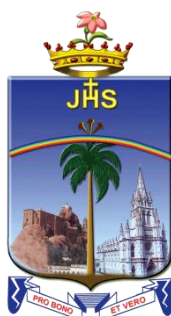


B.Sc. BOTANY
LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE
WITH CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF BOTANY
SCHOOL OF BIOLOGICAL SCIENCES
ST. JOSEPH'S COLLEGE (AUTONOMOUS)

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

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

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to maintain and uphold the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014 – 15, to meet and excel the challenges of the 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 TANSCH 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-2 is 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	K1	K2	K3	K4	K5	K6	Total Marks
SECTIONS							
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	K1	K2	K3	K4	K5	K6	Total Marks
SECTIONS							
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:

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

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 Programme.
- 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
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re-appearance

Credit based weighted Mark System 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 is done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

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

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

Mean Scores of COs = $\frac{\text{Sum of values}}{\text{Total No.of POs \& PSOs}}$		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 imbued with ethical values and social concern will be able to appreciate cultural diversity, promote social harmony and ensure sustainable environment.

Program Specific Objectives (PSOs)

1. Graduates will acquire the basic concepts to utilize them for lifelong learning, communicative skills and to imbibe ethical values to create a better world.
2. Will learn about the systematics, structure and functions of plants for effective management of cultivation practices for improved plant performance.
3. Will develop laboratory skills utilizing modern tools, techniques and protocols to collect and process data to design innovative scientific problems and solutions.
4. Will apply the skills for the benefit of the society through teamwork and project management practices for employability and entrepreneurship.
5. Will exploit the knowledge gained through various courses for sustainable environment and human welfare.

B.Sc. Botany						
PROGRAMME STRUCTURE						
Part	Sem.	Specification	No. of Courses	No. of 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 course : Theory	12	52	32	82
	I-VI	Core course : Practical	7	22	13	
	I-IV	Core course- Allied/(Practical)	4	16(8)	16	
	V-VI	Discipline Specific Elective	4	20	12	
	VI	Project Work	1		2	
	V	Self-paced learning	1	--	2	
	V	Field study/ Industrial visit/ Case study	1		1	
	V	Internship	1	-	2	
	VI	Comprehensive Exam	1	--	2	
	II,III,V	Extra Credit courses (MOOC)	(3)	--	(6)	(6)
IV	V,VI	Generic Elective	2	8	6	14
	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	1-V	Outreach Programme/NCC	-	-	-	4
		Total		180		130(6)

B.Sc. Botany								
PROGRAMME PATTERN								
Course Details						Scheme of Exams		
Sem	Part	Course 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	21UBO13CC01	Algae and Bryophytes	5	3	100	100	100
	3	21UBO13CC02	Fungi, Plant Pathology and Lichens	5	3	100	100	100
	3	21UBO13CP01	Lab Course 1	3	2	100	100	100
	3	21UBO13AC01	Allied I: Zoology I: General Zoology	4	2	100	100	100
	3	21UBO13AP01	Allied I: Lab. Course: Zoology 1	2	2	100	100	100
	4	21UEN14AE01	AECC-1 : Communicative English	(6)	4	100	-	100
	4	21UHE14VE01	Essentials of Humanity	2	1	50	50	50
Total				30	23			
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	21UBO23CC03	Pteridophytes, Gymnosperms and Paleobotany	4	3	100	100	100
	3	21UBO23CC04	Anatomy and Embryology	4	2	100	100	100
	3	21UBO23CP02	Lab Course 2	3	2	100	100	100
	3	21UBO23AC02	Allied I: Zoology II: Agricultural Entomology	4	2	100	100	100
	3	21UBO23AP02	Allied I: Lab. Course: Zoology II	2	2	100	100	100
	4	21UHE24AE02	AECC-2: Environmental studies	2	2	50	50	50
	4	21UHE24VE02	Techniques of Social Analysis: Fundamentals of Human Rights	2	1	50	50	50
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	21UBO33CC05	Taxonomy of Angiosperms	5	3	100	100	100
	3	21UBO33CC06	Plant Breeding and Evolution	3	2	100	100	100
	3	21UBO33CP03	Lab Course 3	3	2	100	100	100
	3	21UBO33AO03A	Allied-II Optional: Chemistry for Biologists - I	4	3	100	100	100
		21UBO33AO03B	Allied-II Optional: Biometrics & Computer Applications I	4	2	100	100	100
	3	@	Allied-II Optional: Lab. Course 1 (Chemistry for Biologists)	2	-	-	-	-
		21UBO33AP03B	Allied-II Optional: Lab. Course 1 (Biometrics & Computer Applications)	2	2	100	100	100
	4	21UBO34SE01	SEC-1 (WD): Mushroom technology	2	1	100	-	100
	4	21UHE34VE03A	Professional Ethics-I: Social Ethics - I	2	1	50	50	50
	4	21UHE34VE03B	Professional Ethics I:Religious Doctrine- I					
			Extra Credit courses (MOOC)-2		(2)			

			Total	30	18/19(2)			
IV	1	21UTA41GL04B	Scientific Tamil	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	21UBO43CC07	Cell Biology and Genetics	4	3	100	100	100
	3	21UBO43CC08	Ecology and Climate Change	4	2	100	100	100
	3	21UBO43CP04	Lab Course 4	3	2	100	100	100
	3	21UBO43AO04A	Allied-II Optional: Chemistry for Biologists - II	4	3	100	100	100
		21UBO43AO04B	Allied-II Optional: Biometrics & Computer Applications II	4	2	100	100	100
	3	21UBO43AP04A	Allied-II Optional: Lab Course 2 (Chemistry for Biologists)	2	2	100	100	100
		21UBO43AP04B	Allied-II Optional: Lab Course 2 (Biometrics & Computer Applications)	2	2	100	100	100
	4	21UBO44SE02	SEC-2 (BS): Mushroom Technology	2	1	100	-	100
	4	21UHE44VE04A	Professional Ethics II: Social Ethics-II	2	1	50	50	50
	4	21UHE44VE04B	Professional Ethics II: Religious Doctrine-II					
			Total	30	19/20			
V	3	21UBO53CC09	Biophysics and Biostatistics	5	2	100	100	100
	3	21UBO53CC10	Microbiology & Immunology	5	3	100	100	100
	3	21UBO53CP05	Lab. Course 5	4	3	100	100	100
	3	21UBO53ES01A	DSE-1: Molecular Biology	5	3	100	100	100
	3	21UBO53ES01B	DSE-1: Bioinformatics & Bionanotechnology					
	3	21UBO53ES02A	DSE-2: Research Methodology	5	3	100	100	100
		21UBO53ES02B	DSE-2: Biopesticides					
	3	21UBO53IS01	Internship	-	2	100	-	100
	3	21UBO53SP01	Self-paced learning: Economic Botany	-	2	50	50	50
	3	21UBO53FV01	Field study/ Industrial visit/ Case Study	-	1	100	-	100
	3	21UBO54EG01	GE-1: Landscape designing	4	3	100	100	100
	4	21USS54SE03	SEC-3: Soft Skills	2	1	100	-	100
			Extra Credit courses (MOOC)-3		(2)			
			Total	30	23(2)			
VI	3	21UBO63CC11	Plant Physiology	4	3	100	100	100
	3	21UBO63CP06	Lab. Course 6	3	1	100	100	100
	3	21UBO63CC12	Genetic Engineering and Biotechnology	4	3	100	100	100
	3	21UBO63CP07	Lab. Course 7	3	1	100	100	100
	3	21UBO63ES03A	DSE-3: Biochemistry	5	3	100	100	100
	3	21UBO63ES03B	DSE-3: Agricultural Botany					
	3	21UBO63ES04A	DSE-4: Medicinal Botany	5	3	100	100	100
	3	21UBO63ES04B	DSE-4: Biological Techniques					
	3	21UBO63PW01	Project Work	-	2	100	100	100
	3	21UBO63CE01	Comprehensive Examination	-	2	50	50	50
	3	21UBO64EG02	GE-2: Solid Waste Management	4	3	100	100	100
	4	21UBO64SE04	SEC-4 (WS): Herbal Technology	2	1	100	-	100
			Total	30	22			
I-VI	5	21UCW65OR01	Outreach Programme		4			
			TOTAL (three years)	180	130(6)			

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

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: 6 th 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	Cognitive Levels (K –Levels)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
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, மனத்தாய்மை
- பெருஞ்சித்திரனார் - அஞ்சாதீர், மொழி இனம் நாடு,
- பட்டுக்கோட்டை - வருங்காலம் உண்டு, உழைக்காமல் சேர்க்கும் பணம்.
- கல்யாணசுந்தரனார் - எழுத்து
- இலக்கணம் - மூன்றாம் பாகம் - தண்டமிழ்த் தொண்டர்கள்
- இலக்கிய வரலாறு

அலகு - 3

(12 மணிநேரம்)

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

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/ week	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	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
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 1^{er} groupe, les adjectifs possessifs, la formation du féminin, la formation du pluriel.

LEXIQUE : Se présenter, Présenter quelqu’un, Remercier, Les jours de la semaine, les mois de l’année, les nombres de 0 à 69, la famille

PRODUCTION ORALE : Comprendre des informations essentielles

PRODUCTION ECRITE : Présentez –vous

Unit - III (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 AI*, Didier, Paris 2016.

Books for Reference

1. J.Girardet and J.Pecheur, *Echo AI*, CLE International, 2^eédition, 2017
2. Régine Mérieux and Yves Loiseau, *Latitudes AI*, 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://français.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/exercices/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	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
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 Tripathy, *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	Cognitive Levels (K –Levels)
	On successful completion of the course, the student will be able to	
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 varathamana kalaha

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 I*. 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	21UBO13CC01	CORE-1: ALGAE AND BRYOPHYTES	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire thorough knowledge on the salient features of Algae and Bryophytes.	K1
CO-2	learn the major classes, types, structure and reproduction of various genera.	K1
CO-3	conserve them in their natural environment.	K2
CO-4	acquire the basic knowledge of the evolutionary relationship between algae and bryophytes.	K3
CO-5	identify the economic importance of Algae and Bryophytes.	K4

Unit-I (15 Hours)

Algae: General characteristics of algae. Commonly found algae in India. Classification (F.E. Fritsch, 1945). Salient features of various classes as per Fritsch's system. Cell structure of prokaryotic algae (Cyanophyceae cell) and eukaryotic algae (Chlorophyceae cell).

Unit-II (15 Hours)

Thallus organization, mode of reproduction, algal life cycle patterns (haplontic, diplontic, haplo-diplontic and diplobiontic). Mass culture (spirulina), economic importance and BGA in *Azolla* as fodder and biofertilizer.

Unit-III (15 Hours)

Detailed study of the following genera: occurrence, distribution, common species, structure and reproduction of *Oscillatoria*, *Oedogonium*, *Caulerpa*, *Cyclotella*, *Sargassum* and *Polysiphonia* (developmental studies on sex organs not required).

Unit-IV (15 Hours)

Bryophytes: General characteristics of Bryophytes, Various natural habitats of Bryophytes, Classification (Rothmaler, 1951), vegetative reproduction and economic importance. Evolution of gametophytes and sporophytes among Bryophytes.

Unit-V (15 Hours)

Detailed study of the following genera: occurrence, distribution, common species, structure and reproduction of *Marchantia*, *Anthoceros* and *Funaria* (developmental studies on sex organs not required).

Books for Study

1. Pandey, BP. 2018. College Botany Volume I, 20/e, S. Chand and Company, New Delhi.
2. Pandey, BP. 2005. Simplified Course in Botany. S. Chand and Company, New Delhi.
3. Sharma, OP. 1992. Text Book of Algae. Tata McGraw Hill, New Delhi.

Books for Reference

1. Gangulee, HC. And Kar, AK. 1989. College Botany, Vol-II, Books & Allied Pvt. Ltd., Calcutta.
2. Prem Puri. 1981. Bryophytes - Morphology growth and differentiation. Atma Ram & Sons. Lucknow.
3. Smith, GM. 1955. Cryptogamic Botany Vol-1&II, McGraw Hill, New York.

Semester	Course Code	Title of the Course									Hours	Credits
I	21UBO13CC01	CORE-1: ALGAE AND BRYOPHYTES									5	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		
CO1	3	3	2	1	1	3	3	2	2	1	2.1	
CO2	1	2	2	2	2	3	2	2	2	1	1.9	
CO3	3	3	3	3	3	2	3	3	3	2	2.8	
CO4	1	2	3	3	3	1	2	3	3	3	2.4	
CO5	3	2	3	3	3	3	2	1	3	3	2.6	
	Mean overall score											2.36
Result											HIGH	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UBO13CC02	CORE-2: FUNGI, PLANT PATHOLOGY AND LICHENS	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire thorough knowledge on the salient features of fungi and lichens.	K1
CO-2	learn the major classes, types, structure and reproduction of various genera.	K2
CO-3	attain basic skills on aetiology and control of various plant diseases.	K3
CO-4	understand the disease cycle caused by the pathogens.	K3
CO-5	identify the ecological importance and economic importance of fungi and lichens.	K4

Unit-I (15 Hours)

Fungi: General characteristics - range of thallus organization, cell wall composition, mode of nutrition and reproduction. Outline on the Classification of fungi (G. C Ainsworth, 1973; C. J Alexopoulos and C. W. Mims, 1979) and general characteristics of the Divisions and Classes in Fungi. Economic importance.

Unit II (15 Hours)

Fungi: detailed study of morphology and reproduction of the following: (a) Mastigomycotina- *Albugo*; (b) Zygomycotina- *Rhizopus*; (c) Ascomycotina- *Saccharomyces* and *Penicillium*; (d) Basidiomycotina- *Puccinia*; (e) Deuteromycotina- *Cercospora*.

Unit III (15 Hours)

Plant Pathology: Definition of terms used in plant pathology; plant diseases: concept and classification of plant diseases—methods of control of plant diseases: mechanical, chemical and biological. Defence mechanism in plants: structural, morphological and biochemical.

Unit IV (15 Hours)

Plant Pathology: Detailed study of the following plant diseases with reference to causes, symptoms, dissemination, control and preventive measures - Viral Diseases: Bunchy top of Banana, mosaic disease of tobacco; Bacterial diseases: Bacterial blight of paddy, Citrus canker, Fungal diseases: Late blight of potato, red rot of sugarcane, paddy blast; Mycoplasma disease: Little leaf of brinjal.

Unit V (15 Hours)

Lichens: occurrence, distribution, classification, structure, vegetative and sexual reproduction (with reference to fruticose lichen - *Usnea*). Economic importance and role in succession and pollution monitoring.

Books for Study

1. Singh V, Pande PC & Jain DK. 2020. A Text Book of Botany (5th ed), Rastogi Publication, Meerut.
2. Pandey, BP. 2018. College Botany Volume I, 20/e, S. Chand and Company, New Delhi.
3. Pandey, BP. 2005. Simplified Course in Botany. S. Chand and Company, New Delhi.

Books for Reference

1. Sharma OP 1989. Text Book of fungi. Tata McGraw Hill, New York.
2. Vasishta BR & Sinha AK. 2003. Botany for degree students Fungi. S Chand New Delhi.
3. Mehrotra R S 1991. Plant Pathology, Tata McGraw-Hill Publishing, New Delhi.
4. Hale ME, 1983 The Biology of Lichens, New Age International publishers, New Delhi.

Semester	Course Code	Title of the Course									Hours	Credits
1	21UBO130202	CORE-2: FUNGI, PLANT PATHOLOGY AND LICHENS									5	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	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	1	2	3	1	2	3	3	2.2	
CO-3	2	2	3	2	1	2	3	2	3	2	2.2	
CO-4	3	2	2	1	2	3	2	3	2	3	2.4	
CO-5	2	3	2	3	1	3	2	3	2	1	2.2	
Mean Overall Score											2.3	
Result											#	Medium

Semester	Course Code	Title of the Course	Hours	Credit
1	21UBO13CP01	LAB COURSE 1 (ALGAE, BRYOPHYTES, FUNGI, PLANT PATHOLOGY AND LICHEN)	3	2

Detailed study of the following genera:

Algae:

Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum and Gracilaria.

Bryophytes:

Marchantia, Anthoceros and Funaria.

Fungi:

Plasmodiophora, Albugo, Peziza, Puccinia and Cercospora.

Plant Pathology:

Tobacco Mosaic Virus, Citrus Canker, Late Blight of Potato, Red Rot of Sugarcane, Bunchy Top of Banana, Little Leaf of Brinjal, Paddy Blast

Lichen:

Usnea

Semester	Course Code	Title of the Course	Hours	Credits
I	21UBO13AC01	ALLIED-I: ZOOLOGY I: GENERAL ZOOLOGY	4	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire basic knowledge on animal organization.	K1
CO-2	understand the mode of action of various hormones.	K2
CO-3	understand the role of protozoan in human health.	K2
CO-4	identify the invertebrate and their role in human welfare.	K3
CO-5	study the physiology and functions of various organs in human.	K4, K5

Unit I (12 Hours)

Basic principles of zoological taxonomy and nomenclature. General classification of the animal kingdom (up to phylum with examples). Salient features of all phyla - Vertebrates (Classes: Pisces, Amphibia, Reptilia, Aves and Mammalia)

Unit II (12 Hours)

Type study of *Plasmodium vivax*, *Leucosolenia*, *Aurelia aurita*, *Taenia solium*, *Ascaris lumbricoides* and *Asterias rubens* – morphology and life history. General topics – human diseases caused by protozoans; canal system of sponges.

Unit III (12 Hours)

Principles of human physiology: Digestion - physiology of digestion, absorption and excretion of food – accessory glands and their role. Respiration: transport of oxygen and carbon dioxide, cellular oxidation. Excretion: structure of a nephron, physiology of urine formation, physical characteristics and chemical composition of urine.

Unit IV (12 Hours)

Circulation – structure and working of artery, vein and heart. Blood: haemopoiesis, types of blood cells, structure of haemoglobin; mechanism of blood clotting, functions of plasma proteins. Blood grouping, lymph and its functions. Muscles: contraction. Proteins involved and theories of contraction. Structure and functions of human eyes ears

Unit V (12 Hours)

Hormones: Types, control - and general mode of action of water soluble and steroid hormones. Reproduction – male and female reproductive organs and formation of gametes, Pregnancy and birth. Nervous control: Structure of neuron; Types of neurons; nerve impulse transmission, synaptic transmission.

Books

1. Agarwal, VK. 2011. Zoology for Degree Students. S. Chand and Company, New Delhi.
2. Rajan K. 2016. Manual of Zoology. Theory and Practicals, Dept. of Botany, St. Joseph's College, Tiruchirappalli.

Reference

1. Gerard, J. Tortord, R. L. Evans & Anagnostakos, NP. 1982. Principles of Human Physiology, Harpor Roul Publishers, New York.
2. Jordan, E. L. & Verma, P. S. 1976. Invertebrate Zoology, S. Chand& Co. Ltd., 6th e, New Delhi.
3. Kotpal, RL 1976. Modern text book of Zoology (Invertebrate), Rastogi Publications, Meerat.

