell, Fred. J. Weibell, Erich A. Pfeiffer, Prentice Hall India, Second Edition (Pearson Education).

Unit	Book	Sections
I	1	3.1- 3.3,3.3.1-3.3.4
II	1	Chapter 4 fully
III	1	6.1, 6.1.2-6.1.4, 6.2, 6.2.1, 6.3, 6.3.1-6.3.4
IV	1	8.1, 8.2, 8.2.1, 8.3, 8.3.1, 8.4.2, 10.1,10.2, 10.4, 10.7, 10.7.1-10.7.3,15.4.4
V	1	9.2.2, 9.2.3, 9.3, 9.3.4, 14.2, 14.2.1, 14.2.2, 14.3

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

Semester V	Course Code 17UPH530302B					Title of the Paper BIOMEDICAL INSTRUMENTATION								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	5	4	4	4	3	4	4	4	4	5	4	3	4	4.0	
CO2	5	3	4	4	4	4	4	4	4	5	4	4	4	4.0	
CO3	4	4	3	4	4	4	4	5	4	5	4	3	4	4.0	
CO4	4	4	3	4	4	4	5	4	5	4	5	4	4	4.0	
CO5	5	4	3	4	4	4	4	5	4	4	3	4	4	4.0	
CO6	5	4	3	4	5	4	5	4	4	4	4	3	4	4.0	
											Mean Overall Score			4.0	

Result: The Score for this Course is 4.0 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **Hours/Week: 2**
17UPH540601 **Credits: 2**

Skill-based Elective-2 (BS):
ELECTRICAL WIRING

Course Outcomes:

1. Learn the fundamentals of electricity, electrical parameters and testing tool.
2. Understand different methods of electricity generation and types of motors.
3. Study the electrical components, symbols, types of circuits and tools
4. Study the various methods of joining conductors and electrical accessories
5. Learn the methods of wiring a house and industry
6. Hands on training on house wiring and troubleshooting the electrical circuits and appliances

Unit-I:

ELECTRICITY GENERATION **(12 Hrs)**

Fundamentals of electricity - Current, Volt, resistance - Ohm's law - Power - Kilowatt hour - Watt meter - Electrical measurements - Electric power generation by Thermal, hydro, atomic and nuclear methods - Battery - Generators - Study of Generator.

Unit-II:

ELECTRIC CIRCUITS AND DISTRIBUTION **(12 Hrs)**

Symbols of electrical parameters - Importance Series, Parallel connections - Ac and DC - Conductors - Inductor, Conductors -Inductor, Capacitor and transformer - Distribution methods - single phase and three phase - Star and delta connections - Rules of electric connections - SWG -Motors - Study of motor, series and parallel circuits.

Unit-III:

ELECTRICAL WIRING - I **(12 Hrs)**

Tools - Methods of Joining conductors - House wiring methods - Gilt, wood casing, Tough - Rubber sheathed, conduit or PVC pipe and concealed – Switches - ceiling roze - lamp holders, sockets - Fuse base - Distribution box –Trip switches - Earth connection -Experimental study of house wiring.

Unit-IV :

ELECTRICAL WIRING - II **(12 Hrs)**

Main board preparation - Distribution - Cut - out preparation - Switch board preparation - Power factor -IEE regulations - Safety precautions –

Testing the insulation -Experimental study of main, distribution and switch boards.

Unit-V:

ELECTRICAL APPLIANCES **(12 Hrs)**

Tungsten - filament bulb - tube light -mercury and sodium vapour lamp - LED lamp - heater - iron box - table fan - ceiling fan - battery eliminator - electrical requirement to washing machine and refrigerator - procedure to rectify the electrical faults in electrical appliances.

BOOK FOR STUDY

Course material prepared by the Department.