Semester	Course Code	Title of the Course									Hours	Credits
I	21UBO13AC01	ALLIED-I: ZOOLOGY I: GENERAL ZOOLOGY									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	2	3	2	2	2	2	2	3	2	2.2	
CO-2	2	3	2	1	2	2	3	2	2	3	2.2	
CO-3	2	2	3	2	2	1	3	2	3	2	2.2	
CO-4	1	2	2	2	2	2	3	2	3	2	2.1	
CO-5	1	2	2	3	2	3	3	2	2	2	2.2	
Mean Overall Score											2.18	
Result											High	

Semester	Course Code:	Title of the Course	Hours	Credits
I	21UBO13AP01	ALLIED I: LAB COURSE: ZOOLOGY 1	2	2

Earthworm: External features and dissection of digestive and nervous systems; Mounting of body and Penial setae, Ovary and Spermatheca

Representative animal for each class in vertebrate and invertebrate phyla.

Different tissues. Human blood cell identification.

Campus fauna identification.

Visit to a vermin-compost farm and submission of report.

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, Tiruchirappalli-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 Levels (K- levels)
இப்பாடத்தின் நிறைவில் மாணவர்கள்		
CO-1	தமிழிலக்கிய வரலாற்றில் சைவ, வைணவ இலக்கியங்கள் பெறும் இடத்தை அறிந்துகொள்வர்	K 1
CO-2	அகப்பொருள், புறப்பொருள் இலக்கணங்களின் அடிப்படை அறிவைப் பெறுவர்.	K 1
CO-3	காப்பியச் சுவையை மாணவர்கள் புரிந்துகொள்வர்	K 2
CO-4	இஸ்லாமிய இலக்கியச் சிந்தனைகளைப் பெறுவர்	K 3
CO-5	கிறித்தவ மதிப்பீடுகளைச் சிற்றிலக்கிய வகைகளின் வழியாகத் திறனாய்வர்.	K 4

அலகு - 1

(12 மணிநேரம்)

- சிலப்பதிகாரம் - கனாத்திறம் உரைத்த காதை
மணிமேகலை - ஆபுத்திரன் திறம் அறிவித்த காதை
இலக்கிய வரலாறு - சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய.
இலக்கணம் - அகப்பொருள் இலக்கணம்

அலகு - 2

(12 மணிநேரம்)

- திருவாசகம் - திருச்சாழல்
சிவவாக்கியார் பாடல்கள் - 25 பாடல்கள் (04, 14, 16, 22, 27, 33, 34, 35, 36,37, 38, 47, 81, 91, 225, 237, 242, 495, 504, 520,522, 533, 534, 536, 548.)

அலகு - 3

(12 மணிநேரம்)

- நாலாயிர திவ்வியப் பிரபந்தம்- அமலானாதிபிரான் (10 பாடல்கள்)
- பெருமாள் திருமொழி (11 பாடல்கள்)
கம்பராமாயணம் - கைகேயி சூழ்வினைப்படலம்
உரைநடை - 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

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	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
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 goûts 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 de paiement

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 : connaître 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 AI*, Didier, Paris 2016.

Books for Reference

1. J.Girardet and J.Pecheur, *Echo AI*, CLE International, 2^e edition, 2017
2. Régine Mérieux and Yves Loiseau, *Latitudes AI*, 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 Tripathy, *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, Sampoorana 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 Course								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	Cognitive Levels (K –Levels)
	On successful completion of the course, the student will be able to	
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. Humorous 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	21UBO23CC03	CORE-3: PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	learn the economic importance of Pteridophytes and gymnosperms.	K1
CO-2	acquire knowledge on fossils and fossilization process.	K1
CO-3	understand the salient features of Pteridophytes and Gymnosperms.	K2
CO-4	comprehend the relative similarities and differences between genera.	K3
CO-5	analyse the evolutionary relationship between Pteridophytes and Gymnosperms.	K4

Unit I (12 Hours)

Pteridophytes: general characteristics, classification (Reimer's System, 1954). General characteristics of major subdivisions: Psilopsida, Lycopsidea, Sphenopsida and Pteropsida. Telome theory. Stelar evolution, homospory, heterospory, seed habit and economic importance.

Unit II (12 Hours)

Detailed study of morphology, anatomy and reproduction of *Lycopodium*, *Selaginella*, *Equisetum*, *Adiantum* and *Marsilea*.

Unit III (12 Hours)

Gymnosperms: general characteristics, distribution and classification (Sporne, 1965). Salient features of Pteridospermales, Bennettitales, Cycadales, Cordaitales, Coniferales and Gnetales. Economic importance.

Unit IV (12 Hours)

Gymnosperms: detailed study of morphology, anatomy, reproduction of the following genera: *Cycas*, *Pinus* and *Gnetum*.

Unit V (12 Hours)

Paleobotany: fossils, types (compression, impression, petrification, coal balls). Indian fossil flora – Rajmahal hill flora. Contribution of Birbal Sahni to Indian Paleobotany. Geological time scale. Morphology, anatomy and reproduction in *Rhynia*, *Lepidodendron*, *Calamites* and *Medullosa*.

Books for Study

1. Sharma OP. 2017. Pteridophyta, McGraw Hill Education, New York.
2. Bhatnagar, S.P. and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.

Books for Reference

1. Rashid .A. 2007. An Introduction to Pteridophyta-Vikas publications, New Delhi.
2. Johri , RM, Lata S , Tyagi K (2005), A text book of Gymnosperms , Dominate pub and Distributer, New Delhi.
3. Vasista PC, Sinha AK and Anilkimar. 2005. Botany for degree students, Gymnosperms, S Chand, NewDelhi.

Semester	Course Code	Title of the Course	Hours	Credits
II	21UBO23CC03	CORE-3: PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY	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	2	1	2	2	3	2	2	2	2	2.1
CO-2	3	2	1	2	2	3	2	2	2	2	2.1
CO-3	3	2	1	2	2	2	3	2	1	2	2.0
CO-4	2	3	2	2	1	2	2	2	1	2	1.9
CO-5	2	3	1	3	2	2	3	2	2	1	2.1
Mean Overall Score											2.1
Result											Medium

Semester	Course Code	Title of the Course	Hours	Credits
II	21UBO23CC04	CORE-4: ANATOMY AND EMBRYOLOGY	4	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge about the tissues of stem, root and leaves present in plants.	K1
CO-2	understand the primary and secondary structure of dicots and monocots with reference to root, stem and leaves.	K2
CO-3	acquire knowledge on the structure, properties and economic importance of wood.	K3
CO-4	attain basic knowledge of the structure and development of male and female gametophytes in plants.	K4
CO-5	understand the morphogenesis, endosperm development and polyembryony.	K5

Unit I (12 Hours)

Tissues - definition, types - simple tissue - parenchyma, collenchyma, sclerenchyma. Fibres and sclerieds - structure and functions. Complex tissues: xylem and phloem. Meristems - classifications. Vegetative shoot apex: and the theories: apical cell, and tunica-corpus. Root apex: Korper – Kappe theory. Concept of totipotency, differentiation, dedifferentiation and redifferentiation. Hydathodes, Lathocysts and laticifers.

Unit II (12 Hours)

The stem - primary and secondary structure of dicotyledonous and monocotyledonous stems. Nodal anatomy: unilacunar, trilacunar and multilacunar. Leaf anatomy: monocot and dicot. The root: primary and secondary structure of dicotyledonous and monocotyledonous roots. Anomalous secondary growth.

Unit III (12 Hours)

Wood anatomy – component of secondary xylem. Physical and chemical properties of wood. Dendrochronology -Classification of wood. Commercial wood species of South India (teak wood, rose wood, sandal wood and red sanders wood).

Unit IV (12 Hours)

Microsporangium: microsporogenesis, development of male gametophyte. Megasporangium: megasporogenesis, development of female gametophyte. Monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*).

Unit V (12 Hours)

Fertilization. Double fertilization. Structure and types of ovules; Types of embryo sacs, Development of dicot embryo (Capsella) & development of monocot embryo (Sagittaria).Endosperm: structure, function and types. Apomixis and polyembryony – types and significance. Parthenogenesis and its significance.

Semester	Course Code	Title of the Course					Hours	Credits			
II	21UBO23CC04	CORE-4: ANATOMY AND EMBRYOLOGY					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	3	2	3	2	2	3	2	2	2	2	2.3
CO-2	2	3	2	3	3	2	3	2	2	2	2.4
CO-3	2	2	3	2	3	3	3	2	3	3	2.7.
CO-4	3	3	2	1	2	3	2	3	1	2	2.3
CO-5	2	3	2	2	3	2	3	2	2	3	2.6
Mean Overall Score											2.5
Result											High

Semester	Course Code	Title of the Paper	Hours	Credit
II	21UBO23CP02	LAB COURSE 2 (PTERIDOPHYTES, GYMNOSPERMS, PALEOBOTANY, ANATOMY AND EMBRYOLOGY)	3	2

Pteridophytes:

Lycopodium, Selaginella, Adiantum and Marsilea.

Gymnosperms:

Cycas, Pinus and Gnetum.

Paleobotany (Fossils): Rhynia, Lepidodendron, Calamites and Medullosa.

Anatomy

Study of simple and complex tissue.

Internal structure of young and old dicot and monocot stem.

Internal structure of dicot and monocot root.

Anomalous secondary thickening in Aristolochia, Bignonia, Boerhaavia, Thunbergia and Dracaena.

Nodal anatomy: Uni, tri and multi lacunar.

Embryology

TS of mature anther. Types of ovule, dissection and isolation of developmental stages of dicot embryos.

Semester	Course Code	Title of the Course	Hours	Credits
II	21UBO23AC02	ALLIED-I: ZOOLOGY II: AGRICULTURAL ENTOMOLOGY	4	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge on morphology and classification of insects.	K1
CO-2	identify beneficial and harmful insects.	K2
CO-3	understand the physiology of insects.	K3
CO-4	apply integrated pest management.	K3
CO-5	evaluate the economical important insects.	K4

Unit I (12 Hours)

General classification of insects. Morphology of insects: head, external structure. Mouth parts, tentorium, compound eye, types of antennae- thorax-tergum, sternum, pleuron. Wing structure, wing venation, Legs and their modification, Abdomen- abdominal appendages, Male and female external genitalia.

Unit II (12 Hours)

Physiology of digestive, respiratory, circulatory, nervous and reproductive systems, Immature stages of insects – metamorphosis, types and hormonal regulation.

Unit III (12 Hours)

Economically important insect (orders): Coleoptera, Dictyoptera, Diptera, Hemiptera, Hymenoptera, Isoptera and Lepidoptera. General characters and classification (up to Orders). Social behaviour/life of insects.

Unit IV (12 Hours)

Economic classification of insects: beneficial insects (predators, parasites, pollinators, weed killers and scavengers). Destructive insects, a general knowledge of apiculture, sericulture and lac culture. Insects' role in forensic science. Recent trends in Integrated Pest Management. Plant protection - physical, chemical and biological methods of pest control.

Unit V (12 Hours)

Pests of stored food materials (*Sitophilus oryzae*, *Rhizopertha dominica*, *Tribolium castaneum*) and their control, Study of Bionomics and control of pests of Paddy (*Tryporyza incertulas*, *Chilopoly charysa*, *Spodoptera amauritia*), Sugarcane (*Chilo infus catellus*, *C. sacchariphagas*, *Tryporyza nivella*), Cotton (*Aphis gossypii*, *Amaras cabiguttula*, *Thrips tabaci*), Coconut (*Oryctes rhinoceros*, *Rhynchophorus ferrugineus*) and Spices pests. Locust and their role in agriculture.

Books

1. Ambrose, PD. 2004. The Insect: Structure, function and biodiversity, First edition. Kalyani Publishers, New Delhi.

Reference

1. Rajan, K & McConnell, MS. 2006. Manual of agricultural entomology - theory and practicals, Dept. of Plant biology & Plant biotechnology, St. Joseph's College, Trichy.
2. Daly, HV, Doyen, JT. & Ehrlich, PR. 1998. Introduction to Insect Biology Diversity, First Edition, McGraw Hill Book, New York.
3. Vasantharaj D B & Kumaraswami, T. 1978. Elements of Economic Entomology, Popular Book Department, Chennai.
4. Nayar, KK., Ananthakrishnan, TN. & David, BV. 1976 General and Applied Entomology, Tata McGraw Hill, New Delhi.
5. Imms, AD. 1963. General Text Book of Entomology, Asia Publ House, New Delhi.

Semester	Course Code	Title of the Course	Hours	Credits
II	21UBO23AC02	ALLIED-I: ZOOLOGY II: AGRICULTURAL ENTOMOLOGY	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	2	3	2	2	2	2	2	3	2	2.2
CO-2	2	3	2	1	2	2	3	2	2	3	2.2
CO-3	2	2	3	2	1	2	3	2	2	2	2.1
CO-4	1	2	2	2	2	2	3	2	3	2	2.1
CO-5	1	2	2	3	2	2	3	2	2	3	2.2
Mean Overall Score											2.16
Result											High

Semester	Course Code	Title of the Course	Hours	Credits
II	21UBO23AP02	ALLIED I: LAB COURSE: ZOOLOGY II	2	2

Detailed study:

- * Study of distinguishing features of insects studied in theory and making sketches.
- * Field collection, identification and preservation of insects of agricultural importance, predators, pollinators, and weed killers – plant galls.
- * Study of different categories of insect pests and types of damage done by them in the field, go-down and warehouses.
- * Dissection of Cockroach to study the mouthparts, digestive, nervous and reproductive systems, Salivary gland, Haemocytes. Modification of Antenna, legs, mouth parts.
- * Light trap collection and identification.
- * Visit to a local sericulture center and submission of report.

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 V Environmental 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:

1. 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 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 21st Century.

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:

1. 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

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 connaître, 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^eedition,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	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
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 khoon
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	Cognitive Levels (K –Levels)
	On successful completion of the course, the student will be able to	
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-XwnvEAAAYAiAAEgLcjd_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	21UBO33CC05	CORE-5: TAXONOMY OF ANGIOSPERMS	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	perceive the codes of nomenclature and interdisciplinary approaches on classification of angiosperms.	K1
CO-2	comprehend scientific terms and recognise general range of variations in angiosperms.	K2
CO-3	demonstrate specific mastery in recognise, compare and contrast distinctive attributes among the major groups of angiosperms.	K3
CO-4	critique the importance of various plant parts for human health and social economics.	K4
CO-5	equip themselves with skills in writing short species description, illustration, field identification and scientific photography.	K5

Unit I (15 Hours)

History of plant taxonomy. Plant collection, Identification (herbaria and botanical gardens), documentation (keys and flora). Taxonomic hierarchy; Botanical nomenclature: ICN principles, scientific names, ranks, authorship, nomenclatural types, valid publication, rejection of names, priority of publication.

Unit II (15 Hours)

Classification: artificial (Carolus Linnaeus), natural (Bentham & Hooker) and phylogenetic (Engler & Prantle's) and Angiosperm Phylogeny Group (APG). Brief account of cytotaxonomy, chemotaxonomy, molecular taxonomy and numerical taxonomy.

Unit III (15 Hours)

Detailed study and economic importance of the following families (classification based on APG IV, 2016): Basal angiosperms: Nymphaeales - Nymphaeaceae; Magnoliids: Piperales - Aristolochiaceae, Magnoliales - Annonaceae; Monocots: Alismatales - Araceae, Liliales - Liliaceae, Asparagales - Orchidaceae, Commelinales - Pontederiaceae, Poales - Poaceae.

Unit IV (15 Hours)

Eudicots: Rosids: Fabales - Fabaceae, Rosales - Rosaceae, Moraceae, Cucurbitales - Cucurbitaceae; Malpighiales - Euphorbiaceae, Myrtales - Lythraceae, Myrtaceae, Sapindales - Anacardiaceae, Rutaceae, Meliaceae.

Unit V (15 Hours)

Eudicots cont.: Superasterids: Santalales - Loranthaceae, Caryophyllales - Amaranthaceae, Asterids: Ericales - Sapotaceae, Gentianales - Rubiaceae, Apocynaceae, Solanales - Solanaceae, Lamiales - Lamiaceae, Asterales - Asteraceae, Apiales - Apiaceae.

Books for Study

1. Michael G. Simpson 2019. Plant Systematics, 3rd ed., Academic Press, London, UK.
2. Sharma OP. 2009. Plant Taxonomy, Tata McGraw-Hill Education Pvt. Ltd., New Delhi.

Books for Reference

1. SampamurthyAVSS. 2015. Taxonomy of Angiosperms, 2nd ed., I.K. International Pvt. Ltd., NewDelhi.
2. Jeffrey C. 1982. An Introduction to Plant Taxonomy, 2nd ed., Cambridge University Press, New York, USA.

Semester	Course Code	Title of the Course									Hours	Credits
III	21UBO33CC05	CORE-5: TAXONOMY OF ANGIOSPERMS									5	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		
CO1	3	2	2	2	2	3	2	3	2	2	2.3	
CO2	3	3	3	2	2	3	2	2	2	3	2.5	
CO3	3	3	3	2	2	3	3	3	2	2	2.6	
CO4	2	3	3	2	3	2	3	3	3	3	2.7	
CO5	3	3	3	2	3	3	3	3	3	3	2.9	
Mean Overall Score											2.6	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UBO33CC06	CORE-6: PLANT BREEDING AND EVOLUTION	3	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge on objectives and various methods of plant breeding.	K1
CO-2	outline the process of evolution and various theories pertaining to biological evolution.	K2
CO-3	judge which plant breeding methods are appropriate for specific objectives.	K3
CO-4	analyse, evaluate and synthesize information relevant to plant breeding.	K4, K5
CO-5	formulate a plan for the application of plant breeding methods to achieve a specific objective.	K6

Unit I

(9 Hours)

Plant Breeding: History and objectives; genetic basis and important achievements in plant breeding; modes of reproduction in crop plants (asexual, sexual, apomictic)- advantages and limitations, Floral biology in relation to selfing and crossing techniques; Plant Introduction – types and procedures; Centres of origin and domestication of crop plants.

Unit II

(9 Hours)

Selection methods: Mass selection, pure line and clonal selection- merits and demerits; Hybridization: objectives, choice of parents and causes of failure; Incompatibility and male sterility - methods to overcome; Methods of handling segregation material for isolation of superior strains – bulk method and pedigree method of selection; Role of distant hybridization- in crop improvement.

Unit III

(9 Hours)

Inbreeding depression and heterosis: genetic basis and its applications; Steps in the production of single cross, double cross, three-way cross; Polyploidy: induced polyploidy, role of auto and allopolyploids; Mutation and crop improvement.

Unit IV

(9 Hours)

Back crossing: theory and procedure for transferring various types of character; Breeding for disease resistance and drought tolerance; Preservation and utilization of germplasm; Breeding techniques for rice, sugarcane, groundnut and maize; Limitations of conventional breeding; Aspects of molecular breeding.

Unit V

(9 Hours)

Evolution: origin of life, theories of evolution of life forms: Lamarckism and Darwinism. Variations – definition causes and types, mutation (principles of Hugo De Vries). Role of mutation in speciation. Evolution through ages: human evolution. Evidences for evolution.