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

Semester V	Course Code 17UPH540601			Title of the Paper Skill-based Elective (BS): ELECTRICAL WIRING								Hours 2/w	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	1	5	5	4	5	5	5	5	4	4	5	5	4.46
CO2	5	2	5	4	3	5	5	5	5	4	4	3	5	4.23
CO3	4	1	4	5	2	3	4	5	5	5	5	4	5	4.00
CO4	4	1	5	5	2	4	4	5	5	5	5	4	5	4.00
CO5	4	2	5	5	2	3	4	5	5	5	5	4	5	4.15
CO6	4	1	5	5	2	3	4	5	5	5	5	4	5	4.07
												Mean Overall Score		4.15

Result: The Score for this Course is 4.15 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **Hours/Week: -**
17UPH530212 **Credits: 2**

Self-Paced Course: ASTRONOMY

Course Outcomes

1. Acquire the knowledge of solar system, Moon and eclipses, and the history behind the Lunar and Solar calendars.
2. Understand the basic ideas of motion of Moon, age, phase and rising and setting of moon, and also planets in the solar system.
3. Understand the great number of diverse phenomena used in the Astronomical Instruments and framing the various calendars.
4. Apply the scientific thinking to the real world situations by observing the solar and lunar eclipses and comparing the calendars.
5. Understand and demonstrate the astronomical telescopes and how it helps to observe the solar and lunar eclipses and planets in the solar system.
6. Apply the knowledge and to communicate the scientific information's about solar system, moon and its details, formation of eclipses, and various calendars.

Unit-I:

The Moon

Introduction – Sidereal month – Synodic month – daily motion of the moon – age of moon – phase of moon – position of moon at rising and setting.

Unit-II:

Eclipses

Introduction – umbra and penumbra – lunar eclipse – solar eclipse – duration of lunar and solar eclipse – comparison of solar and lunar eclipses.

Unit-III :

Astronomical Instruments

Sidereal clock – chronometer – gnomon – sun dual – the heliometers – the sextant – chronograph – radio telescope.

Unit-IV:

Solar system

Introduction – the Sun – Mercury - the Venus – Mars – Jupiter – Saturn – Uranus – Neptune – Pluto.

Unit-V:

The Calendars

Lunar and Solar calendars – Egyptian – Mayan – Roman – Julian and Gregorian calendars – Indian National calendar – Tamil and Malayalam calendars.

Book for Study:

"Astronomy" by Prof. S. Kumaravelu and Prof. Susheela Kumaravelu, revised edition 2013.

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

Semester V	Course Code 17UPH530212					Title of the Paper Self-Paced Course: ASTRONOMY								Hours 2/w	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	3	2	1	2	4	4	4	3	4	4	4	3	2		3.08
CO2	4	3	2	3	4	4	3	3	4	3	3	4	3		3.30
CO3	4	3	2	3	4	4	3	2	4	3	3	3	1		3.00
CO4	3	3	1	4	3	3	3	3	3	3	3	3	2		2.84
CO5	3	3	2	3	4	3	3	2	4	3	3	2	3		2.92
CO6	2	3	4	3	4	3	3	4	4	3	2	3	3		3.15
													Mean Overall Score		3.04

Result: The Score for this Course is 3.0 (Moderate 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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester V **L P C**
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: Definition 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 Group 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
3. 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.
5. 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. H*iring the Best: A Manager's Guide to Effective Interviewing and Recruiting*.

Evaluation Pattern

Modules	Topic	Examination Pattern	
		CIA	Online
I	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**

Semester V **Hours/Week: 2**
17USS540701B **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 service-weaker 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.

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Semester VI **Hours/Week: 5**
17UPH630214 **Credits: 4**

OPTICS, SPECTROSCOPY AND LASER

Course Outcomes:

1. Learn the concepts of dispersion of Light , interference, diffraction and polarization of light waves and their applications
2. Study the different aberrations of lens and learn different methods of minimizing the aberrations of lens.
3. Study the principle of Microwave, Infra red, Raman and Resonance Spectroscopy and its instrumentation.
4. Understanding the physics concepts behind the mechanism of Fresnel's biprism and Michelson's interferometer.
5. Learn the working principle of Lasers, holography and their applications.
6. Should be able to associate the learning from the courses related to nanoscience , crystal growth and spectroscopy

UNIT-I: GEOMETRICAL OPTICS (12 Hrs)

Dispersion of Light - Dispersive Power –Achromatism in prism - Deviation without dispersion - Dispersion without deviation- Constant deviation Prism- Constant deviation spectroscope- Aberration- Spherical aberration- methods of minimizing spherical aberration - Chromatic aberration of a lens - Longitudinal chromatic aberration – Lateral chromatic aberration – Achromatic combination of lenses – Conditions for achromatism of two lenses placed in contact – Two lenses separated by a finite distance - Eyepiece- Huygen's eyepiece - Ramsden's eyepiece.-Comparison of eyepieces.

UNIT-II : PHYSICAL OPTICS (12 Hrs)

Interference - Condition for sustained interference of light - Fresnel's biprism - colors of thin films due to transmission - Michelson Interferometer and its applications. Fresnel &Fraunhofer diffraction – Fresnel's explanation of rectilinear propagation of light - Zone plate - construction - theory- Comparison of zone plate with a convex lens -Plane transmission grating - theory - Determination of wavelength of light using grating (Normal Incidence) - Polarization - double refraction -Nicol prism - Theory of Production of elliptically and circularly polarized light - Quarter wave plate - Half- wave Plate-Detection of plane , circularly and elliptically polarized light - Optical activity.

UNIT-III: MICROWAVE AND INFRARED SPECTROSCOPY (12 Hrs)

Theory of Microwave spectroscopy - diatomic molecule as a rigid rotator- Instrumentation. IR - Range of IR radiation - theory of IR absorption

spectroscopy - theory of vibrational diatomic molecule as anharmonic oscillator - Instrumentation.

UNIT -IV: RAMAN AND RESONANCE SPECTROSCOPY (12 Hrs)

Raman spectroscopy: Principle - characteristics and properties of Raman lines - Difference between Raman and IR spectra - quantum theory - Perkin Elemer Raman spectrometer. Resonance Spectroscopy: ESR, NMR, NQR (Principle & Theory only).

UNIT -V: LASERS AND APPLICATIONS (12 Hrs)

Introduction - Principles of laser – Einstein's explanation for stimulated emission – Differences between stimulated and spontaneous emission - Population inversion –Properties of laser -Types of lasers - He- Ne Lasers - Semiconductor Lasers - Holography – Construction of hologram – Reconstruction of hologram - Advantages– applications of laser.

BOOKS FOR STUDY

1. R. Murugesan, Kiruthigasivaprasath, Optics and Spectroscopy, S.Chand& Company Ltd, 8th Revised Edition. 2012.
2. Gurdeep R. Agarwal and Sham K.Anand - Spectroscopy (atomic and molecular), Himalaya Publishing House, 2004.
3. A.Marikani – Engineering physics, PHI Learning private limited ,Eastern economy edition,2012.

Unit	Book	Sections
I	1	1.7,1.9,1.10, 1.12, 1.13, 1.15,1.16, 1.17, 1.20,1.21,1.22, 1.25 -1.28
II	1	2.1,2.3,2.5,2.11,2.12,3.1,3.2,3.3,3.5,3.12,3.17,4.1,4.5,4.8,4.10,4.11-4.15
III	2	– 2.4, 2.10, 3.1, 3.2, 3.4, 3.5, 3.9
IV	2	- 4.6, 7.1 -7.3, 9.1 – 9.3, 10.1 – 10.6
V	3	2.1,2.2,2.3,2.4,2.5,2.7,2.8,2.8.2,2.8.5,2.10,2.10.1,2.10.2,2.10.3, 2.11,3.1,3.2,3.3,3.4,3.6,3.6.1,3.6.2,3.6.3,3.8,3.8.1,3.11,3.11.3.

BOOKS FOR REFERENCE

1. S.L. Kakni, K.C. Bhandari, A text book of Optics, S.Chand and Sons, New Delhi, 2002.
2. N. Subramanyam, Brijal. A Text Book of Optics S.Chand and Company Ltd., New Delhi.
3. B.B.Laud Lasers and Non-Linear Optics.
4. H.S. Randhawa, Modern Molecular Spectroscopy, Macmillan India Ltd.