Text Book

1. Chaudhari, H.K., (1995) Revised Ed., Elementary Principles of Plant Breeding, Oxford & IBH, New Delhi.
2. Chittaranjan K. (2006-07). Genome Mapping and Molecular Breeding in Plants. Vols. I-VII. Springer.

References

1. Chopra, V. L. (1994). Plant breeding- Theory and Practice. Oxford & IBH.
2. Sharma J. R. (1996). Principles and Practice of Plant Breeding, Tata McGraw Hill
3. Sinha, U. and Sinha, S. (1992). Cytogenetics, Plant Breeding and Evolution, Vikas Publishing House Pvt. Ltd, India.

Semester	Course Code	Title of the Course									Hours	Credits
III	21UBO33CC06	CORE-6: PLANT BREEDING AND EVOLUTION									3	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	2	2	2	3	2	2	3	2	2	2.2	
CO-2	3	2	2	1	2	1	3	3	2	3	2.2	
CO-3	1	2	3	2	3	2	3	2	3	2	2.3	
CO-4	2	2	1	3	1	2	3	2	3	3	2.2	
CO-5	1	2	2	2	3	1	3	2	2	3	2.1	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UBO33CP03	LAB COURSE 3 (TAXONOMY OF ANGIOSPERMS AND PLANT BREEDING)	3	2

Detailed Study:

- Description of plant in technical terms.
- A detailed study of the range of vegetative and floral characters of plants belonging to the families mentioned in the theory part except Orchidaceae.
- Field trip to any place within or outside the state to study the plants in their natural habitats.
- Spot identification (Binomial, Family) of plants included in the theory.
- Field note-book and 5 herbarium sheets of common angiosperms are to be prepared and submitted at the time of Practical Examination.
- Breeding techniques: Emasculation, Layering and Grafting.

Semester	Course Code	Title of the Course	Hours	Credits
III	21UBO33AO03A	ALLIED-II: CHEMISTRY-I (For B.Sc Botany)	4	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	observe the chemistry of different types of soils and their utility.	K1
CO-2	understand the principles involved in periodicity and chemical bonding.	K2
CO-3	develop the knowledge about various reactions of organic chemistry	K2
CO-4	relate bioinorganic complex molecules with human life	K3
CO-5	apply the various analytical concepts in quantitative analysis.	K4

Unit-I Periodicity and Chemical Bonding

(12 Hours)

Periodicity: classification of elements, division of periodic table into blocks (*s*, *p*, *d*, *f*), atomic radius, ionic radius, ionization energy, electronegativity, electron affinity–trends within a group and periods. General electronic configurations and oxidation states of *s*, *p* and *d*- block element, inert pair effect.

Ionic Bond – definition, examples, condition for the formation of ionic bond, properties of ionic molecules.

Covalent bond – definition, examples, properties of covalent molecules, hybridization, types of hybridization, VSEPR theory: structures of BeCl₂, BF₃, NH₃ and H₂O.

Unit-II Organic Chemistry

(12 Hours)

Classification of organic compounds: (i) Hydrocarbons: aliphatic saturated / unsaturated, cyclic acyclic and aromatic compounds (ii) alkyl and aryl halides (iii) alcohols and ethers (iv) aldehydes, ketones and carboxylic acid and their derivative (v) amines and nitro compounds; nomenclature and examples upto five carbon atoms.

Unit-III Quantitative Analysis

(12 Hours)

Error Analysis: accuracy, precision, errors, determinate and indeterminate errors, eliminating and minimizing error, relative error, absolute error.

Concentration units: mole, molarity, molality, formality, normality, ppm, mole fraction. Primary standard and secondary standard solutions, principle of volumetric analysis, acid–base titration, redox titration, complexometric titration, precipitation titration and indicators.

Unit-IV Agricultural Chemistry

(12 Hours)

Soil types—red soil, black soil, alluvial soil, desert soil, red soil; role of humus: Manures and their importance. Chemical fertilizers: Natural and synthetic fertilizers: NPK fertilizers: manufacture of NPK fertilizers, mixed fertilizers; role of macronutrients and micronutrients: Pesticides: classification insecticides, herbicides and fungicides; Structure of important pesticides: DDT, BHC, 2, 4-D, 2, 4, 5-T; biomass and its utilization; triple revolution India (Green, Blue and White).

Unit-V Coordination and Bioinorganic Chemistry (12 Hours)

Coordinate bond – ligands, classification of ligands, nomenclature of complexes DMG, EDTA ligands and their importance. Structure of $[\text{Ag}(\text{NH}_3)_2]^+$ linear; $[\text{Cu}(\text{NH}_3)_4]^{2+}$ square planar; $[\text{Ni}(\text{Cl})_4]^{2-}$ Td; $[\text{Pt}(\text{CN})_4]^{2-}$ square planar.

Chemistry of haemoproteins, nature of hemoglobin and myoglobin, chemistry of chlorophyll, porphyrin unit and photosynthesis. Nitrogen fixation and carbon cycle.

Books for Study

1. Puri B R, Sharma L R and Kalia K K, *Principles of Inorganic Chemistry*, 33rd Edition, Vishal Publishing Co, Jalandhar Delhi, 2020.

Unit-I Chapter 2 and 5

Unit-V Chapter 26 and 37

Unit III Chapter 40

2. Arun Bahl and Bahl B S, *Advanced Organic Chemistry*, 22nd Edition, S. Chand, New Delhi, 2014.

Unit-II Chapter 4

3. Sharma B K, *Industrial Chemistry*, Goel Publishing Company, New Delhi, 2011.

Unit-IV Chapter 5

Books for Reference

1. Puri B R, Sharma L R and Pathania M S, *Principles of Physical Chemistry*, 23rd Edition, ShobanLal Nagin S, Chand, New Delhi. 1993.
2. Tewari K S and Vishnoi N K, *A Text Book of Organic Chemistry*, 3rd Edition, S. Chand and Company Pvt. Ltd., New Delhi, 2000.
3. Gopalan R, *Elements of Analytical Chemistry*, S. Chand, New Delhi, 1999.

Web Resources

1. https://bansal.ac.in/acc_sample_ioc.pdf
2. https://www.niser.ac.in/sps/sites/default/files/basic_page/Error%20Analysis_2015.pdf



Basics of Inorganic Chemistry



Error Analysis

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

Semester	Course code			Title of the Course						Hours/ week	Credits
III	21UBO33AO03A			ALLIED-II: CHEMISTRY–I (For B.Sc Botany)						4	2
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	3	2	3	1	2	3	2	2.1
CO–2	3	1	2	2	3	3	2	1	3	2	2.2
CO–3	2	2	1	3	2	2	1	2	3	2	2.0
CO–4	3	3	2	1	2	2	2	3	2	1	2.1
CO–5	3	2	2	3	3	2	3	2	2	3	2.5
Mean overall Score											2.2
Result											High

Semester	Course Code	Title of the Course	Hours	Credits
III	21UBO33AO03B	ALLIED-II: BIOMETRICS AND COMPUTER APPLICATIONS-I	4	2

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO-1	acquire the knowledge of Statistics in biological context	K1
CO-2	describe the concept of matrix	K2
CO-3	compute the system of equation.	K3
CO-4	utilize the statistical diagrams to represent real life problems.	K3
CO-5	analyse the univariate data.	K4

Unit I (12 Hours)

Types of measurements – Interval, ratio, rank order and categorical - Logarithm, Permutation and Combination

Unit II (12Hours)

Solving Equations: Solving a simple linear equation involving one variable and two variables. Matrices - Operation on matrices – Determinants – Inverse – Solving a system of equations of order 3x3 using Cramer’s rule and inverse method.

Unit III (12 Hours)

Mathematical modeling: Principle of least squares (concepts only) –Curvilinear regression, $y = ax^2 + bx + c$, $y = ab^x$ and $y = ae^{bx}$.

Unit IV (12 Hours)

Statistics –Introduction -Uses and limitations of Statistics – Collection and classification of data - Frequency table – Frequency graphs – Diagrammatic representation of data - Sampling-Census and sample method - Methods of sampling.

Unit V (12 Hours)

Measures of location: Mean, Median and Mode. **Measures of Dispersion:** Range, Mean deviation, Standard deviation and Coefficient of variation. Skewness and Kurtosis.

Books for Study

- Gupta S.P, Statistical Methods, Sultan Chand & Sons, New Delhi, 43rd Edition 2014
Unit –I - page no 1428-1430
- PA.Navanitham, Business Mathematics and Statistics ,Jai publishers 2015
Unit –II Chapter IV (sec 6,7,8,9,12)

3. Gupta S.P. & Kapoor V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 12th Edition 2020.
Unit III Chapter 11 (sec 11.2, 11.3)
4. Gupta S.P, Statistical Methods, Sultan Chand & Sons, New Delhi, 43rd Edition 2014
Unit –IV Chapter 1, 2, 3 & 4
Unit –V Chapter 7, 8 & 9

Books for Reference

1. Nageswara Rao G.: Statistics for Agricultural Science, BS Publications, Third Edition, 2018
2. Olive Jean Dunn & Virginia A Clark: Basic Statistics: A primer for the Biomedical Sciences, A John Wiley & Sons, Inc., Publications, Fourth Edition, 2009.

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

Semester	Course Code	Title of the Course									Hours	Credit
III	21UBO33AO03B	ALLIED-II: BIOMETRICS AND COMPUTER APPLICATIONS-I									4	3
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	3	2	3	3	3	2	3	3	3	2.8	
CO-2	1	2	2	3	3	2	1	2	3	3	2.2	
CO-3	3	3	2	3	3	1	3	3	2	2	2.5	
CO-4	2	3	2	2	3	3	1	2	3	3	2.4	
CO-5	3	3	3	2	2	3	2	2	3	3	2.6	
Mean Overall Score											2.5 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UBO33AP03B	ALLIED-II: LAB COURSE-1: (BIOMETRICS AND COMPUTER APPLICATIONS I)	2	2

CO No.	CO– Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO-1	find the solutions of the system of equations.	K 1
CO-2	predict the future value by fitting the appropriate curve.	K 2
CO-3	display the frequency table for the given data.	K 3
CO-4	sketch out the frequency curves.	K 3
CO-5	draw and explain the diagrams for the data under study.	K 4

Using the Excel packages the students are asked to solve the following exercises:

1. Solving a system of equations – Inverse Matrix, Cramer's rule.
2. Curve fitting – Straight line, Regression line and second degree.
3. Construction of frequency table – Univariate, Bivariate and Cross tabs.
4. Drawing frequency graphs.
5. Pictorial presentation – Bar diagrams, Pie diagrams etc.

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

Semester	Course Code	Title of the Course									Hours	Credit
III	21UBO33AP03 B	ALLIED-II: LAB COURSE I (BIOMETRICS AND COMPUTER APPLICATIONS I)									2	2
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	1	2	3	3	3	2	1	1	2	
CO-2	2	3	2	3	3	3	2	1	2	3	2.4	
CO-3	3	2	3	3	2	1	3	2	1	2	2.2	
CO-4	2	3	2	1	3	1	2	3	2	3	2.2	
CO-5	1	2	3	2	1	2	3	1	1	2	1.8	
Mean Overall Score											2.12 (High)	

Semester	Course Code:	Title of the Course	Hours	Credits
III	21UBO34SE01	SEC-1 (WD): MUSHROOM TECHNOLOGY	2	1

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	identify various cultivable species of mushrooms.	K1
CO-2	design various recipe from mushrooms.	K2
CO-3	assess preservation and storage of mushrooms.	K3
CO-4	evaluate and explore the economic viability of mushrooms.	K4
CO-5	prepare the culture techniques of edible mushrooms.	K5

Unit I

(6 Hours)

Introduction - Classification - Edible and Poisonous. Tests for identification - Nutritive value of mushrooms.

Unit II

(6 Hours)

Characteristics of common edible mushrooms Paddy straw, Oyster and milky mushrooms. Life cycle of a common mushroom (Agaricus).

Unit III

(6 Hours)

Culture Techniques – Preparation of spawn, preparation of compost – Spawn running – Harvesting and Marketing.

Unit IV

(6 Hours)

Preservation and storage of mushrooms – Diseases and pests of mushrooms.

Unit V

(6 Hours)

Delicious recipes of mushroom – Economic importance of mushrooms.

Book

1. Nita Bahl (1984). Handbook on Mushrooms, Oxford and IBH Publishing Company

Reference

1. Dubey, RC. (2001) A Textbook of Biotechnology, S.Chand & Co. Ltd.

Semester	Course Code	Title of the Course	Hours	Credits
III	21UBO34SE01	SEC-1 (WD): MUSHROOM TECHNOLOGY	2	1

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	2	3	2	1	2	3	2	2	3	2.3
CO-2	2	2	3	1	2	2	2	2	3	2	2.1
CO-3	1	3	3	2	3	1	2	3	2	3	2.3
CO-4	2	3	2	2	1	2	3	1	2	3	2.2
CO-5	1	3	3	2	1	2	3	2	1	3	2.1
Mean Overall Score											2.2
Result											Medium

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

CO No.	Co- Statements	Cognitive Level
	On completion of this course the graduates will be able to:	
CO-1	know the responsibility of the educated youth.	K1
CO-2	understand the values prescribed under social ethics.	K2
CO-3	apply their minds critically to the various types of cyber crime.	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

Books for Study:

1. 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 Level
	On completion of this course, the graduates will be able to:	
CO-1	understand the history of the Catholic Church	K1
CO-2	examine and grasp the Sacraments of the Catholic Church	K2
CO-3	apply the Christian Prayer to their everyday life	K3
CO-4	analyze themselves in the light of Sacraments & Christian Prayer	K4
CO-5	create a harmonious society learning values from all religions	K5 & K6

Unit-I	God of salvation	(6 Hours)
Unit-II	Life & Mission of Jesus Christ	(6 Hours)
Unit-III	The Holy Spirit	(6 Hours)
Unit-IV	Biblical Values	(6 Hours)
Unit-V	Mother Mary	(6 Hours)

Books for Text

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- Statements	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 விசம்பு 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 சொல்லிடல் (திருமூலர்)

அணுவில் அணுவினை ஆதிபிராணை (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.

Semester	Course Code		Title of the Paper							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 tâches 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 événements du passés, 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 de l'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	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
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/labdh
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 Gupt, *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)

Sanskrita 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)

Sanskrita 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: Bloomsbury Academic, 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	21UBO43CC07	CORE-7: CELL BIOLOGY AND GENETICS	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the organization of cells.	K1
CO-2	acquire knowledge on the structure and organization of various cell organelles	K2
CO-3	learn cell cycle and methods of cell division	K2
CO-4	solving problems with relevance to the principles and applications of genetics.	K3
CO-5	acquire the basic knowledge on genomics and proteomics.	K4

Unit I (12 Hours)

Cell as a unit of structure and function; prokaryotic and eukaryotic; Endosymbiotic theory. Structure, organization and functions of nucleus, mitochondria, chloroplasts, ER, ribosomes, Golgi complex, lysosome and vacuole. Organisation of cytoskeleton.

Unit II (12 Hours)

Cytoplasmic membrane structure and functions. Cellular mechanisms in development and differentiation. Cell division (mitosis and meiosis), Cell cycle. Mutation – types, causes and detection. Mutant types – lethal, conditional, biochemical; germinal vs somatic mutants, insertional mutagenesis. Special types of chromosome – polytene and lampbrush.

Unit III (12 Hours)

Mendel's laws of heredity, Modified Mendelian ratios. Multiple alleles. Linkage and crossing over. Sex linked inheritance. Sex determination mechanism. Extra chromosomal inheritance.

Unit IV (12 Hours)

DNA is the genetic material: Griffith's, Avery et al., and Hershey and Chase. RNA as genetic material. Basic knowledge and applications of genomics and proteomics. Genomics: structural and functional genomics. Plant genome (*Arabidopsis* and *Oryza*), animal (*Homo sapiens*). Human Genome Project - objectives and controversies.

Unit V (12 Hours)

Population genetics: gene frequency, genepool, Hardy–Weinberg equilibrium. Genetic drift, Gene frequencies – conservation and changes. Selection - natural, artificial, ecological.

Books for Study

1. Verma, P. S. & V. K. Agarwal, 2003, Genetics. S. Chand & Co. Ltd., New Delhi.
2. Gupta, P.K. 2018. Genetics. 5th Edition, Rastogi Publications, Meerut.

Books for References

1. Sinnott, EW, Dunn, LL. & Dobzhansky, T. 1997. Principles of Genetics, Tata McGraw Hill, New Delhi.

2. Freifelder, D. 1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.
3. Gardner, EJ, Simmons, MJ. & Snustad, D. 1991. Principles of Genetics, 8th Edn, John Wiley & Sons, New York.

Semester	Course Code	Title of the Course									Hours	Credits
IV	21UBO43CC07	CORE-7: CELL BIOLOGY AND GENETICS									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	2	3	2	2	3	2	2	2	2	2.3	
CO-2	2	3	2	3	3	2	3	2	2	2	2.4	
CO-3	2	2	3	2	3	3	3	2	3	3	2.7.	
CO-4	3	3	2	1	2	3	2	3	1	2	2.3	
CO-5	2	3	2	2	3	2	3	2	2	3	2.6	
Mean Overall Score											2.5	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO43CC08	CORE-8: ECOLOGY AND CLIMATE CHANGE	4	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the fundamentals of ecology	K1
CO-2	acquire know on various ecosystems and their components	K2
CO-3	understand techniques of community studies	K2
CO-4	apply their skill to manage climate change	K3
CO-5	analyse the biogeochemical cycles and their significance	K4

Unit I (12 Hours)

Introduction to ecology and ecosystem. Ecological factors – physical, edaphic, topographic. Biogeochemical cycles - C, N & P. Plant succession: definition, primary and secondary succession, autogenic and allogenic succession, pioneers and climax communities. Mechanism of plant succession - xerosere.

Unit II (12 Hours)

Autecology and Synecology – definition. Population ecology –definition, size, density, age structure, dispersal and growth. Population interactions – negative and positive. Basic idea of biodiversity – species, genetic, ecosystem and habitat diversity.

Unit III (12 Hours)

Sampling techniques in plant community studies – quadrat and transect methods; species area curve – density, frequency, abundance, dominance of populations; importance value index – construction of phytographs. Phytogeographical zones of India.

Unit IV (12 Hours)

Centres of origin and distribution of species. Patterns of plant distribution - continuous and discontinuous. Continental drift - evidences and impact. Endemic distribution, theories on endemism, age and area hypothesis. Ecotone and edge effect.

Unit V (12 Hours)

Carbon emissions, global warming, climate change, carbon credit, carbon sequestration, blue carbon, alternative energy sources and green energy. Climate change conferences and the role of IPCC and UNFCCC. Anthropause effects on Environment during Covid – 19.

Books for Study

Kormondy, E.J. 2017. Concepts of Ecology. Prentice Hall, U.S.A. 4th edition

Books for References

Sharma, P.D. 2010. Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition

Eugene Odum, 2017. Fundamentals of Ecology 5th Ed. Cengage, Bengaluru.
 Trevor Letcher, 2015. Climate Change, 2nd Ed., Elsevier Publishing.
 Jason Smerdon, 2018. Climate Change: The Science of Global Warming and Our Energy Future, Columbia University Press, New York.