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

Semester VI	Course Code 17UPH630214					Title of the Paper OPTICS, SPECTROSCOPY AND LASER								Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
CO1	4	3	2	3	4	4	3	2	4	3	3	3	1	3.00	
CO2	3	2	1	2	4	4	4	3	4	4	4	3	2	3.08	
CO3	4	3	3	3	4	3	3	3	3	3	4	4	1	3.15	
CO4	3	3	1	4	3	3	4	2	3	3	4	3	1	2.84	
CO5	3	3	1	4	3	3	3	3	3	3	3	3	2	2.84	
CO6	4	3	2	3	4	4	3	3	4	3	3	4	3	3.30	
												Mean Overall Score		3.04	

Result: The Score for this Course is 3.0 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester VI **Hours/Week: 5**
17UPH630215 **Credits: 4**

QUANTUM MECHANICS AND RELATIVITY

Course Outcomes:

1. Understand limitations of classical mechanics and origin of quantum mechanics.
2. Ability to understand the various concepts of quantum mechanics.
3. Understand the mathematical proof of Schrodinger equation.
4. Ability to analysis and solve the Schrodinger wave equation for one dimensional systems and spherically symmetric potential problem.
5. Understand the Special theory of Relativity
6. Solving length contraction and time dilation problem

UNIT-I: ORIGIN OF QUANTUM MECHANICS (12 Hrs)

Planck's quantum theory- particle wave duality-de Broglie concept of matter waves – expression for group velocity – relation between group and phase velocity-experimental study of matter waves - Heisenberg's Uncertainty principle – Mathematical proof of uncertainty principle for one dimensional wave packet –Properties of wave functions.

UNIT-II: GENERAL FORMALISM (12 Hrs)

Basic postulates of wave mechanics and quantum mechanics– derivation of time dependent and time independent Schrödinger's wave equation – Probability current density – Ehrenfest's theorem- Commutator algebra – form of wave function in terms of definite momentum – probability density – properties of energy eigen values.

UNIT-III: ONE DIMENSIONAL SCHROEDINGER PROBLEMS (12 Hrs)

Particle in a box – Infinite square well potential – potential step. The free particle – rectangular potential well- Finite square potential well. Barrier penetration problem. Linear harmonic Oscillator – Comparison of classical and quantum ideas.

UNIT-IV: SPHERICALLY SYMMETRIC POTENTIAL PROBLEMS (12 Hrs)

Wave mechanical atom model – The hydrogen atom – normalized wave function of the Hydrogen atom – Expression for energy of the electron of the Hydrogen atom in the ground state – Significance of various quantum numbers – electron probability density –Orbital angular momentum – expression for eigen values of L^2 and L_z – Rigid rotator.

UNIT-V: RELATIVITY **(12 Hrs)**

Introduction – Frame of reference - Newtonian relativity – Galilean Transformation equations – The Ether hypothesis – The Michelson –Morley experiment – Special theory of relativity – The Lorentz Transformation equations – Length contraction – Time Dilation - relativity of simultaneity – addition of velocities – variation of mass with velocity – Mass Energy equivalence – Minkowski's Four dimensional Space-Time continuum.

BOOK FOR STUDY:

1. R.Murugesan and Er. Kiruthiga Sivaprasath, Modern physics, S Chand & Co, New Delhi, Seventeenth Revised Edition 2014.

Unit	Book	Sections
I	1	Chapter 9, 2.1,11.1- 11.4,11.6,11.9
II	1	11.7,12.1,11.8,12.2,12.6,14.4,15.5-15.7
III	1	11.10-11.13,12.3,12.4,14.1,16.4, 16.5.
IV	1	11.5,11.14,13.1- 13.4,14.5,11.15
V	1	1.1-1.15

BOOKS FOR REFERENCE:

1. Arthur Besier, Shobhit Mahajan and S. Rai Choudhury, Concepts of Modern Physics: Mcgraw Hill Education, 7th Edition, 2015.
2. A. K. Saxena, Principles of Modern Physics, Narosa Book Distributors Pvt Ltd, 4th edition 2014.

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

Semester VI	Course Code 17UPH630215	Title of the Paper QUANTUM MECHANICS AND RELATIVITY										Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	2	3	4	4	5	2	2	3	2	2	3	3.2
CO2	5	5	2	3	5	5	4	3	2	3	2	2	3	3.4
CO3	5	4	2	2	3	3	3	2	3	4	2	2	3	3.7
CO4	5	5	2	2	4	4	3	5	2	4	2	2	5	3.5
CO5	5	5	3	3	5	5	3	3	2	3	2	2	4	3.5
CO6	5	5	3	3	4	3	3	5	2	4	2	2	5	3.5
												Mean Overall Score		3.5

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	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:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$ **Mean Overall Score for COs** = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$

Semester VI **Hours/Week: 5**
17UPH630216 **Credits: 4**

DIGITAL ELECTRONICS AND MICROPROCESSOR

Course Outcomes:

1. Understand the structure of various number system and basic logic gates.
2. Ability to design and solve the Boolean Algebra simplification and Karnaugh Maps.
3. Develop skill to build and troubleshoot combinational digital circuits.
4. Ability to construct sequential circuits and to design counters.
5. Learn the working principle of Shift Register and its types.
6. Understand the basic of intel 8085 microprocessors architecture and its instruction set and to write assembly language programme for the intel 8085.

Unit-1: Number Systems, Logic Gates & Boolean Algebra and K- Maps (12 hr)

Number Systems and Logic Gates: Different Number Systems -Binary, Octal and Hexa-decimal. Conversion between the number systems. Different Digital codes – ASCII, BCD, Gray codes. Basic logic gates : AND, OR and NOT Gates. Realization using Diodes and Transistor. Universal gates - NAND, NOR - conversion into Basic gates, Special Gates – Ex-OR , Ex-NOR.

Boolean algebra and K- Maps :- Boolean Laws. De-Morgan's Theorems. Simplification of Logical expression using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Implementation of a Truth Table into an Equivalent Logic Circuit by Boolean Algebra and Karnaugh Maps - 4 Variables.

Unit-II: Combinational and Arithmetic Digital Circuits and Semiconductor Memories (12 hr)

Data processing circuits :- A basic study of TTL, CMOS and MOSFET – Classification and parameters. Basic Idea of Multiplexers 2:1, 4:1, De-multiplexers 1:2, 1:4, Decoders, Encoders – decimal – to - BCD, Parity Generator and Checker – odd & even.

Arithmetic Circuits :- Binary Addition, Binary Subtraction using 2's Complement Method, Half Adders, Half Subtractors, Full Adders and Full Subtractors.

Memories: - Read-only memories (ROM), PROM, EPROM and RAM.

Unit-III: Sequential Circuits (12 Hrs)

Sequential Circuits: RS, D, JK and T Flip-Flops. Level Clocked and Edge Triggered Flip-Flops. Preset and Clear Operations. Race-around Conditions in JK Flip-Flops. Master-Slave JK Flip-Flop (As Building Block of Sequential Circuits).

Counters: Asynchronous and Synchronous Counters. Decade Counter, UP-DOWN Counters, Ring Counter.

Shift registers: - Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out, and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Unit-IV: Microprocessors Intel 8085 microprocessor architecture (12 hr)

Architecture of Intel 8085. Block Diagram, different blocks, Buses, Registers, ALU, Memory- Stack Memory. Interfacing Devices, Timing and Control Circuitry, Pin-out Diagram. Timing States, Instruction Cycle, Interrupts and Interrupt Control, Input / Output. Machine Language. Assembly Language. Instruction Set and Format. Data Transfer, Arithmetic, Logical, Branching and Machine Control Operations. RIM and SIM.

Different Addressing Modes: Register, Implied, Immediate, Direct and Indirect.

Memory Organization and Addressing, Memory Interfacing, Memory Map.

Unit-V: 8085 Instruction Set and Programming (12 Hrs)

Microprocessor Programming: - Algorithm and Flowcharts. Simple programming Exercises : Addition – sum of two 8-bit data without carry, sum of two 8-bit data with carry, decimal addition, sum of a string of data, Subtraction of two 8-bit data, 8 bit Multiplication – using successive addition and 8 bit Division – using successive subtraction, Look-up-table, Masking of a data, block transfer.

Books for Study:

1. Digital Fundamentals, Thomas L. Floyd, 8th Edition (Universal Book Stall, India, 2008).
2. Fundamentals of microprocessors and microcontrollers, B.Ram, 7th revised edition, Dhanapat Rai Publications, 2011.