Semester	Course Code	Title of the Course									Hours	Credits
IV	21UBO43CC08	CORE-8: ECOLOGY AND CLIMATE CHANGE									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	2	1	2	3	2	3	2	3	2	2.2	
CO-2	2	3	2	2	1	3	2	2	2	2	2.1	
CO-3	2	3	1	3	3	3	2	3	2	2	2.4	
CO-4	2	2	2	2	3	3	2	3	2	2	2.3	
CO-5	2	2	2	2	3	3	2	2	2	2	2.2	
Mean Overall Score											2.3	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO43CP04	LAB COURSE 4 (CELL BIOLOGY, GENETICS, ECOLOGY AND CLIMATE CHANGE)	3	2

Cell Biology and Genetics:

1. Ultra structure of cell organelles.
2. Study of mitosis in root tips
3. Study of meiosis in anthers
4. Inheritance Patterns – Mendelian and modified Mendelian ratios
5. Linkage Mapping.
6. Estimation of allele frequency in natural (random matting) populations.
7. Isolation and display of polytene chromosomes.
8. Extraction of human genomic DNA from saliva.
9. Estimation of DNA (Colorimetric).

Ecology and Climate Change

1. Chemical analysis of water and Soil –Total hardness, Carbonates and Bicarbonates and Dissolved oxygen.
2. Vegetation Analysis: Quadrat, Line transects, Species Density, abundance and richness. Basal area and relative dominance
3. Green auditing
4. Field trip

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO43AO04A	ALLIED-II: CHEMISTRY-II (For B.Sc Botany)	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	recognize the chemistry of natural products.	K1
CO-2	discuss the fundamental aspects of pharmaceutical chemistry.	K2
CO-3	understand the chemical kinetics and thermodynamic properties of the reaction.	K2
CO-4	apply the different types of chromatographic techniques to analyze and to identify the components.	K3
CO-5	classify the types of catalyst and their effects on the reactions.	K4

Unit – I Physical Chemistry

(12 Hours)

Chemical Kinetics: rate, order, molecularity of reactions. Zero order and first order reaction, rate constant derivation, examples, Importance of kinetic study, activation energy, activated complex, Arrhenius equation, factors affecting rate of the reactions.

Thermodynamics: terms ΔE , ΔH , ΔS , ΔG , endothermic, exothermic reactions, conditions for spontaneity of reactions. Laws of thermodynamics (I, II, III definition only).

Unit – II Pharmaceutical Chemistry

(12 Hours)

Classification of drugs: Definitions of: drug, pharmacophore, pharmacognony, pharmacy, harmaco kinetics, pharmaco dynamics, pharmacopoeia (IP, BP, USP). Antibiotics: Pencillin, chloramphenicol, (only the structural properties and SAR): Anaesthetics–general and local anaesthetics: Inhalation anaesthetics (N_2O , $CHCl_3$, haloethane, ethylchloride). Intravenous anaesthetics (thiopental sodium); Cardiovascular Drugs: classification and examples: cardiac glycosides, antihypertensive and anti–hypotensive drugs and sulphonamides –isolation of bioactive molecules from plants by soxhlet method.

Unit – III Chemistry of Natural Products

(12 Hours)

Vitamins–type, sources and deficiency disorders of Vitamins A1 retinol, Vitamin B complex(thiamine–B1, riboflavin–B2, cyclocobalamine–B12), Vitamin C, Vitamin D and Vitamin E Alkaloids: occurrence, classification, physical properties and biological functions, uses of coniine, piperine, nicotine, morphine and quinine alkaloids – Terpenoids: classification, isolation, structure, properties and uses of camphor, citral and α -pinene.

Unit – IV Catalysis

(12 Hours)

Types of catalyst–positive catalyst, negative catalyst and catalyst poison. types of catalysis–homogeneous catalysis, heterogeneous catalysis and autocatalysis – general characteristics of catalytic reactions, autocatalysis. Biocatalysis– enzyme catalyst, kinetics of enzyme catalysis, Michaelis – Menton constant, active sites, turn over number, factors affecting enzyme catalysis; concentration of substrate, temperature, pH and inhibitors.

Unit – V Separation and purification techniques

(12 Hours)

Types of Chromatographic Techniques– TLC – Column – HPLC: Principles, instrumentation, sampling and applications of paper, thin layer, column chromatography and electrophoresis– distillation – steam and vacuum distillation – recrystallization.

Books for Study

1. Puri B R, Sharma L R and Pathania M S, *Principles of Physical Chemistry*, 23rd Edition, New Delhi, Shoban Lal Nagin Chand and Co, 1993.

Unit – I Chapter 23 and 27

Unit–IV Chapter 31

2. Jayashree Ghosh, *A Text Book of Pharmaceutical Chemistry*, 3rd Edition, S. Chand and Company Pvt. Ltd., New Delhi, 2012.

Unit – II Chapter 11

3. Subramanian P S, Gopalan R and Rangarajan K, *Elements of Analytical Chemistry*, S. Chand New Delhi, 2003.

Unit – V Chapter 9

Books for Reference

1. Tewari K S and Vishnoi N K, *A Text Book of Organic Chemistry*, 3rd Edition, S. Chand and Company Pvt. Ltd., New Delhi, 2000.
2. Arun Bahl and Bahl B S, *Advanced Organic Chemistry*, 22nd Edition., S. Chand, New Delhi, 2014.

Web Resources

1. <https://www.youtube.com/watch?v=bYwq5oNZmq4>
2. <https://www.slideshare.net/Kamyaparashar/chemical-kinetics-presentation>



Electrophoresis



Chemical Kinetics

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

Semester	Course code	Title of the Course									Hours/ week	Credits
IV	21UBO43AO04A	ALLIED-II: CHEMISTRY-II (For B.Sc Botany)									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	3	2	2	3	3	2	3	2	2	3	2.5	
CO-2	2	2	1	3	2	2	1	2	3	2	2.0	
CO-3	3	1	2	2	3	3	2	1	3	2	2.2	
CO-4	3	3	2	1	2	2	2	3	2	1	2.1	
CO-5	2	1	2	3	2	3	1	2	3	2	2.1	
Mean overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO43AO04B	ALLIED-II: BIOMETRICS AND COMPUTER APPLICATIONS- II	4	2

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO-1	match the real life situations with probability concepts	K1
CO-2	describe the concept of test of significance	K2
CO-3	describe the concept of association of attributes	K2
CO-4	compute correlation and regression	K3
CO-5	analyse the nonparametric test	K4

Unit I (12 Hours)

Probability: Normal distribution – Definition – Properties – Areas under normal curve – Interpreting areas as probabilities – Importance of normal distributions. Confidence interval: Confidence interval for means – between two means, variance and proportion.

Unit II (12 Hours)

Testing of hypothesis: Null hypothesis – Two kinds of errors – Testing of hypothesis based on simple mean – difference between mean – Population proportion – Difference between the population proportion – Chi-square test – Goodness of fit – Test for independence – F-test: Equality of variances.

Unit III (12 Hours)

Correlation and regression: Correlation: Types of correlation – Scatter diagram – Pearson's coefficient of correlation – Rank correlation. Simple regression: Meaning of regression lines – Regression equations y on x and x on y only – Regression coefficient – Simple problems.

Unit IV (12 Hours)

Theory of attributes: Introduction – Notations – Dichotomy – Classes and class frequencies – Consistency of data – Criteria of independence – Yule's coefficient of association – Coefficient of colligation.

Unit V (12 Hours)

Non –Parametric tests: Introduction – Advantages - Sign test- Mann Whitney U test – One sample runs test – Kruskal – Wallis test and Run test for randomness.

Books for Study

1. Gupta S.P, Statistical Methods, Sultan Chand & Sons, New Delhi, 43rd Edition 2014

Unit 1 *Volume II Chapter 2*

Unit 2 *Volume II Chapter 3,*

Unit 3 *Volume I Chapter 10*

Unit 4 *Volume I Chapter 12*

Unit 5 *Volume II Chapter 11*

Books for Reference

1. Nageswara Rao G.: Statistics for Agricultural Science, BS Publications, Third Edition, 2018

2. Olive Jean Dunn & Virginia A Clark: Basic Statistics: A primer for the Biomedical Sciences,

A John Wiley & Sons, Inc., Publications, Fourth Edition, 2009.

Semester	Course Code	Title of the Course									Hours	Credit
IV	21UBO43AO04B	ALLIED-II: BIOMETRICS AND COMPUTER APPLICATIONS-II									4	2
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	2	3	2	2	3	3	2	2	3	2	2.4	
CO-2	3	2	2	3	3	3	2	1	2	3	2.4	
CO-3	2	3	2	3	3	3	2	3	2	3	2.6	
CO-4	3	3	2	2	3	3	1	3	3	2	2.5	
CO-5	3	3	3	3	2	3	3	2	2	3	2.7	
Mean Overall Score											2.52 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO43AP04A	ALLIED-II: CHEMISTRY PRACTICALS (For B.Sc Botany)	2	2

CO No.	CO-Statement	Cognitive Levels (K-levels)
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– elements 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. $\text{K}_2\text{Cr}_2\text{O}_7$ x FAS x KMnO_4).
6. Estimation of $\text{K}_2\text{Cr}_2\text{O}_7$ 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, Shoban Lal, Nagin Chand and Co, New Delhi, 1993.

Unit–II Chapter 4I

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 and Kulandaivelu 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-II: CHEMISTRY PRACTICALS

(For B.Sc Botany)

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 50 marks

- | | |
|---------------|----------|
| Error upto 2% | 50 marks |
| 1.1–3.0 % | 45 marks |
| 3.1–4.0 % | 40 marks |
| >4.0 % | 20 marks |

III. Observation and Record note–book 10 marks

Scheme for Semester examination 100 marks

I. Analysis 40 marks

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

II. Volumetric analysis 50 marks

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

III. Theory behind practical

10 marks

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO43AP04B	ALLIED-II: LAB COURSE-II (BIOMETRICS AND COMPUTER APPLICATIONS II)	2	2

CO No.	CO– Statements	Cognitive Levels (K-Levels)
	On successful completion of this course, students will be able to	
CO-1	acquire the knowledge of basic statistical test	K1
CO-2	understand the t-test, F-test and -test	K2
CO-3	compute correlation and rank correlation	K3
CO-4	utilize statistical hypothesis testing to draw inferences	K3
CO-5	analyse non- parametric test	K4

Using the SPSS software the students are asked to solve the following exercises:

1. Finding Mean and Variance.
2. Finding correlation coefficient, Rank Correlation.
3. T- test
4. F-test
5. Chi-square test
6. Non-parametric tests.

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

Semester	Course Code	Title of the Course									Hours	Credit
IV	21UBO43AP04B	Allied: LAB COURSE 2 (Biometrics and Computer Applications II)									2	2
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	2	1	2	3	2	1	2	2	3	2	2	
CO-2	3	2	3	2	3	2	2	3	1	2	2.3	
CO-3	2	2	3	2	2	3	3	2	1	3	2.3	
CO-4	3	2	2	2	3	1	2	3	1	3	2.2	
CO-5	1	3	2	2	1	3	2	1	3	2	2	
Mean Overall Score											2.16 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UBO44SE02	SEC-2 (BS): MUSHROOM TECHNOLOGY	2	1

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	identify various cultivable species of mushrooms.	K1, K2
CO-2	design various recipes from mushrooms.	K3
CO-3	assess preservation and storage of mushrooms.	K4
CO-4	evaluate and explore the economic viability of mushrooms.	K5
CO-5	prepare the culture techniques of edible mushrooms.	K6

Unit I

Introduction - Classification - Edible and Poisonous. Tests for identification - Nutritive value of mushrooms.

Unit II

Characteristics of common edible mushrooms Paddy straw, Oyster and milky mushrooms. Life cycle of a common mushroom (Agaricus).

Unit III

Culture Techniques – Preparation of spawn, preparation of compost. Spawn running – Harvesting and Marketing.

Unit IV

Preservation and storage of mushrooms – Diseases and pests of mushrooms.

Unit V

Delicious recipes of mushroom – Economic importance of mushrooms.

Book

1. Nita Bahl (1984). Handbook on Mushrooms, Oxford and IBH Publishing Company

Reference

1. Dubey, RC. (2001) A Textbook of Biotechnology, S. Chand & Co. Ltd.

Semester	Course Code	Title of the Course									Hours	Credits
IV	21UBO44SE02	SEC-2 (BS): MUSHROOM TECHNOLOGY									2	1
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	2	3	2	1	2	3	2	2	3	2.3	
CO-2	2	2	3	1	2	2	2	2	3	2	2.1	
CO-3	1	3	3	2	3	1	2	3	2	3	2.3	
CO-4	2	3	2	2	1	2	3	1	2	3	2.2	
CO-5	1	3	3	2	1	2	3	2	1	3	2.1	
Mean Overall Score											2.2	
Result											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 Level
	On completion of this course the graduates will be able to:	
CO-1	know the value of natural resources 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:

1. 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 Level
	On completion of this course, the graduates will be able to:	
CO-1	Understand the history of the Catholic Church	K1
CO-2	Examine and grasp the Sacraments of the Catholic Church	K2
CO-3	Apply the Christian Prayer to their everyday life	K3
CO-4	Analyze themselves in the light of Sacraments & Christian Prayer	K4
CO-5	Create a harmonious society learning values from all religions	K5 & K6

Unit-I	The Catholic Church	(6 Hours)
Unit-II	Sacraments of Initiation	(6 Hours)
Unit-III	Sacraments of Healing & at the Service of Community	(6 Hours)
Unit-IV	Christian Prayer	(6 Hours)
Unit-V	Harmony of Religions	(6 Hours)

Books for Text

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	21UBO53CC09	CORE-9: BIOPHYSICS AND BIOSTATISTICS	5	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the field of biophysics with reference to bioenergetics	K1
CO-2	understand the principles of statistics and know the method of calculation	K2
CO-3	learn to apply physical principles to biological systems	K3
CO-4	apply the statistical principles to solve the biological problems	K3
CO-5	analyse the measures of central value and standard deviation	K4

Unit I (15 Hours)

Biophysics: Photobiology - electromagnetic spectrum, visible range of spectrum, solar energy and photosynthesis. Influence of light on Phytochrome and its effect on root growth. Phototropin, its significance in plant growth. Fluorescence. Bioluminescence. Phosphorescence.

Unit II (15 Hours)

Bioenergetics - energy and work. Laws of thermodynamics – concept of entropy and enthalpy. Gibbs's free energy – energy transduction in biological systems. High-energy compounds – ATP bioenergetics and energy coupled reactions. Radioactivity - structure of an atom, isotopes, types of radiations, application of radioactive isotopes in biological studies, detection of radiation, autoradiography.

Unit III (15 Hours)

Biostatistics: Data - primary & secondary; variable - discrete & continuous. Population and sample, sampling techniques, classification of data, frequency distribution - discrete, continuous and cumulative; parts of a statistical table – advantages of classification of data. Presentation of data - histogram, frequency polygon, frequency curve, Ogive curve, bar charts - simple, multiple, subdivided, pie diagram.

Unit IV (15 Hours)

Measures of central values: mean, median, mode. Measures of dispersion: range, mean deviation, standard deviation, coefficient of variation – Skewness. Correlation - definition – types – methods of studying correlation: scatter diagram method and Karl Pearson's coefficient of correlation for simple and linear data. Regression: definition – regression lines.

Unit V (15 Hours)

Probability - definition, binomial, poisson and normal distributions. Tests of significance. General procedure – large sample testing & small sample testing: t-Test, Chi-square test and F test.

Books for Study

1. Cleri Fabrizio. 2016. The physics of living systems. Springer International Publishing.

Books for References

1. Mishra, S. R. 2010. Textbook of Photobiology. Discovery Publishing Pvt. Ltd. New Delhi.

2. S.P. Gupta, 2008. Elementary Statistical Methods, Sultan Chand & Sons, New Delhi

Semester	Course Code	Title of the Course									Hours	Credits
V	21UBO53CC09	CORE-9: BIOPHYSICS AND BIOSTATISTICS									5	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	3	2	2	2	2	3	2	2	1	2	2.2	
CO-2	2	3	1	2	3	3	2	2	2	2	2.2	
CO-3	2	3	1	2	2	2	2	2	1	2	1.9	
CO-4	2	2	2	2	1	2	2	2	1	2	1.8	
CO-5	2	2	1	3	3	2	3	2	2	2	2.3	
Mean Overall Score											2.1	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53CC10	CORE-10: MICROBIOLOGY AND IMMUNOLOGY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the various types of microbes in an environment and their importance.	K1
CO-2	comprehend the structure and function of immune system in humans.	K2
CO-3	demonstrate the role of microorganisms in food processing and spoilage, soil fertility and sewage disposal	K3
CO-4	identify the defense mechanism against infection in humans.	K4
CO-5	assess role of microorganisms in industrial processing of microbial products	K5

Unit I (15 Hours)

Microbiology: History, Development and Classification (Outline). Whittaker's five kingdom concept, Bergey's Manual of Systematic Bacteriology (outline). Morphology, cell structure, cell wall chemistry, growth, nutrition and reproduction of bacteria. Viruses: structure, classification and reproduction - lytic and lysogenic cycle. A brief account on Rickettsias, Chlamydia, Mycoplasmas, Viroids and Prions.

Unit II (15 Hours)

Culture of microorganisms: Pure cultures, batch and continuous cultures. Methods of Preservation of microorganisms. Microorganisms and Human diseases: Food borne (Botulism), water borne (Cholera), air borne (Tuberculosis), vector borne (malaria) and contact diseases (AIDS) and SARS. Control of microorganisms – physical, chemical and biological methods.

Unit III (15 Hours)

Soil Microbes and Their Roles, Improvements in Soil Fertility, Nitrogen Fixing Bacteria and Their Role in Nitrogen Cycle, Phosphate Solubilization. Mycorrhizae. Plant-Microbes Interactions: Ectomycorrhizae and Endomycorrhizae. Food microbiology: Types of food spoilage and methods of food preservation. Dairy microbiology: Fermented dairy products. Industrial microbiology: Fermentation and Industrial production of alcohol and antibiotics.

Unit IV (15 Hours)

Immunology: Immune system - adaptive, innate, humoral and cellular immunity. Origin, structure and immunological role of primary lymphoid organs (bone marrow and thymus) and Secondary lymphoid organs (Spleen, lymph nodes, Payer's patches, tonsils and appendix).

Unit V (15 Hours)

Origin and role of immune cells (Leucocytes and lymphocytes). Lymph: composition and functions. Antibody types, study of IgG, its structure and immunological role. Virus encounter human system.

Books for Study

1. Pelczar J Chan ECS and Krieg, R. 1999. Microbiology, Tata McGraw Hill, New Delhi.
2. Sullia SB and Shantharam S 2005. General microbiology. Oxford & IBH

Books for References

1. Dubey RC and Maheshwari DK. 2004. A text book of microbiology.S.Chand New Delhi.
2. Casida LE, 2005. Industrial Microbiology.New Age International.