UNIT	BOOK	SECTIONS
1	1	2.2- 2.5, 2.8-2.11, 3.1-3.6, 4.1-4.10
2	1	11.1-11.4, 6.2, 6.5, 6.6, 6.8-6.10, 10.2-10.4
3	1	7.1-7.3, 8.1-8.4, 9.1-9.5
4	2	3.1-3.3, 4.1-4.4, 4.6, 5.2, 5.5, 7.1-7.3, 7.5, 7.6
5	2	6.1-6.6, 6.8, 6.17-6.19, 6.26, 6.27, 6.29, 6.30

BOOKS FOR REFERENCE:

1. Digital principles and Applications by Donald P. Leach & Albert Paul Malvino, (Glencoe, 1995).
2. Microprocessor Architecture, Programming, and Applications with the 8085 by Ramesh S.Gaonkar, (Prentice Hall, 2002).
3. Microprocessor Architecture, Programming, and Systems featuring the 8085 by William A. Routt, (Thomson Delmar Learning, 2006)

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

Semester VI	Course Code 17UPH630216				Title of the Paper DIGITAL ELECTRONICS AND MICROPROCESSOR								Hours 5	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	3	2	3	4	4	4	4	3	3	2	2	3	3.2
CO2	4	4	3	4	3	4	3	4	3	4	3	2	3	3.4
CO3	4	3	2	3	4	4	4	3	3	3	1	3	3	3.1
CO4	3	4	1	4	3	4	3	4	3	3	3	2	4	3.2
CO5	4	4	2	4	4	3	4	4	3	4	3	1	3	3.3
CO6	4	3	3	3	4	4	3	3	3	3	4	3	3	3.3
													Mean Overall Score	3.3

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester VI **Hours/Week: 6**
17UPH630217 **Credits: 3**

PHYSICS PRACTICAL - IV

Any 16 Experiments

1. Monostable and bistable multivibrators.
2. Spectrometer – Cauchy's constant.
3. Spectrometer – small angle prism.
4. B.G. – L by Anderson's bridge.
5. B.G. – High resistance by leakage.
6. Potentiometer – EMF of a thermocouple.
7. Potentiometer – High range voltmeter.
8. Series and parallel resonance.
9. NAND and NOR as universal building blocks.
10. Adders and Subtractors.
11. Op-amp - basic operations.
12. Astable multivibrator using Transistors.
13. Simplification of Boolean expression using k map and implementation.
14. Encoder and Decoder.
15. Binary adder and subtractor.
16. Multiplexer and Demultiplexer.
17. Flip Flops using IC gates.
18. Shift registers.
19. Counters.
20. Microprocessor – data transfer operations and exchange.
21. Microprocessor –Arithmetic operations. – 8-bit Addition, Subtraction (Binary and Decimal), 16-bit Addition only, Multiplication and Division.
22. V-I characteristics of Solar panel.

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Semester VI **Hours/Week: 4**
17UPH630303A **Credits: 4**

Core Elective-3 (WD): COMMUNICATION SYSTEMS

Course Outcomes:

1. Understanding AM, FM and PM modulation and demodulation techniques
2. Learning the basic concepts of fiber optics and types of fiber
3. Understanding the basic radar system and types of radar
4. Learning the working principle of satellite communication system
5. Exposing the students to the mobile communication system
6. Studying the concept of internet protocol, wi-fi and 3G

UNIT I: RADIO TRANSMISSION AND RECEPTION (12 Hrs)

Transmitter: Modulation - types of modulation-amplitude modulation - modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-comparison of FM and AM-Demodulation-Essentials in demodulation.

Receivers: A.M. radio receivers -Types of A.M. radio receivers – Stages of superhetrodyne radio receiver-Advantages of superhetrodyne circuit -FM receiver-Difference between FM and AM receivers.

UNIT II: FIBER OPTIC COMMUNICATION (12 Hrs)

Introduction -Basic principle of fiber optics – Advantages – Construction of optical fiber-Acceptance angle and Numerical aperture –Classification of optical fibers based on the refractive index profile – Classification of optical fibers based on the number of modes of propagation – Losses in optical fibers – Attenuation – Fiber optic communication – Advantages.

UNIT III: RADAR COMMUNICATION (12 Hrs)

Introduction -Basic radar system -Radar range –Antenna scanning – Pulsed radar system – A Scope- Plan position indicator-Search radar- Tracking radar- Moving target indicator- Doppler effect-MTI Principle- CW Doppler Radar- Frequency modulator CW Radar.

UNIT IV: SATELLITE COMMUNICATION (12 Hrs)

Introduction – history of satellites – satellite communication system – satellite orbits Basic components of satellite communication system– constructional features of satellites-Commonly used frequency in satellite

communication- Multiple access – communication package – antenna- power source – satellite foot points- satellite communication in India.

UNIT V: MOBILE COMMUNICATION (12 Hrs)

Introduction-The concept of cell –Basic cellular mobile radio system-The cellphone-Facsimile-Important features of Fax machine-Application of Facsimile – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television) –Wi-Fi-3G (Basic ideas only).

BOOKS FOR STUDY:

1. Metha V.K., Principles of Electronics, S. Chand & Company Ltd., 2013
2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S.Chand & Company Pvt. Ltd., 2013.

BOOKS FOR REFERENCE:

1. Poornima Thangam I, Satellite communication, Charulatha Publications, 2012.
2. Dennis Roddy and John Coolen, Electronic Communication, PHI, 1990.
3. William C.Y. lee, Cellular telecommunication (second edition), Tata Mcgraw Hill, 1991.

UNIT	BOOK	SECTIONS
I	1	16.2-16.5,16.7,16.10,16.11,16.13-16.15,16.17-16.22
II	2	14.1-14.5.1, 14.4-14.5
III	2	16.1-16.6
IV	2	13.1-13.3
V	2	20.1-20.3, 20.5,20.7-20.9

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

Semester VI	Course Code 17UPH630303A	Title of the Paper Core Elective (WD): COMMUNICATION SYSTEM											Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	3	4	4	4	3	4	4	3	3	2	3	2	2	3.1
CO3	4	4	3	3	4	4	4	3	4	2	2	2	3	3.2
CO5	3	3	2	3	3	4	4	3	3	4	2	3	3	3.0
CO6	4	3	3	3	3	4	4	3	3	2	2	3	4	3.1
CO7	4	4	4	3	3	4	4	3	4	3	4	4	3	3.6
CO8	4	4	3	4	3	4	4	3	4	2	4	3	3	3.4
													Mean Overall Score	3.2

Result: The Score for this Course is 3.2 (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

Values Scaling:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester VI **Hours/Week: 4**
17UPH630303B **Credits: 4**

Core Elective-3 (WD): ASTROPHYSICS

Course Outcomes:

1. Acquire the knowledge on the elements of space dynamics, solar system with their small bodies, universe and its neighbors and life in universe.
2. Understand the basic concepts of space dynamics, solar system: structure, activity and its features etc.
3. Understand the great number of diverse phenomena in the Universe through Physics like origin and nature of universe –subjects relevance to contemporary social issues.
4. Apply the scientific thinking to the real world problems and qualitative analysis about the solar system and their members.
5. Understand and demonstrate the formation of solar and lunar eclipses.
6. Apply the knowledge and to communicate the scientific information's about universe, solar system, and life in Mars: pre Mariner and post Mariner.

UNIT-I: ELEMENTS OF SPACE DYNAMICS (12 Hrs)

Man's quest for space – the energy requirements – Rocket propulsion – suborbital flights – Artificial earth satellites – Lunar and planetary probes

UNIT-II: THE HEART OF THE SOLAR SYSTEM (12 Hrs)

Vital statistics of the Sun – the solar photosphere – the Fraunhoffer lines – structure of solar atmosphere – the solar interior – Sunspots and solar activity – other features of the solar activity – Radio studies of the quiet Sun – Radio radiation of the distributed Sun.

UNIT-III : SMALL BODIES IN THE SOLAR SYSTEM (12 Hrs)

Asteroids – Meteorites – Comets as members of the Solar system – Physical properties of comets – Origin and evolution of comets – Space studies of comets – Meteors – an inventory of satellites – the large satellites – Medium, small and tiny satellites – Planetary rings.

UNIT-IV : OUR HOME AND THE NEAREST NEIGHBOUR (12 Hrs)

EARTH: Gross properties – internal structure – the terrestrial atmosphere – the Earth's magnetic field – motions – Solar terrestrial relations – the Earth in space – atmospheric circulation in the troposphere. MOON : Some basic facts – telescopic studies – internal structure – surface features – Origin of the Moon – the lunar environment – Solar and Lunar eclipses.

UNIT-V: LIFE IN THE UNIVERSE (12 Hrs)

Nature of life on Earth – A survey of objects in the Solar System – Pre Mariner search for life on Mars – Post Mariner search for life on Mars – Life outside the Solar system – the search for life in the Universe.