Semester	Course Code	Title of the Course									Hours	Credits
V	21UBO53CC10	CORE-10: MICROBIOLOGY AND IMMUNOLOGY									5	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	2	3	2	2	3	2	2	2	2	2.3	
CO-2	2	3	2	2	1	2	3	2	2	2	2.1	
CO-3	2	2	3	2	2	3	3	2	3	1	2.3	
CO-4	3	3	2	1	1	3	2	2	1	2	2.1	
CO-5	2	3	2	2	3	1	3	2	1	3	2.4	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53CP05	LAB COURSE 5 (BIOPHYSICS, BIOSTATISTICS, MICROBIOLOGY AND IMMUNOLOGY)	4	3

Biophysics

1. Separation of cell and tissue components by centrifugation
2. Separation of pigments by Paper chromatography
3. Absorption spectrum of macromolecules and pigments – UV, FTIR

Biostatistics

1. Sampling by Random Number Table
2. Data Collection
3. Classification of Data: Discrete, continuous and cumulative.
4. Statistical diagrams: Histogram, Frequency curve, Bar chart and Ogive curve
5. Measures of Central Values: Mean, Median and Mode
6. Measures of Dispersion: Range, Mean Deviation and Standard Deviation.

Microbiology

1. Preparation of common media (Nutrient agar & Potato dextrose agar).
2. Staining of Bacteria (Simple & Grams staining).
3. Isolation and enumeration of microbes in soil and water (serial dilution).
4. Study of motility by Hanging Drop.
5. Pure cultures of bacteria – Streak plate, Pour plate and Spread plate.
6. Microbiology of milk (Phosphatase and MBRT)
7. Antibiosis - Kirby Baur method

Immunology

1. Blood grouping
2. WIDAL- test for typhoid
3. RPR- test for syphilis
4. RF- test for rheumatoid arthritis
5. Immunoelectrophoresis – Demo
6. ELISA – Demo

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53ES01A	DSE-1: MOLECULAR BIOLOGY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the structural, organization and function of prokaryotic and eukaryotic genome.	K1
CO-2	acquire knowledge on mechanism and influences on genetic code and its perpetuation.	K1
CO-3	comprehend the basic cellular and molecular events.	K2
CO-4	apply the knowledge acquired to study the molecular mechanisms.	K3
CO-5	analyse the principles of gene regulation.	K4

Unit I (15 Hours)

Organisation of genome – prokaryotic and eukaryotic. Linear and circular DNA molecules. Mutations – types, causes and detection. Mutant types – lethal, conditional, biochemical, germinal vs somatic mutants, insertional mutagenesis. Basic idea about mobile genetic elements - IS elements and transposons.

Unit II (15 Hours)

DNA replication: General features, enzymology, detailed mechanism (initiation, elongation and termination). DNA damage: damages caused by alkylation, UV, gamma and X-rays. DNA repair: excision, double-strand break, mismatch and SOS mechanisms.

Unit III (15 Hours)

Transcription: The Central Dogma, Genetic code, RNA polymerase, promoters, enhancers, silencers, general transcription factors and the mechanism of transcription (initiation, elongation and termination) in prokaryotes and eukaryotes. Post-transcriptional events (splicing, capping and polyadenylation).

Unit IV (15 Hours)

Translation: Organization of mRNA, genetic code and its characterization, ribosome and rRNA, amino acyl synthetase, tRNA and amino acid activation. Mechanism of initiation elongation and termination. Translation factors, post-translation processing.

Unit V (15 Hours)

Gene regulation: Basic principles of transcriptional regulation- positive and negative; inducible and repressible; activators and repressors. The lac operon (positive and negative control), the trp operon (repression-derepression and attenuation), riboswitches, mRNA stability, RNA interference, microRNAs.

Books for Study

1. Freifelder, D.1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.
2. Gupta PK 2005. Molecular Biology and Genetic Engineering, Rastogi Publications, Meerut.

Books for References

1. De Robertis & De Robertis. 1990. Cell and Molecular Biology, Saunders College, Philadelphia, USA.
2. Elliott WH & Elliott DC. 2005. Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford.

Semester	Course Code	Title of the Course									Hours	Credits
V	21UBO53ES01A	DSE-1: MOLECULAR BIOLOGY									5	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	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	1	2	3	1	2	3	3	2.2	
CO-3	2	2	2	3	1	2	2	3	2	2	2.1	
CO-4	3	2	2	1	3	3	1	3	2	3	2.4	
CO-5	2	3	2	3	1	3	2	3	2	1	2.2	
Mean Overall Score											2.3	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53ES01B	DSE-1: BIOINFORMATICS AND BIONANOTECHNOLOGY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	study the basic elements of interface, concepts between biology and nanotechnology.	K1
CO-2	outline the basics of sequence alignment and analysis.	K2
CO-3	classify different types of biological databases.	K3
CO-4	explain the synthesis approaches for nanomaterial and its characterization.	K4
CO-5	construct various types of nanomaterial for application and evaluate the impact on environment.	K5, K6

Unit I (15 Hours)

Bioinformatics: Introduction, Aim, Scope and Research areas of Bioinformatics. Branches of Bioinformatics. Biological Databases, Classification format of Biological Databases, Biological Database Retrieval System - NCBI, PUBMED, EBI, EMBL, gene bank etc.

Unit II (15 Hours)

Database searches for homology using BLAST and FASTA and interpretation of the results to derive biological significance of the queried DNA/protein sequences. Alignment of protein and DNA sequences using algorithm software to deduce homology and interpretation of data.

Unit III (15 Hours)

Nanotechnology: Origin, scope and importance. Nanoparticles – definition. Principles: quantization effects - inverse relationship between size and reactive surface area. Properties: surface effects, the effects of size, shape, surface and bulk composition, and solubility and persistence.

Unit IV (15 Hours)

Essentials of nanostructure generation: top-down vs. bottom-up. Chemical and physical self assembly. Physical, chemical and biogenic synthesis of nanomaterials – biomimetics, green plants, and microorganisms. Role of biomolecules - reducing and/or capping agents: proteins, viruses and carbohydrates, Preparation and characterization of nanoparticles (UV, FTIR, SEM, DLS and zeta potential, X-ray diffraction).

Unit V (15 Hours)

Targeted nanoparticles: active and passive targeting. Application: medicine, manufacturing & materials, delivery vehicles, cancer therapy, tissue engineering, fluorescent biological labels, biological assays, nano-imaging, biosensors, micromanipulation techniques, metabolic engineering and gene therapy, environmental management; nanotechnology in agriculture; Interactions of nanoparticles, uptake, transport and toxicity.

Books for Study

1. Sharon, M. & Sharon, M 2012. Bio-Nanotechnology - Concepts and Applications, CRC Press.
2. Rastogi, S.C., Medirattta, N. and Rastogi. P. (2004). Bioinformatics, methods and applications, genomics, proteomics and drug discovery, Prentice Hall of India, pvt. Ltd., New Delhi.

Books for References

1. Attwood, T. K. and Parry-Smith, D. J. (2001). Introduction to Bioinformatics Delhi. Pearson Education (Singapore) Ptd. Ltd.
2. Jain K.K. Nanobiotechnology molecular diagnostics: Current techniques and application (Horizon Bioscience) 2006 Taylor & Francis 1st edition.
3. Volker Mailander and Katharina Landfester 2009 Interaction of nanoparticles with cells. *Biomacromolecules*, 10 (9): 2379 – 2400. DOI:10.1021/bm900266r.

Online Resources

- 1) <http://ieet.org/index.php/IEET/more/bionanotechnology20141007> Institute of Ethics & Emerging Technologies
- 2) <https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html>
- 3) <http://www.particle-works.com/applications/controlled-drug-release/Applications>
- 4) <https://jnanobiotechnology.biomedcentral.com/articles/10.1186/1477-3155-2-3> DOI: 10.1186/1477-3155-2-3
- 5) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3865110/>
- 6) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/>

Semester	Course Code	Title of the Course									Hours	Credits
V	21UBO53ES01B	DSE-1: BIOINFORMATICS AND BIONANOTECHNOLOGY									5	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	2	1	2	2	3	2	1	2	2.1	
CO-2	2	3	2	2	2	2	3	2	2	3	2.3	
CO-3	2	2	3	2	1	2	2	3	2	2	2.1	
CO-4	1	2	2	3	2	2	3	2	3	2	2.2	
CO-5	1	2	2	3	2	2	3	2	1	3	2.1	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53ES02A	DSE-2: RESEARCH METHODOLOGY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	obtain knowledge on basic concepts in research.	K1
CO-2	understand the objective of research.	K2
CO-3	evaluate the significance of databases and citation index.	K3
CO-4	plan basic research and the research process.	K4
CO-5	acquire skill in writing research articles and formatting the papers.	K5

Unit I (15 Hours)

Foundations of Research: Meaning, Objectives, Motivation, Utility. Characteristics of scientific method. Understanding the language of research – Concept, Construct, Definition, Variable. Research Process.

Unit II (15 Hours)

Structure of thesis and research article. Literature collection: Books, Research articles and e-resources. Manuscript for publication and proof correction. Structure and components of research proposal, National and International funding sources.

Unit III (15 Hours)

Bibliometrics: definition and relevance; Bibliometrics databases, h-index, SNIP, Page Rank, Impact Factor and evaluation. The use of bibliometrics in research: Citation Research, Science Citation Index. Plagiarism, Tailored Research and Retraction. Indian Patent Act.

Unit IV (15 Hours)

Research Design: Concept and Importance in Research. Features of a good research design. Experimental Design: Concept of Independent and group research.

Unit V (15 Hours)

Interpretation of Data and Paper Writing, Layout of a Research Paper, Journals in Life Science, Impact factor of Journals, Ethical issues related to publishing.

Books for Study

1. Kothari, C. R. 2014. Research Methodology-Methods & Techniques. WishwaPrakashan
2. Misra, R. P, 2000. Research Methodology - A Handbook, Concept Pub. Company, New Delhi.
3. Pillai and Bagavathi, 2008 Statistics, S. Chand& Company Ltd, New Delhi

Books for Reference

1. Gupta, SP. 1990. Statistical Methods, Sultan Chand & Sons, New Delhi.
2. NageswaraRao, G. 1983. Statistics for Agricultural Science Oxford & IBH, New Delhi
3. Gupta, SC. 2013. Fundamentals of statistics, Himalaya Publishers, Mumbai.

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53ES02A	DSE-2: RESEARCH METHODOLOGY	5	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	2	3	2	2	3	2	2	3	2	2.4
CO-2	2	3	2	3	2	2	3	2	2	1	2.2
CO-3	2	2	3	2	1	3	3	2	3	1	2.2
CO-4	3	3	2	3	1	3	3	2	3	1	2.4
CO-5	2	2	2	2	1	2	2	2	2	1	1.8
Mean Overall Score											2.2
Result											High

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53ES02B	DSE-2: BIOPESTICIDES	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	study the importance of appropriate control measures for managing insect pests in crops.	K1
CO-2	acquire knowledge on present use of biopesticides as part of integrated pest management.	K2
CO-3	illustrate the mass production techniques of microbial biopesticides.	K3
CO-4	analyze how to use the variable biopesticide methods for managing different kinds of pests.	K4
CO-5	design various types of biopesticide formulations.	K5

Unit I (15 Hours)

Biological control of insect pests: scope and principles, factors affecting biological control. Biopesticides: introduction, importance and classification– living creatures to control pests – weeds for controlling pest. Pest Control in Organic Farming. Application methods of biopesticides.

Unit II (15 Hours)

Botanical pesticides: present status and future prospects; opportunities for botanical pesticides in crop rotation; multiple cropping for controlling pests, Trap Crops. Plants as a source of natural pesticides: Neem, Chrysanthemum, Pongamia, Garlic, Turmeric, Tobacco and Citronella.

Unit III (15 Hours)

Biocontrol agents: Isolation, identification, mode of action and mass production of *Pseudomonas fluorescens* (bacterial agent), *Trichoderma viride* (fungal agent).

Unit IV (15 Hours)

Biological pesticides: isolation, identification. Bacterium as biopesticide (*Bacillus thuringiensis*) - production and field applications. Fungus as biopesticide (*Entomophaga* - *Beauveria bassiana*). Insect as biopesticide (Reduviid predators - *Rhynocoris kumarii*, *R. fuscipes*, *R. marginatus*). *Trichogramma*. Virus as biopesticide (Baculovirus - NPV). Virulence, pathogenicity and symptoms of entomopathogenic nematodes.

Unit V (15 Hours)

Production methods of biopesticides: liquid culture fermentation and solidstate fermentation – Types of biopesticide formulations: dry inoculum, granules, pellets, capsules, wettable powder and liquid formulations. Impediments and limitation in production and use of biopesticide.

Books for Study

1. Ghosh GK, 2000, Biopesticide and Integrated pest Management, A P H Publishing Corporation, New Delhi.
2. Bhattacharyya P. and Purohit SS, 2008. Organic Farming: Biocontrol and Biopesticide Technology, Agro House, Jodhpur, Rajasthan. ISBN: 978-81-7754-369-8.
3. Saleem F and Shakoori AR (2012) Development of Bioinsecticide, Lap Lambert Academic Publishing.

Books for References

1. Krishna Chandra, Greep and Srivathsa, 2005, Bio Control Agents & Biopesticides,
2. D. Dent, 2000, Insect Pest Management 2nd Ed, ABI Publishers, UK

Semester	Course Code:	Title of the Course									Hours	Credits
V	21UBO53ES02B	DSE-2: BIOPESTICIDES									5	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	2	3	2	2	2	2	2	3	2	2.2	
CO-2	2	3	2	1	2	2	3	2	2	3	2.2	
CO-3	2	2	3	2	1	2	3	2	2	2	2.1	
CO-4	1	2	2	2	2	2	3	2	3	2	2.1	
CO-5	1	2	2	3	2	2	3	2	1	3	2.1	
Mean Overall Score											2.14	
Result											High	

Semester	Course Code:	Title of the Course	Hours	Credits
V	21UBO53SP01	SELF PACED LEARNING: ECONOMIC BOTANY	-	2

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	learn the origin and history of various crop plants.	K1
CO-2	understand the cultivation of various economically important crops.	K2
CO-3	acquire knowledge on the binomial nomenclature and morphology of economic crops.	K3
CO-4	acquire the skill for preparation plant-based products.	K4
CO-5	produce beverages and narcotics from specific plants.	K5

Unit I: Cereals and Legumes (15 Hours)

Origin and History, Botanical description, Cultivation, Harvesting and uses of Cereals and Legumes: Wheat, Rice, Maize, Black gram, Redgram, Chick pea and Pigeon pea.

Unit II: Vegetables and Fruits (15 Hours)

Origin and History, Botanical description and economic importance of Vegetables and Fruits: Apple, Banana, Mango, Brinjal, Tomato and Potato.

Unit III: Spices and Condiments (15 Hours)

Origin and History, Botanical description, Cultivation and uses of Spices and Condiments: Pepper, Cardamom, Clove, Chilly, Coriander and Turmeric.

Unit IV: Beverages Plants, Fibres and Timber (15 Hours)

Origin and History, Botanical description, Cultivation, Processing and uses of Beverages plants: Tea, Coffee and Cocoa. Fibers and Timber: Cotton and Jute, Teak, Rosewood, and Mahogany.

Unit V: Oil Yielding Plants (15 Hours)

Origin and History, Botanical description, Harvesting, Extraction and uses of Fatty oils and Vegetable Fats: Sun flower, Soya bean, Coconut and Gingelly. Medicinal Plants: Rauwolfia, Chinchona and Digitalis.

Books for Study

1. Kochhar, SL. 2012. Economic Botany in Tropics. MacMillan & Co. New Delhi, India.
2. Panday, BP. 2000. Economic Botany. S Chand Publishing Company. New Delhi. India

Books for References

1. Wickens, GE. 2001. Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
2. Chrispeels, MJ. And Sadava, DE. 2003. Plants, Genes and Agriculture. Jones & Bartlett Publish

Semester	Course Code:	Title of the Course									Hours	Credits
V	21UBO53SP01	SELF PACED LEARNING: ECONOMIC BOTANY									-	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	3	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	1	2	3	1	2	3	3	2.2	
CO-3	2	2	2	3	1	2	2	3	2	2	2.1	
CO-4	3	2	2	1	3	3	1	3	2	3	2.4	
CO-5	2	3	2	3	1	3	2	3	2	1	2.2	
Mean Overall Score											2.3	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UBO53EG01	GENERIC ELECTIVE-1: LANDSCAPE DESIGNING	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	know about the brief history, divisions, classification and structure of horticultural plants.	K1, K2
CO-2	acquire knowledge on plant growth processes and stages of plant growth.	K3
CO-3	develop practical skills in micro propagation techniques.	K4
CO-4	apply techniques of flower decoration and importance of economic cultivation crops as self-employment.	K5
CO-5	design propagation methods and propagation through various specialized underground structures.	K6

Unit I

(12 Hours)

Importance of scope of horticulture – Divisions of horticulture famous gardens in world & India; Tools & Implements used in horticulture. Vegetative Propagation: Cutting, Layering, Grafting and Budding, advantages and disadvantages of vegetative propagation.

Unit II

(12 Hours)

Nursery: definition, objectives and scope, Preparation of Nursery beds. Transplantation – steps and Methods. Bonsai – Training, Terrarium, Mulching and Topiary techniques. Lawn making and maintenance, water garden, glass house, rockery, hanging baskets. Parks: components, types. Xeriscaping.

Unit III

(12 Hours)

Gardening; definition, objectives and scope. Designing outdoor garden – hedges, edges, fences, terrace garden/roof garden, Fruit garden, Vegetable garden: Tomato, brinjal, and snake guard, Medicinal plant: Layout model outdoor college garden. Designing Indoor gardening – Foliage plants, flowering plants. Layout model indoor kitchen garden.

Unit IV

(12 Hours)

Horticultural Crops - Conservation and Management. Varieties and cultivars of various horticultural crops. IPR issues. National, International and Professional Societies. Sources of Information on Horticulture. Post-Harvest Management of Horticultural Crops. Field Visit; Horticultural Department.

Unit V

(12 Hours)

Floriculture: Cultivation of commercial flower crops – Rose, Jasmine and Chrysanthemum. Flower decoration – Dry and wet decoration. Fruit crops: Induction of flowering, flower thinning, fruit setting, fruit development. Cultivation of important fruit crops - Mango, Grapes, Sapota and Guava. Economics of cultivation Crops: Cardamom, pepper, ginger, turmeric and clove.

Books for Study

1. Acquaah, G. 2002. Horticulture: Principles and Practices. Pearson Education, Singapore.
2. Bose, TK., Maiti, RG., Dhua, RS. and Das, P. 1999. Floriculture and Landscaping. NayaProkash, Calcutta.

Books for Reference

1. Ashman, M. A. and Puri, G. 2002. Essential soil science- A clear and concise introduction to soil science. Blackwell scientific publishers, London.
2. SubbaRao, N. S. 1997. Biofertilizers in Agriculture and Forestry. India Book House Limited, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
3. Tolanus, S. 2006. Soil fertility, Fertilizer and Integrated Nutrient management. International Book Distributory Co.

Semester	Course Code	Title of the Course									Hours	Credits
V	21UBO53EG01	GENERIC ELECTIVE-1: LANDSCAPE DESIGNING									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	2	3	2	2	3	2	3	3	2	2.5	
CO-2	2	3	2	3	2	2	3	2	3	3	2.5	
CO-3	2	3	2	3	2	3	2	2	3	2	2.4	
CO-4	3	3	3	3	2	3	2	3	2	2	2.6	
CO-5	2	2	3	2	3	3	2	3	2	3	2.5	
Mean Overall Score											2.5	
Result											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, Questionnaires & 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

Melchias G, Balaiah John, John Love Joy (Eds), 2018. Straight from the Traits: Securing Soft Skills, SJC, Trichy.

References

Aggarwal, R.S. 2010. *A Modern Approach to Verbal and Non Verbal Reasoning*. S.Chand, New Delhi. Covey, Stephen. 2004. *7 Habits of Highly effective people*, Free Press. Egan, Gerard. (1994).

The Skilled Helper (5th Ed). Pacific Grove, Brooks/Cole.

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

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

Other books

Murphy, Raymond. 1998. *Essential English Grammar*. 2nd ed., Cambridge University Press. Sankaran, K., & Kumar, M. *Group Discussion and Public Speaking*. M.I. Pub, Agra, 5th ed., Adams, Media.

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

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

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63CC11	CORE-11: PLANT PHYSIOLOGY	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	compile the underlying principles of various physiological processes of plants.	K1
CO-2	discuss various mineral nutrients in plants.	K2
CO-3	assess the mechanism of photosynthesis and respiration.	K3
CO-4	evaluate the various plant growth substances and their physiological effects.	K4
CO-5	predict the seed dormancy and photoperiodism.	K5

Unit I (12 Hours)

Water, Mineral and Solute: Uptake and Transport. Molecular Structure and properties of water. Diffusion and osmosis – osmotic pressure, turgor pressure and significance of osmosis. Plasmolysis and its importance. Mechanism of absorption of water – passive and active absorption. Ascent of sap – theories on absorption. Absorption, mechanism and transport of mineral salts. Transpiration – types, mechanism, significance and factors affecting transpiration.

Unit II (12 Hours)

Mineral nutrition: plant nutrients – essential and non-essential elements – micro and macro nutrients. Source, physiological role and deficiency symptoms of minerals. Hydroponics and aeroponics. Nitrogen metabolism: importance of nitrogen to plants. Sources of nitrogen, nitrogen cycle, nitrogen, ammonium assimilation and transamination.

Unit-III (12 Hours)

Photosynthesis: Photosynthetic apparatus and pigment system, Emerson Enhancement Effect and two pigment systems, Antenna complexes and reaction centers, Photosynthetic electron transport system and its mechanism, photophosphorylation and types – cyclic, non-cyclic and pseudocyclic pathway of carbon, CO₂ fixation - C₃, C₄ and CAM plants.

Unit IV (12 Hours)

Respiration: Definition, types of respiration: Glycolysis (EMP pathway), Krebs cycle, Terminal oxidation, Electron transport chain (modern view) and oxidative phosphorylation. ATP synthesis, Photorespiratory carbon, Oxidative cycle, Pentose Phosphate pathway: its significance, Respiratory Quotient.

Unit V (12 Hours)

Plant Growth: Plant growth substance: discovery and physiological effects of Auxin, Gibberellins and cytokinins. Growth inhibitor hormone: Ethylene and Absciscic acid. Physiology of flowering: Photoperiodism and Phytochrome, Vernalisation: techniques and mechanism. Seed dormancy and germination: physiological and biochemical changes.

Books for Study

1. Verma V. 2007. Text book of Plant Physiology, Ane Books India, New Delhi
2. Jain V.K. 2006. Fundamentals of Plant Physiology, 18th ed. Chand & Co.
3. Pandey, SN & Sinha, BK. 2006. Plant Physiology, 4th Ed. Vikas Publishing House Ltd.

Books for References

1. Noggle and Fritz, 1976. Introductory Plant Physiology, Prentice Hall, New Delhi.
2. Bajjal BD & Ravisharma, 1981. A Textbook of Plant Physiology, Shiva Lal Agarwal
3. Salisbury, F.B. & Ross, CN. 1995. Plant Physiology. CBS Publishers, New Delhi

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63CC11	CORE-11: PLANT PHYSIOLOGY									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	2	2	2	1	2	3	1	2	3	2.1	
CO-2	2	2	3	1	2	3	2	2	3	2	2.2	
CO-3	1	3	2	2	3	1	2	3	2	3	2.2	
CO-4	2	3	2	3	1	2	3	1	2	3	2.3	
CO-5	1	3	3	2	2	2	3	2	1	3	2.2	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63CP06	LAB. COURSE 6: PLANT PHYSIOLOGY	3	1

Detailed Study:

1. Effect of temperature on membrane permeability.
2. Osmosis – Thistle funnel, potato osmoscope.
3. Determination of water potential and solute potential.
4. Determination of root pressure and sap exudation.
5. Effect of environmental factors on the rate of transpiration.
6. Extraction and separation of leaf pigments.
7. Effect of light and CO₂ on photosynthesis.
8. Aerobic respiration – Ganong's respiroscope.
9. Ascent of sap – Balsam plant experiment.
10. Measurement of lipase activity.
11. Demonstration experiments:
 - i. Phototropism,
 - ii. Geotropism,
 - iii. Arc Auxanometer,
 - iv. Dialatometer
 - v. Hydroponics

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63CC12	CORE-12: GENETIC ENGINEERING AND BIOTECHNOLOGY	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	define the principles and application of intellectual property rights.	K1
CO-2	understand the principles of genetic engineering.	K2
CO-3	learn the types and application of cloning vectors.	K3
CO-4	study and analyze different types of gene transfer methods.	K4
CO-5	design protocol for plant tissue culture.	K5

Unit I (12 Hours)

Basic principle and important steps in recombinant DNA Technology. *Agrobacterium*-mediated gene transfer and Crown gall disease. Steps in Methods to generate desired foreign genes: isolation of prokaryotic gene by restriction enzymes and of eukaryotic gene by cDNA synthesis. Joining DNA molecules: ligases, linkers and homopolymers.

Unit II (12 Hours)

Cloning vectors: natural vectors - *E. coli* plasmids; *in vitro* vectors – pBR; cosmids; single-stranded DNA vectors - M13; and shuttle vectors - *E. coli*; Yeast shuttle vector. Selectable markers. Gene cloning strategies: cDNA library and genomic library.

Unit III (12 Hours)

Methods of gene transfer to bacteria, plants and animals: Ca-transfection, microinjection, electroporation, shotgun, lipofection, somatic cell nuclear transfer, and embryonic stem cells.

Unit IV (12 Hours)

Various methods of Plant Tissue Culture and Applications. Protoplast fusion technology. Applications of plant tissue culture in agriculture and forestry. Transgenic plants against herbicide, insects, drought and salinity. Genetic Use Restriction Technology. Anti-sense RNA technology and the FlavrSavr tomato.

Unit V (12 Hours)

Production technology of plantibodies and monoclonal antibodies by hybridoma technology. Gene therapy. Cloning animals (therapeutic and reproductive). Xenografting. Release of GMOs: *Bt*brinjal in India. Concerns of genetic engineering. IPRs – meaning, types (IP, Copyrights & Patents). Arguments for and against patenting genes and life forms.

Books for Study

1. Bernard R Glick and Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.
2. Old, RW and Primrose, SB. 2001. Principles of Gene Manipulation-an introduction to genetic engineering, Black Well Science Ltd., New York.

Books for References

1. Gamborg, OL and Phillips, GC. 1995. Plant cell, Tissue and Organ culture, Narosa publishing House, New Delhi.
2. George, EF and Sherrington, PD. 1984. Plant propagation by Tissue culture, Exegetics Limited, London.
4. JD Watson, M Gilman, J Witkowski and M Zoller 1992. Recombinant DNA (2nd Edition), WH Freeman Co., New York.

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63CC12	CORE-12: GENETIC ENGINEERING AND BIOTECHNOLOGY									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	2	3	2	2	3	3	2	3	2	2.5	
CO-2	2	3	2	3	2	2	3	2	2	3	2.4	
CO-3	2	2	3	2	3	3	3	2	3	1	2.4	
CO-4	3	3	3	3	1	3	3	3	3	1	2.6	
CO-5	1	2	2	2	3	1	2	2	2	3	2.0	
Mean Overall Score											2.38	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63CP07	LAB. COURSE 7 (GENETIC ENGINEERING, BIOTECHNOLOGY AND BIOCHEMISTRY)	3	1

Detailed Study:

Genetic Engineering, Biotechnology

1. Culture media and sterilization techniques
2. Generation of In vitro plants
3. Embryo culture
4. Callus induction and differentiation
5. Somatic embryogenesis.
6. Micropropagation and Synthetic seeds

Biochemistry

7. Qualitative estimation of sugars.
8. Estimation of total lipids (gravimetric).
9. Estimation of amino acids.
10. Determination of strength of amino acids.
11. Quantitative estimation of total protein.
12. Effect of pH/temperature on enzyme activity
13. Estimation of total phenolics

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63ES03A	DSE-3: BIOCHEMISTRY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge about chemical and molecular foundations of life.	K1
CO-2	compile the structure, properties and roles of carbohydrates, proteins and lipids.	K2
CO-3	analyze the structure, function and acid base properties of amino acids.	K3
CO-4	critique the role of vitamins and enzymes in biological systems.	K4
CO-5	evaluate the importance of secondary metabolites to mankind.	K5

Unit I (15 Hours)

Carbohydrates: Classification of carbohydrates; Stereochemistry of simple sugars; α , β -glycosidic linkages, Structure and properties of monosaccharide (glucose, fructose, mannose), disaccharide (maltose, lactose, sucrose) and oligosaccharides; Polysaccharides: Chemical structure and functions of starch, glycogen, plant cell wall and bacterial cell wall.

Unit II (15 Hours)

Lipids: Classification, structure, properties and synthesis of lipids; Saturated and Unsaturated fatty acids; Structure and function of phospholipids, glycolipids; cholesterol-biological importance; Membranes and fluid mosaic model.

Unit III (15 Hours)

Amino acids: Structure & properties, Non-protein amino acids and their functions; Proteins: classification, peptide bond, structure- primary, secondary, tertiary (collagen), quaternary and the forces stabilizing protein structure.

Unit IV (15 Hours)

Enzymes: biocatalysts – definition and characteristics, IUB classification; principles of catalysis, activation energy, transition state, active site and Michaelis-Menten equation; Mode of action - Lock & Key and Induced Fit models; Factors affecting enzyme action – pH, temperature, substrate & enzyme concentration; Enzyme regulation by inhibition: competitive, non-competitive & feedback.

Unit V (15 Hours)

Secondary metabolites and their functions in plants: Terpenoids: N- containing metabolites (alkaloids), Phenolics: classification, properties and significance; Shikimic acid and mevalonic acid pathway; Synthesis of alkaloids from amino acids.

Books for Study

1. Lehninger: Principles of Biochemistry (2013) 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York), ISBN: 13: 978-1-4641-0962-1 / ISBN: 10:1-4292-3414-8.
2. Harper's Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63ES03A	DSE-3: BIOCHEMISTRY									5	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	2	2	3	1	3	3	2	2	2	2.2	
CO-2	3	2	2	1	2	2	3	1	2	3	2.1	
CO-3	1	2	3	2	3	2	3	2	3	2	2.3	
CO-4	1	2	2	3	1	2	3	2	2	3	2.1	
CO-5	2	2	1	2	3	2	3	2	2	3	2.2	
Mean Overall Score											2.2	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63ES03B	DSE-3: AGRICULTURAL BOTANY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the scope and importance of various branches of agriculture.	K1
CO-2	gain knowledge in agricultural development at global level.	K2
CO-3	acquire skills of various crops cultivation in india.	K3
CO-4	classify various agricultural operational procedures of various crops.	K4
CO-5	prioritize various harvesting procedures.	K5

Unit I: Introduction to Agriculture

(15 Hours)

Agriculture – Definition – Importance and scope - Branches of agriculture- Agronomy – Definition – Meaning and scope. National and International Agricultural Research Institutes. Indian economy – National income.

Unit II: History of Agriculture Development

(15 Hours)

Evolution of human beings and agriculture – Era of civilization- Importance of Neolithic civilization - History of Agricultural development in world and India – Agriculture in ancient India – Development of scientific Agriculture - Stages of agriculture development - Chronological agricultural technology development in India.

Unit III: Crop Classification and Crop Production

(15 Hours)

Crops and their classification–Major crops of India and TamilNadu-Economic importance. Major soil types of India and Tamil Nadu. Factors affecting crop production – climate - edaphic- biotic - physiographic and socioeconomic factors - Agricultural seasons of India and Tamil Nadu. Tillage – Definition - Types- Objectives - Modern concepts of tillage.

Unit IV: Basic Agricultural Operations

(15 Hours)

Seed treatment. Nursery. Sowing methods. Germination – Factors affecting germination. Plant population and geometry - effect on growth and yield. After cultivation – Thinning - Gap filling. Weeds – Definition – Beneficial and Harmful effects of weed. Irrigation and its role on plant growth. Manures and fertilizers – Time and methods of application.

Unit V: Harvesting and Storage

(15 Hours)

Maturity symptoms of field crops – methods of harvesting – Cleaning and drying -methods of storage. Current stream of developments

Books

1. Sudhagar Rao, G.B., M. Thiruppathi., C.Ravikumar and K.P.Senthilkumar, 2015.Basic Agronomy, Manibharathi Publications, Chidambaram.
2. Chandrasekaran, B., K. Annadurai and E. Somasundaram. 2010. A Textbook of Agronomy. New Age International Publishers, New Delhi.

REFERENCES

1. Balasubramanian, P. and SP.Palaniappan. 2010. Principles and Practices of Agronomy. Agrobios. Jodhpur - 342 002.
4. ICAR. 2011. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi.
5. Panda, S.C. 2010. Agronomy. Agro bios (India), Jodhpur - 342 002.
6. Yellamananda Reddy, T. and Sankara Reddi, G.H. 2010. Principles of Agronomy. Kalyani Publishers, New Delhi.

E-RESOURCES

1. http://www.dphu.org/uploads/attachements/books/books_2248_0.pdf
2. <https://www.scribd.com/doc/119183030/principles-of-agronomy-and-agrometerology>
3. <http://www.newagepublishers.com/samplechapter/001757.pdf>
4. [http://www.sun.worldcat.org/title/principles of agronomy/oclc/689265](http://www.sun.worldcat.org/title/principles%20of%20agronomy/oclc/689265)

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63ES03B	DSE-3: AGRICULTURAL BOTANY									5	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	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	3	2	2	3	2	2	1	2.2	
CO-3	2	2	3	2	3	3	3	2	3	2	2.4	
CO-4	3	3	2	3	1	3	3	2	3	1	2.4	
CO-5	2	2	1	2	1	2	2	1	2	1	1.6	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63ES04A	DSE-4: MEDICINAL BOTANY	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire the knowledge about understanding of principle and efficacy of various Indian system of medicines.	K1
CO-2	learn the identification, pharmacological importance and processing of medicinal plants based on their classification and characterization.	K2
CO-3	analyze the suitable conservation method for medicinal plants using modern biotechnology tools to ensure the sustainable utilization.	K3
CO-4	evaluate the medicinal plants based drug efficacy and its various applications for different ailments	K4
CO-5	create new methods for identification and characterization of drug adulteration and formulations for the human welfare.	K5

Unit I

Medicinal Plants: History, Scope and Importance. Traditional medicinal systems: Ayurvedha, Siddha, Naturopathy, Aromatherapy and Acupuncture. Definition of drug classification of natural drugs: Alphabetical, Morphological, Taxonomical, Chemical and pharmacological.

Unit II

Ethnobotany: definition, major tribes of South India and their ethno botanical heritage. Ethnobotany and conservation of plants with special reference to India. Mythology and conservation of ecosystems (sacred groves). Role of ethnic groups in conservation of medicinal plant genetic resources. Endangered taxa and forest management.

Unit III

Cultivation, collection and preparation of natural drugs macroscopic (physical and organoleptic characters), therapeutic and pharmaceutical characterization of the following medicinal plants: *Adathoda vasica*, *Aloe vera*, *Centella asiatica*, *Piper nigrum*, *Allium sativum*, *Curcuma longa*, *Ocimum sanctum* and *Catharanthus roseus*. Conservation of endangered and endemic medicinal plants using Plant Tissue Culture.

Unit IV

Drugs from leaves (Eucalyptus), flower (Eugenia), fruits and seeds (Coriander), roots (Withania), underground stem (Ginger), bark (Cinchona) and wood (Ephedra). Cultivation and utilization of selected medicinal plants *Bacopa monnieri*, *Cassia senna*, *Andrographis paniculata*, *Gloriosa superba*, *Phyllanthus amarus* and *Rauvolfia serpentina*.

Unit V

Drug adulteration and types. Drug evaluation: physical, chemical and biological. Quality control of herbal drugs. Role of NMPB, AYUSH and CDRI.

Books for Study

1. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2003). Pharmacognosy. NiraliPrakashan, Pune.

Books for References

1. Bhattacharjee, S.K. 2004. Hand Book of Medicinal plants. Pointer Publishers, Jaipur.
2. Harbourne, J. B. (1998). Phytochemical methods: A Guide to Modern Techniques of Plant Analysis (3rd edition). Chapman and Hill Co., New York.
3. Joshi, S.G. (2001). Medicinal plants. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63ES04A	DSE-4: MEDICINAL BOTANY									5	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	2	3	1	3	3	3	1	2	2	2.3	
CO-2	2	2	3	2	2	1	3	3	2	3	2.3	
CO-3	3	3	3	2	3	1	3	3	2	3	2.6	
CO-4	3	1	3	2	3	2	3	1	2	2	2.2	
CO-5	2	3	2	2	3	1	1	2	3	3	2.2	
Mean Overall Score											2.32	
Result											High	

Semester	Course Code:	Title of the Course	Hours	Credits
VI	21UBO63ES04B	DSE-4: BIOLOGICAL TECHNIQUES	5	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the various micro techniques in biology.	K1
CO-2	learn the principles and applications of microscopy.	K2
CO-3	construct immunological techniques and applications.	K3
CO-4	distinguish and identify techniques used to preserve organisms in museum.	K4
CO-5	prepare biofertilizers and animal rearing.	K5

Unit I

(15 Hours)

Microtechniques - selection of material, fixation, fixation images- acid and basic. Preparation of permanent slide-Dehydration process, Infiltration of wax, embedding, sectioning (microtome), mounting. Leaf clearing, smear and squash techniques.

Unit II

(15 Hours)

Stains: Classification- single, double, triple staining. Florescent image processing Nuclear, cytoplasmic, cell wall stains and their rationale. Herbarium – collection, drying, pasting of plant specimen, Protection of Herbarium- importance.

Unit III

(15 Hours)

Techniques of the preparation of vertebrate skeletons and transparency preparations (Alizarian red) cartilage staining, museum techniques: dry and wet preparation. Taxidermy Arthropod squash. Blood grouping ABO and Rh, blood smear preparation. Haemocytometer.

Unit IV

(15 Hours)

Earthworm and its types. Preparatory methods of vermiculture techniques. Vermin compost – panchakavia; fish extract, Economic and ecological importance of vermicompost. Biofertilizers-Cultivation of Spirulina and Scenedesmus. Animal rearing: albino rats, rabbits and fruit fly.