BOOKS FOR STUDY

1. Astrophysics of the Solar System – KD Abhyankar, University Press Pvt. Ltd. Hyderabad, 1999.

Unit	Section
I	3.1-3.6
II	4.1-4.10
III	9.1-9.11
IV	5.1-5.9, 6.1-6.6
V	11.1-11.7

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

Semester VI	Course Code 17UPH630303B				Title of the Paper Core Elective (WD): ASTROPHYSICS								Hours 4	Credits 4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	2	4	4	5	4	3	2	3	2	4	3	3	3.38
CO2	4	3	5	4	4	4	3	4	3	2	3	4	3	3.54
CO3	3	4	5	4	4	4	3	3	4	3	4	2	2	3.46
CO4	5	3	4	3	4	3	4	4	3	4	5	4	3	3.77
CO5	3	4	4	5	4	4	3	2	4	3	4	2	2	3.38
CO6	3	2	1	2	4	4	4	4	3	4	4	4	3	3.23
													Mean Overall Score	3.46

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	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:

$$\text{Mean Score of COs} = \frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}} \qquad \text{Mean Overall Score for COs} = \frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$$

Semester VI **Hours/Week: 2**

17UPH640602 **Credits: 2**

Skill-Based Elective (WS): CELL PHONE SERVICING

Course Outcomes:

1. Understand the concepts of GSM/CDMA and to be aware of the call processing of a GSM and GPRS
2. Identify various IC's inside mobile phones and to trained to assemble and disassemble the parts of the mobile phone
3. Learn the SMT technology and soldering and desoldering
4. Understand the network problems and SIM card problems and to learn the trouble shooting process
5. Understand the IMEI information and software unlocking and flashing
6. Diagnose the problem of the mobile phone and understanding possible problem using diagnostic tools and to replacement the required modules.

Unit-I: FUNDAMENTALS OF CELL PHONE (12 Hrs)

Introduction to GSM/CDMA - Working of GSM/CDMA CellularTechnologies - Information of Cell Sites & Base Station -Call Processing of a GSM –Smart Phones (Android, IOS, Windows) APPs - GPRS - Mobile Software (PC suite)

Unit-II: CHIP LEVEL STUDY (12 Hrs)

Block Diagrams -Schematic Diagrams - Chip Level Information of Mobile Phones - BGA -SMD Reworking Station - Soldering lead -Soldering paste - De- Soldering wire - Identification of IC's - Assembling &Disassembling of Smart Phones.

Unit-III: TROUBLE SHOOTING (12 Hrs)

Causes for various problems & Troubleshooting of Problems in a Smart Phone - Network Problems - Display Problems –Touch Problems - Sim Card Problems – Charging problems - Battery Problems - Software Problems - IMEI information - Sim Card problems - Problems related tomobile phone handsets - replacement of Various components ICS.

Unit-IV: PRACTICAL 1 (12 Hrs)

Tools and Test Equipment - Disassembling the cell phone –Testing of Battery, Display, Touch, Antenna,Mic, Speaker, Ringer, Charger, Vibrator and headset - SMD soldering.

Unit-V : PRACTICAL 2 (12 Hrs)

Software Unlocking - User lock, SPC, MSL, FSC, OTKSL, Flashing - Downloads of logos and Ring tones - Hand set problems –Replacement of modules (display, touch screen, mic,speaker, antenna, amplifier, etc.).

BOOK FOR STUDY - Course material prepared by the Department.

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

Semester VI	Course Code 17UPH640602			Title of the Paper Skill-based Electives (WS): CELLPHONE SERVICING									Hours 2	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)								Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	3	4	5	5	5	4	4	4	4	5	4	4.3
CO2	5	4	4	4	5	4	5	4	4	5	4	4	4	4.3
CO3	5	4	3	4	4	5	4	5	4	5	4	5	4	4.3
CO4	5	4	4	4	5	4	5	4	5	4	5	4	5	4.4
CO5	4	3	4	4	4	4	4	5	4	4	4	3	3	3.8
CO6	5	4	4	5	5	4	5	4	4	4	5	4	4	4.3
												Mean Overall Score		4.2

Result: The Score for this Course is 4.2 (Very 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

***Values Scaling*:**

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	**Mean Overall Score for COs** = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$