Unit V

(15 Hours)

PCR - principles, technique and applications- Types of PCR –Reverse Transcriptase (RT) Blotting techniques-Northern. DNA finger printing and barcoding. Immunological test - WIDAL, RPR, RF and ELISA.

Books for Study

1. Yadav, P.R. 2006. Biological Techniques, Discovery Publishing House, New Delhi.
2. Swargiary, A. 2017. Biological Tools & Techniques, Kalyani Publishers, New Delhi.

Books for Reference

1. Ramakrishnan, S. 2012. Manual of Medical Laboratory Techniques, Jaypee Brothers Medical Publishers, New Delhi.

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63ES04B	DSE-4: BIOLOGICAL TECHNIQUES									5	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	2	1	2	2	3	2	1	2	2.1	
CO-2	2	3	2	2	3	2	3	2	2	1	2.2	
CO-3	2	2	3	2	1	2	2	3	2	2	2.1	
CO-4	1	2	2	3	2	1	3	2	3	2	2.1	
CO-5	1	2	2	3	2	2	3	2	2	3	2.2	
Mean Overall Score											2.1	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63EG02	GENERIC ELECTIVE-2: SOLID WASTE MANAGEMENT	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	Understand the types of solid waste and their importance.	K1
CO-2	Acquire knowledge on decomposition of organic matters.	K2
CO-3	Learn the technology of vermicomposting and their applications.	K3
CO-4	Learn the Mushroom cultivation technique and their medicinal values.	K4, K5
CO-5	Know the methods of composting and their importance.	K6

Unit-I (12 Hours)

Definition-scope and importance of solid waste management-Types of solid wastes: garbage, rubbish, agricultural, hospital and domestic wastes. Collection-transport and processing of solid wastes.

Unit-II (12 Hours)

Composting techniques: Types of composting, anaerobic and aerobic composting, Factors affecting aerobic composting, Techniques for effective aerobic composting, Salient features of selected small-scale aerobic composting techniques-Role of microbes in composting

Unit-III (12 Hours)

Solid waste management - methods of solid waste management - open dumping, land filling, incineration, pyrolysis Biogas production-mechanism of methane gas formation. Factors affecting methane formation Utilization of Biogas.

Unit-IV (12 Hours)

Vermicomposting-Earthworm and its characteristics-internal anatomy-digestive, excretory, respiratory and reproductive systems. Preparatory methods of vermiculture. Economic and ecological importance of vermicompost and vermi wash.

Unit-V (12 Hours)

Mushroom culture - Characteristics of common edible mushrooms - Nutritive value of mushrooms. Culture techniques-preparation of spawn - Preparation compost-spawn running and harvesting. Preservation and storage. Recipes of mushroom.

Books for Study

1. Dubey, RC. 2009. A Text book of microbiology, S. Chand & Co. Ltd, New Delhi.

Books for Reference

1. NIIR Board. 2004. The Complete Technology Book on Biofertilizers and Organic Farming, National Institute of Industrial Research.
2. David, SV. and Kumaraswamy, T. 1998. Elements of Economic Entomology. Popular Book Depo, Chennai.

3. Mohoney, R. 1966. Lab Techniques in Zoology. Butterworth, UK.

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO63EG02	GENERIC ELECTIVE-2: SOLID WASTE MANAGEMENT									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	2	1	2	2	3	2	2	2	2.3	
CO-2	2	3	2	2	3	2	3	2	2	1	2.2	
CO-3	2	2	3	2	2	3	2	3	2	2	2.3	
CO-4	1	3	2	3	2	1	3	2	3	2	2.2	
CO-5	1	2	2	3	2	3	3	2	2	3	2.3	
Mean Overall Score											2.3	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO64SE04	SEC-4 (WS): HERBAL TECHNOLOGY	2	1

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	Obtain the knowledge about understanding of Preparation of Herbal based remedies using various types of medicinal plant raw materials.	K1
CO-2	Learn the current trade status and role of medicinal plants in socio economic growth.	K2
CO-3	Study and Investigate the disease curing ability medicinal plants in various ailments.	K3
CO-4	Evaluate and Analyze the market value of herbal based formulations and products in pharmaceutical industries.	K4
CO-5	Create new drug formulations using therapeutically valuable plant materials for the healthy life of society.	K5, K6

Unit-I

(6 Hours)

Herbal decoction preparation: *Andrographis paniculata*, *Tinospora cordifolia*, *Alpinia officinarum*, *Hygrophila auriculata* and *Adathoda vasica*.

Unit-II

(6 Hours)

Herbal powder preparation: *Withania somnifera*, *Cyanodon dactylon*, Anti diabetic FTN Sooranam, *Kaphasura kudineer* Sooranam.

Unit-III

(6 Hours)

Herbal massage oil preparation: *Pindathylam*, Herbal bath conditioner preparation: *Nalankumavu*, *Panchakarbam*. Preparation of Herbal Face pack.

Unit-IV

(6 Hours)

Herbal hair oil preparation: *Neelibirikathi*. Herbal cream preparation: *Mathanthylam*. Herbal health drinks preparation: *Mathulaimanabaku* (*Punica granatum* and *Hibiscus Rose Milk*).

Unit-V

(6 Hours)

Preparation of herbal tea, herbal soup, herbal sweet and herbal cosmetics. Preparation of Herbal Mosquito Repellent. Flowers Salad.

Semester	Course Code	Title of the Course									Hours	Credits
VI	21UBO64SE04	SEC-4 (WS): HERBAL TECHNOLOGY									2	1
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	2	3	1	3	3	3	1	2	2	2.3	
CO-2	3	2	3	3	3	1	2	3	3	2	2.5	
CO-3	3	3	3	2	3	2	3	3	2	3	2.7	
CO-4	3	1	3	2	3	2	3	1	2	2	2.2	
CO-5	2	3	2	2	3	1	2	2	3	3	2.3	
Mean Overall Score											2.40	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UBO63CE01	COMPREHENSIVE EXAMINATION	-	2

Unit-I:

Classification, structure and reproduction of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms, Plant diseases and defense mechanism. Ecology and Evolutionary trends. Binomial nomenclature, Numerical Taxonomy and Chemotaxonomy, Tissues, totipotency, properties of wood; Microsporogenesis, megasporogenesis, double fertilization and polyembryony.

Unit-II:

Cell Biology - Cell as a unit structure and function, Cell division: Mitosis and Meiosis Chromosomal behaviour and their cytological significance; Mendelian Genetics- linkage and crossing over, Chromosome mapping, Human genome project; Protein synthesis and gene expression, DNA replication; Polyploidy and mutations in crop improvement. Heterosis and Inbreeding Depression; theories of evolution and variations in speciation

Unit-III:

Photosynthesis: mechanism and importance, Nitrogen Metabolism. Physiology of seed dormancy and germination, Plant growth Regulator, Phytochrome and its role. Biopolymers- carbohydrates, proteins and lipids; Enzyme kinetics and Mode of enzyme action. Secondary metabolites- Alkaloids, phenolics and terpenoids. Bioenergetics, redox potential and coupled reaction, photobiology.

Unit-IV:

Whittaker's five kingdom concept, food spoilage and preservation, Role of microbes in waste water treatment, Biofertilizer, protoplast culture, Somatic hybrid and Cybrids. Synthetic seeds and their application, Vectors in gene cloning – Plasmids, Cosmids, Bacteriophages, fermentation as a biochemical process, Microbial Single Cell Protein (SCP) production, humoral and cellular immunity, Antibody types and immunological role.

Unit-V:

Sampling techniques, Central values (mean, mode, median), T-test, Chi square Test; Concept of Ecosystem, Method of studying plant communities, Vegetation types of India, Biotic interactions – Succession and its types, Biogeochemical cycles. Ethnobotany- scope and Tribes of Tamil Nadu, Conservation – in situ and ex situ conservation.

M. Sc. BOTANY

SYLLABUS - 2018

**SCHOOL OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)**



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

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

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS)

POSTGRADUATE COURSES

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

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

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

What is Credit system?

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

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

POSTGRADUATE COURSE PATTERN (June 2018 onwards)

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

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

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

Course Pattern

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

Core Courses

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

Inter-disciplinary Core

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

Core Elective

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

Extra Credit Courses

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

Inter-Departmental Courses (IDC)

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

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

Subject Code Fixation

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

Year of Revision	PG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
18	P##	x	x	xx
18	PBO	1	1	01

For Example :

IMSc - Botany, first semester 'Plant Diversity-I'

The code of the paper is **18PBO1101**.

Thus, the subject code is fixed for other subjects.

Specification of the Part

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

EXAMINATION

Continuous Internal Assessment (CIA):

PG - 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-Semster & End-Semester Tests

Centralised – Conducted by the office of Controller of Examinations

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

SEMESTER EXAMINATION

Testing with Objective and Descriptive questions

Part-A: Objective MCQs only (30 Marks)

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

Part-B & C: Descriptive (70 Marks)

Part-B: 5 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 marks

Part-B: 25 x 3 = 75 marks

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

GRADING SYSTEM

1. Grading

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

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

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

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

- The classification of final results shall be based on the CGPA, as indicated in the following Table-2.
- 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.
- 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
Below 50	NA	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
Below 5.00	RA	Re-appearance

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

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

Declaration of Result:

Mr./Ms. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) is _____ and the class secured _____ by completing the minimum of 110 credits.

The candidate has also acquired _____ (if any) extra credits offered by the parent department courses.

M. Sc. Botany
Course Pattern - 2018 Set

Sem.	Code	Course	Hr	Credit
I	18PBO1101	Plant Diversity-I (Thallophytes and Bryophytes)	6	5
	18PBO1102	Laboratory Course 1	4	3
	18PBO1103	Plant Diversity-II (Pteridophytes, Gymnosperms & Paleobotany)	6	5
	18PBO1104	Plant Anatomy, Embryology and Morphogenesis	6	5
	18PBO1105	Laboratory Course 2	4	3
	18PBO1201A	Core Elective – 1: Ecology & Phytogeography (OR)	4	4
	18PBO1201B	Core Elective – 1: Forestry and Wood Science		
	18PBO1401	Extra credit course 1: MOOC-I	-	(2)
Total for Semester I			30	25
II	18PBO2106	Plant Physiology	6	5
	18PBO2107	Laboratory Course 3	3	3
	18PBO2108	Biochemistry	5	4
	18PBO2109	Laboratory Course 4	3	3
	18PBO2110	Cell and Molecular Biology	5	5
	18PBO2111	Self-phased learning: Plant Breeding and Evolution	-	2
	18PBO2202A	Core Elective-2: Biophysics and Instrumentation (OR)	4	4
	18PBO2202B	Core Elective-2: Plant Pathology		
	18PSS2301	IDC-1: Soft Skills	4	4
Total for Semester II			30	30
III	18PBO3112	Plant Systematics	5	5
	18PBO3113	Laboratory Course 5	4	3
	18PBO3114	Genetics	3	3
	18SBS3101	Inter disciplinary core: Solid waste management	6	5
	18PBO3203A	Core Elective-3: Pharmacognosy (OR)	4	4
	18PBO3203B	Core Elective-3: Bioinformatics and Bionanotechnology		
	18PBO3301	IDC-2 (WS): Bioprocess Technology	4	4
	18PBO3302	IDC-3 (BS): Horticulture and Landscaping	4	4
	18PBO3402	Extra Credit course II: MOOC-II	-	(2)
Total for Semester III			30	28
IV	18PBO4115	Microbiology and Immunology	5	5
	18PBO4116	Genetic Engineering and Biotechnology	5	4
	18PBO4117	Laboratory Course 7	4	3
	18PBO4118	Research Methodology	4	4
	18PBO4119	Comprehensive Examination	--	2
	18PBO4120	Project Work	12	4
Total for Semester IV			30	22
I-III	18PBO4601	Outreach Programme (SHEPHERD)	-	5
Total for all Semesters			120	110+(4)

Programme Outcomes (POs):

1. Post graduate students are to be passionately engaged in initial learning with an aim to think differently as agents of new knowledge, Poststanding and applying new ideas in order to acquire employability/ self-employment.
2. Postgraduate students are trained to take up higher learning programmes.
3. Postgraduate students are made to be competent and socially responsible citizen of India.
4. Postgraduate students are to be exposed to technical, analytical and creative skills.
5. Postgraduate 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. Graduates will acquire knowledge on various groups of plants and study their utilization and conservation.
2. Graduates will learn about the internal organization of plants and their role in functioning of plant system.
3. Graduates understands the ecological principles and their importance for sustainable utilization.
4. Graduates learn various techniques of plant breeding to enable better crop production for human welfare.
5. Graduates will acquire basic knowledge on statistics and learn its application in biological studies.
6. Graduates will develop skills on bioprocess technology which enable the scientific production of bioactive compounds of economic value.
7. Graduates will acquire knowledge on the production of GMOs which play a significant role in field of agriculture and medicine.
8. Graduates will learn the principle and methodology of thesis writing and research publications.

Semester I
18PBO1101

Hours/Week: 6
Credits : 5

**PLANT DIVERSITY-I:
THALLOPHYTES AND BRYOPHYTES**

Course Outcomes:

1. To understand the major groups of cryptogamic plants and their characteristics.
2. To study their interrelationships and trace their evolutionary trends.
3. To know the classification, life cycle and economic importance of Algae.
4. To study the general features, classification and economic importance of Fungi.
5. To acquire basic knowledge on Lichens,
6. To understand Bryophytes and their salient features.
7. To understand the classification of Bryophytes.
8. To learn the economic importance of Bryophytes.

Unit-I: Algae

Introduction and history of phycology. Algology in India (Contributions of eminent Indian Algologists.), Criteria used in algal classification (Fritsch & De Silva) - Life cycles and mass culture of algae - General characteristics, thallus variations, reproduction, distribution and economic importance of major groups of algae. Cyanophyta: *Oscillatoria* and *Scytonema*.

Unit-II:

Chlorophyta: *Chlamydomonas*, *Volvox*, *Cladophora*, *Coleochaete*, *Ulva*, *Caulerpa*, *Oedogonium*, and *Spirogyra*. Phaeophyta: *Ectocarpus*, *Padina* and *Sargassum*. Rhodophyta: *Batrachospermum*, *Gracillaria* and *Polysiphonia*. Centric and Pinnate Diatoms.

Unit-III: Fungi

General features, occurrence and distribution; Classification of fungi (Ainsworth, 1973; Alexopoulos and Mims, 1983), General characters of major divisions - Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Ecology of fungi, Reproduction (vegetative, asexual and sexual), Spore dispersal mechanisms. Economic importance of fungi.

Unit-IV:

Heterothallism; heterokaryosis; parasexuality; sex hormones in fungi; degeneration of sex. Phylogeny and interrelationship of Myxomycetes,

Oomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes.

Lichens: Classification of Lichens (Hale, 1969). Occurrence and interrelationship of phycobionts and mycobionts, structure and reproduction in *Usnea*. Economic importance of lichens.

Unit-V: Bryophyta

Classification, general and reproductive characters of major classes - distribution of bryophytes - comparative study of gametophytes and sporophytes of major classes. Hepaticopsida: *Marchantia*, *Porella*, Anthocerotopsida: *Anthoceros*, *Notothylus*. Bryopsida: *Sphagnum* and *Polytrichum*. Economic importance of bryophytes.

Books:

1. Singh, Pande and Jain. 1998. A text book of Botany, Rastogi Publication, Meerut.
2. Venkataraman, *et al.*, 1974, Algae-Form & Function. Today and Tomorrow, Pub.Co.
3. Prem Puri, 1973. Bryophytes - a broad perspective. Atma Ram & Sons, New Delhi.

Reference:

1. Delevoryas, T., 1977, Plant Diversification. Holt, Rinehart & Winston, New York.
2. Chapman, V.J. & Chapman, D.J. The Algae. ELBS & MacMillan, London
3. Srivastava, H.N., 1999, Fungi. Pradeep Publications, Jalandhar
4. Hale, Jr. M.E., 1983, Biology of Lichens. Edward Arnold, Mayland.
5. Alexopoulos, C. J. and Mims, C. W. (1979). Introductory Mycology. Wiley Eastern Ltd., NY
6. Bessey, E. A. 1979. Morphology and Taxonomy of Fungi. Vikas Pub, New Delhi.
7. Bold, H. C. 1980. Morphology of Plants and Fungi. Harper and Row Publishing Inc., NY
8. Burnet, J. H. 1971. The Fundamentals of Mycology. ELBS Publications, London.
9. Mehrotra, R. S and Aneja, K. R. 1990. An Introduction of Mycology. Wiley Eastern, New Delhi.
10. Vashishta, B. R. and Sinha, A. K. (2007). Botany for Degree Students - Fungi. S. Chand, New Delhi.
11. Cavers F. 1911. The interrelationship of Bryophytes. New Phytologist.

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

Semester I	Code 18PBO1101	Title of the Paper PLANT DIVERSITY-I (Thallophytes and Bryophytes)										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		
CO1	4	5	5	5	4	4	4	5	3	3	5	4.27	
CO2	5	5	4	5	4	5	3	4	5	5	5	4.54	
CO3	5	5	4	4	5	5	4	4	5	5	5	4.63	
CO4	5	5	4	4	5	5	4	4	5	5	5	4.63	
CO5	4	4	5	5	5	5	4	5	5	3	5	4.54	
CO6	4	4	5	5	5	5	3	4	5	4	4	4.36	
CO7	4	5	5	5	4	4	4	5	3	5	5	4.54	
CO8	5	5	4	4	5	5	4	4	5	3	5	4.54	
Overall Mean Score for COs												4.42	

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Result: The Score for this Course is 4.4 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester I
18PBO1102

Hours/Week: 4
Credits : 3

Laboratory Course-1

PLANT DIVERSITY-I: (THALLOPHYTES AND BRYOPHYTES)

Course Outcomes:

1. To study the internal organization of thallophytes and Bryophytes.
2. To learn the range of thallus organization in various thallophytes and Bryophytes.

Algae

Ulva, Caulerpa, Padina, Sargassum, Batrachospermum, Gracilaria, Nostoc and Oscillatoria.

Fungi

Plasmodiophora, Rhizopus, Fusarium, Pilobolus, Xylaria, Aspergillus, Penicillium, Agaricus and Peziza.

Lichen

Usnea.

Bryophytes

Reboulia, Anthoceros, Pogonatum and Polytrichum

Field Trip and Report submission.

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Semester I
18PBO1103

Hours/Week: 6
Credits : 5

**PLANT DIVERSITY-II:
(PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY)**

Course Outcomes:

1. To understand the major groups of lower vascular plants and their characteristics.
2. To trace their interrelationships and study their evolutionary trends.
3. To study their classification and life cycle patterns of representative genera.
4. To study the classification, phylogeny and economic importance of Gymnosperms.
5. To study the morphology, anatomy and reproduction of representative genera.
6. To acquire knowledge on Geological periods, fossilization and types of fossils.
7. To understand some Pteridophyte fossil genera and their life cycle.
8. To acquire knowledge on gymnosperm fossils.

Unit-I:

Pteridophytes - General characters - Reimer's classification (1954), life cycle. Theories of origin of sporophyte. Telome concept. Sporangium development - eusporangiate and leptosporangiate type. Apogamy and Apospory. Detailed account on stelar and soral evolution in Pteridophytes. Heterospory and seed habit.

Unit-II: Diversity in Pteridophytes

Morphology, anatomy, reproduction and evolution of the gametophytes and sporophytes of the following genera *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Alsophila* and *Marsilea*.

Unit-III: Gymnosperms

General characters. Classification of gymnosperms (Sporne, 1965). Phylogeny and economic importance of gymnosperms. Comparative study of Cycadopsida, Coniferopsida, and Gnetopsida. Salient features of Pteridospermales, Bennettitales, Pentaxylales, Cycadales, Cordaitales, Coniferales and Gnetales.

Unit-IV:

A general account of distribution, morphology, anatomy, reproduction and life cycle of the following genera: Cycadopsida - *Cycas*, Coniferopsida - *Biota*, Gnetopsida - *Gnetum*.

Unit-V: Palaeobotany

Geological time scale, fossilization and types of fossil. Carbon dating. Detailed study of the fossil forms - Pteridophytes: *Rhynia*, *Lepidodendron* and *Calamites*. Gymnosperms: *Lyginopteris*, *Williamsonia*, *Cordaites*.

Books:

1. Vasista PC, Sinha AK and Anilkumar. 2005. Botany for degree students, Gymnosperms, S Chand, New Delhi.
2. Pandey BP. 1998. A Text Book of Botany Vol. II. S Chand, New Delhi.

Reference:

1. Pandey, S.N., S.P. Misra and P.S. Trivedi. 2002. A Textbook of Botany Volume II. Vikas Publishing House Pvt Ltd, New Delhi.
2. Rashid, A. 2007. An Introduction to Pteridophyta - Vikas publications, New Delhi.
3. Johri, R.M., Lata S., Tyagi K (2005), A text book of Gymnosperms, Dominant pub and Distributer, New Delhi.
4. Sporne, K.R. (1975). The Morphology of Pteridophytes, Hutchinson and Co., London.
5. Sporne, K.R. (1967). The morphology of gymnosperms, Hutchinson and Co., London.

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

Semester I	Code 18PBO1103	Title of the Paper PLANT DIVERSITY-II (Pteridophytes, Gymnosperms & Paleobotany)										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		
	CO1	5	4	5	4	4	4	4	5	3	3	5	4.1
	CO2	5	4	4	5	4	5	3	4	5	5	5	4.4
	CO3	5	4	5	5	5	5	4	4	5	5	5	4.7
	CO4	5	5	4	4	4	5	3	4	5	5	5	4.4
	CO5	4	3	5	3	5	5	4	3	4	3	5	4.0
	CO6	5	4	3	5	4	5	3	4	3	4	4	4.0
	CO7	5	4	5	4	4	4	4	5	3	3	5	4.1
	CO8	5	5	4	4	4	5	3	4	5	5	5	4.4
Overall Mean Score for COs												4.3	

Result: The Score for this Course is 4.3 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester I
18PBO1104

Hours/Week: 6
Credits : 5

PLANT ANATOMY, EMBRYOLOGY AND MORPHOGENESIS

Course Outcomes:

1. To understand various types of tissues present in plants
2. To acquire knowledge about the tissues of stem, root and leaves
3. To understand the primary and secondary structure of dicots and monocots with reference to root, stem and leaves
4. To acquire basic knowledge of the structure and development of male and female gametophytes in plants
5. To acquire knowledge on the structure and development of dicot and monocot embryos
6. To understand the Morphogenesis and its relation to morphology
7. To study various type of endosperms.
8. To understand polyembryony and its uses.

Unit-I:

General account and theories of organization of apical meristems of shoot apex and root apex, quiescent center. Structural diversity and phylogenetic trends of specialization of xylem and phloem. Cambium - origin - cellular structure, cell division, storied and non-storied types. Cambium in budding and grafting - wound healing role. Trichomes, periderm and lenticels.

Unit-II:

Anatomical characteristics and vascular differentiation in primary and secondary structure of root and stem in Dicot and Monocot. Origin of lateral roots - Root stem transition - Anatomy of Dicot and Monocot leaves. Leaf abscission, stomata types, nodal anatomy, petiole anatomy, vascularization of flower and seedling.

Unit-III:

Microsporangium - Microsporogenesis, Microspores - morphology - ultrastructure - Micro gametogenesis - Pollen - Stigma - Incompatibility - Methods to overcome incompatibility - Mega sporangium - Mega gametogenesis - Female gametophyte - Monosporic - Bisporic and Tetrasporic - Nutrition of embryo sac and fertilization.

Unit-IV:

Endosperm - Types - Endosperm haustoria - Cytology and physiology of endosperms, functions of endosperms - Embryo development in Dicot and

Monocot, Nutrition of embryo - Polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement programs and seed development.

Unit-V:

Definition - Morphogenesis and its relation to morphology - Turing's diffusion reaction theory - Morphogenetic factors - growth regulators - genetic and environment - polarity. Molecular basis of morphogenesis. Cellular level morphogenesis - Nuclear transplantation experiments with *Acetabularia* - Sachs's and Error's laws - Asymmetric divisions and their significance. Morphogenesis at tissue level - Differentiation, dedifferentiation and redifferentiation of vascular tissue in vitro and in vivo and in wounds. Plant galls and their importance in morphogenesis.

Text Book

1. Fahn, A. (1989). Plant Anatomy. Maxwell Pvt. Ltd., Singapore.
2. Bhojwani, S. S. and Bhatnagar, S. P. (1981). Embryology of Angiosperms. Vikas Publishing House Pvt. Ltd., New Delhi.
3. Murphy, T. M. and Thompson, W. F. (1988). Molecular Plant Development. Prentice Hall of India Pvt. Ltd., New Jersey.

Reference

1. Cutter, E. G. (1978). Plant Anatomy. Edward Arnold Publishers Ltd., London.
2. Easu, K. (1953). Plant Anatomy. John Wiley & Sons Inc., New York.
3. Pandey, B. P. (1989). Plant Anatomy. S. Chand and Co. Ltd., New Delhi.
4. Agarwal, S. B. (1990). Embryology of Angiosperms - a fundamental approach. Sahitya Bhawan, Agra.
5. Bard, J. (1990). Morphogenesis. Cambridge University Press, London.
6. Burgess, J. (1985). An Introduction to Plant Cell Development. Cambridge University Press, London.

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

Semester	Code	Title of the Paper										Hours	Credits
I	18PB01104	PLANT ANATOMY, EMBRYOLOGY AND MORPHOGENESIS										6	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		
CO1	5	4	5	4	4	5	4	5	3	3	5	4.27	
CO2	5	4	4	5	4	4	3	4	5	5	4	4.27	
CO3	5	4	5	5	3	5	4	5	4	5	5	4.54	
CO4	5	4	5	4	5	5	3	4	5	3	5	4.36	
CO5	4	3	4	3	5	5	4	3	4	3	3	3.72	
CO6	5	4	5	5	4	4	3	4	3	4	4	4.09	
CO7	5	4	5	4	4	5	4	5	3	3	5	4.20	
CO8	4	3	4	3	5	5	4	3	4	3	3	4.30	
Overall Mean Score for COs													4.21

Result: The Score for this Course is 4.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester I
18PBO1105

Hours/Week: 4
Credits : 3

Laboratory Course-2
PTERIDOPHYTES, GYMNOSPERMS,
PALAEOBOTANY, ANATOMY, EMBRYOLOGY AND
MORPHOGENESIS

Course Outcomes

1. To study the internal organization of Pteridophytes and Gymnosperms.
2. To understand the similarities and differences between Pteridophytes and Gymnosperms.

Pteridophytes

Psilotum, Lycopodium, Selaginella, Equisetum, Alsophila and Marsilea.

Gymnosperms

Cycas, Cupressus, Gnetum.

Palaeobotany

Rhynia, Lepidodendron, Calamites, Lyginopteris, Williamsonia, Cordaites.

Plant Anatomy and Embryology

- Study of cambium - non storied and storied.
- Study the anomalous primary and secondary features in *Aristolochia* and *Bignonia*.
- Micrometry of xylem elements.
- Study of leaf anatomy-structure, stomata, trichomes, types of stomata. Study of pollen morphotypes (Malvaceae and Asteraceae)
- Isolation of different stages of embryo and polyembryony in citrus, jamun (*Syzygium cumini*)
- Tests for pollen viability using stains and *in vitro* germination. Pollen germination using hanging drop technique.

Semester I
18PBO1201A

Hours/Week: 4
Credits : 4

Core Elective-1
ECOLOGY AND PHYTOGEOGRAPHY

Course Outcomes:

1. To understand the basic concepts of ecosystem and energy flow.
2. To acquire knowledge on population dynamics.
3. To understand the causes and consequences of climate change.
4. To study the principle and concepts of Phytogeography.
5. To acquire knowledge on biodiversity and their importance.
6. To learn the conservation strategies of biodiversity.

Unit-I:

Introduction to ecology: ecosystem structure; and dynamics - food chain and food webs, energy flow, mineral cycling (C, N & P). Plant succession - types. Characteristics of population, population size and exponential growth, limits of population growth, population dynamics, natality and mortality and age structure, population growth and population interactions.

Unit-II:

Greenhouse effect, global warming, global climatic changes and the consequences. Climate change conferences-role of UNFCCC and IPCC. Paris 2015 COP21: legality and respective capabilities, long-term goal, mitigation, carbon markets, transparency, compliance, adaptation. Carbon economy and carbon credits.

Unit-III:

Biodiversity: types-species, genetic, ecosystem and habitat. Importance of genetic diversity with reference to crops and farm animals. Preserving the crop genetic resources-germplasm collections and the Svalbard Global Seed Vault. Centres of origin of diversity-Vavilov's and FAO's.

Unit-IV:

Phytogeography: geographical history, continental drift, land bridges and shifting of poles. Phytogeography of the Western Ghats. Concepts of phytogeography: Endemism, hotspots and hottest hotspots, plant introductions and explorations, invasions and exotic species.

Unit-V:

Conservation: approaches-*in situ* and *ex situ* and their evaluation. Biodiversity, its importance, assessment, loss and conservation and World

organisation for conservation of biodiversity, biodiversity act (2002), Red List categories of IUCN, means and ways for conservation.

Book

1. Sharma P.D, (2009). Ecology and Environment, Rastogi Publications, Meerut.

Reference

1. Odum, E.P., (1970). Fundamentals of Ecology, 3rd edn, W.B. Saunders Ltd.,UK
2. Melchias Gabriel 2001 Biodiversity and Conservation, Science Publ., NHUSA
3. Krishnamurthy K.V. 2003. An advanced text book on Biodiversity Principle and Practice. Oxford and IBH Publishing Co. NewDelhi.

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

Semester I	Code 18PBO1201A	Title of the Paper Core Elective-I: ECOLOGY & PHYTOGEOGRAPHY										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		
CO1	4	4	5	4	3	5	5	5	3	3	5	4.18	
CO2	4	5	5	4	3	5	3	4	5	5	4	4.27	
CO3	3	5	5	5	5	5	5	5	5	5	3	4.63	
CO4	5	3	3	5	4	5	4	4	4	5	4	4.18	
CO5	5	5	4	4	3	5	4	4	4	3	3	4.00	
CO6	4	5	5	4	5	4	3	3	4	5	3	4.09	
Overall Mean Score for COs												4.22	

Result: The Score for this Course is 4.2 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester I
18PBO1201B

Hours/Week: 4
Credits : 4

Core Elective-1
FORESTRY AND WOOD SCIENCE

Course Outcomes:

1. To prepare students for careers in the forest services and wood processing industry.
2. To educate students to protect and conserve forests.
3. To acquire knowledge on forest resources and their utilization.
4. To understand the physical, chemical and mechanical properties of commercial wood.
5. To understand the raw materials needed for industries.
6. To acquire knowledge on wood substitution.

Unit-I:

World and Indian forest scenario; Forest types of India; Factors that influence forest and forest protection. Rare and endangered species. Conservation strategies; Exotics and its significance; Silviculture- principles and practices; Genetic Engineering and its application in forestry; Remote sensing and GIS in forestry.

Unit-II:

Forest Resources and utilization; Forest products; Forest laws and policies, people and Forest; Social and community forestry; Forest industries; Role of social forestry in cottage industry; Role of forestry in Indian economy. Biomass conversion strategies-energy plantations.

Unit-III:

Nature and properties of wood: physical, chemical, mechanical and anatomy of wood. Durability of wood. Wood seasoning and preservation; Defects and abnormalities of wood; types of commercial wood species of India.

Unit-IV:

Wood deterioration- fungi, insects and other agents; Wood protection- Practical methods for preserving and protection, Chemical processing of wood.

Unit-V:

Composite wood: adhesives-manufacture, properties and uses- manufacture and uses of plywood, fiber boards and particle boards. Present status of

composite wood, paper and rayon industries. Present position of supply of raw materials to industries and wood substitution.

Books

1. De Vere Burton L., 2000, Introduction to Forestry Science, Delmar publishers, NY
2. J.L. Bowyer, R. Shmulsky and J.G. 2007. Haygreen. Forest Products and Wood Science: An Introduction, Blackwell Publishing Professional.
3. Franz F. P. Kollmann, Wilfred A. Jr. Cote. 2012. Principles of Wood Science and Technology: I Solid Wood, Springer.

Reference

1. Negi, S.S., 1994, India's Forests, Forestry and Wildlife, Indus Publishing Co., New Delhi.
2. Jha, L.K., 1996. Forestry for rural development, APH Publishing Corporation, New Delhi.

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

Semester	Code	Title of the Paper										Hours	Credits
I	18PBO1201B	Core Elective-I: FORESTRY AND WOOD SCIENCE										4	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		
CO1	4	4	5	4	3	5	5	5	3	3	5	4.18	
CO2	4	5	5	4	3	5	3	4	5	5	4	4.27	
CO3	3	5	5	5	5	5	5	5	5	5	3	4.63	
CO4	5	3	3	5	4	5	4	4	4	5	4	4.18	
CO5	5	5	4	4	3	5	4	4	4	3	3	4.00	
CO6	4	5	5	4	5	4	3	3	4	5	3	4.09	
Overall Mean Score for COs													4.22

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Result: The Score for this Course is 4.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PBO2106Hours/Week: 6
Credits : 5

PLANT PHYSIOLOGY

Course Outcomes:

1. To understand plant's diverse physiological functions.
2. To study the recent aspects of various physiological processes in plants.
3. To understand the application of physiology in agriculture.
4. To know how plants function at molecular, cellular and whole plant level.
5. To develop knowledge and confidence to pursue advance courses and research.
6. To get career as a field botanist or teacher in academic institutions.
7. To understand nitrogen metabolism in plants.
8. To understand physiology of flowering.

Unit-I:

Water relations of plants: Water potential, osmotic potential, pressure potential and water transport process. Stomatal physiology, mechanism of transpiration and antitranspirants. Mineral nutrients and deficiency symptoms, mineral ion uptake. Various mechanism of solute transport.

Unit-II:

Photosynthesis: Light reaction general concepts. Role of chlorophylls and accessory pigments; antennae molecules and active center molecules; evidences for two photosystems; Mechanism of electron transport; proton transport and ATP synthesis. Carbon reactions: The C_3 cycle and its regulations; Photorespiration and its regulations; CO_2 concentrating mechanisms: algal and cyanobacterial pumps, C_4 cycle, Crassulacean Acid Metabolism. Synthesis of starch and sucrose.

Unit-III:

Respiration: Glycolysis, gluconeogenesis and their regulation. Oxidation of pyruvate and the Citric Acid cycle. Pasteur effect, anaplerotic reactions, amphibolic nature of the Citric Acid cycle. Respiratory chain complexes and oxidative phosphorylation, unique electron transport enzymes of plant mitochondria, alternate electron pathways in plants and their significance. The Glyoxylate cycle. Pentose phosphate pathway and its importance.

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Unit-IV:

Nitrogen in the environment; assimilation of nitrate and ammonium - GS-GOGAT; biological nitrogen fixation. Applications of auxins, gibberellins, cytokinins in agriculture and horticulture. Physiology of growth retardants - ethylene and abscisic acid. Biological rhythm - circadian rhythm, photoperiodism- phytochrome mediated processes.

Unit-V:

Physiology of flowering and fruit ripening. Dormancy of seeds - causes and methods of breaking dormancy. Physiology of seed germination. Ageing and senescence-types and physiological/biochemical changes. *Stress Physiology*: Response of plants to abiotic stresses; mechanism of tolerance to abiotic stress (drought and salinity).

Books:

1. Lincoln Taiz, Eduardo Zeiger, Ian Max Moller and Angus Murphy, 2015. Plant Physiology. Sixth Edition, Sinauer Associates.
2. Pandey, S.N. & Sinha, 2010, Plant Physiology, Vikas Publishing, New Delhi.

Reference:

1. Noggle, G.R. and Fritz, G.J. 2001, Introductory Plant Physiology, Prentice-Hall, India.
2. Devlin, R.M., 2000, Plant Physiology, Affiliated East West Press Pvt. Ltd.
3. Epstein, E., 2000, Mineral Nutrition in Plants-Principles and Perspectives, Wiley.
4. Frank B. Salisbury & Cleon W. Ross, 1992, Plant Physiology 4th Edition, Wadsworth Publishing Co., Belmont.

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

Semester II	Code 18PB02106	Title of the Paper PLANT PHYSIOLOGY										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		
CO1	5	4	3	4	5	5	3	5	4	3	5	4.18	
CO2	5	5	4	5	4	3	4	5	5	5	5	4.54	
CO3	5	5	4	5	4	4	3	5	3	5	4	4.27	
CO4	5	3	3	5	4	5	4	4	4	5	4	4.18	
CO5	5	5	4	4	3	5	4	4	4	3	3	4.00	
CO6	4	5	4	5	3	4	4	5	4	3	4	4.09	
CO7	5	4	3	4	5	5	3	5	4	3	5	4.18	
CO8	5	5	4	4	3	5	4	4	4	3	4	4.09	
Overall Mean Score for COs												4.21	

Result: The Score for this Course is 4.21 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PBO2107

Hours/Week: 3
Credits : 3

Laboratory Course-3 PLANT PHYSIOLOGY

Course Outcomes

1. To study the effect of various physical factors on photosynthesis.
2. To estimate the quantity and activity of various enzymes.

Experiments

1. Determination of water potential (Shardakov's method).
2. Determination of solute potential.
3. Hills reaction.
4. Estimation of total acidity in CAM plants.
5. Apparent photosynthesis.
6. Effect of CO₂ concentration on photosynthesis.
7. Effect of quality of light on photosynthesis.
8. Estimation of total free amino acids and proline.
9. *In vivo* assay of NR and NiR.
10. Estimation of IAA.
11. Estimation of starch by perchloric method.
12. Estimation of nitrogen (Nessler's method).
13. Determination of activity of peroxidase and lipase.

Semester II
18PBO2108

Hours/Week: 5
Credits : 4

BIOCHEMISTRY

Course Outcomes:

1. To fathom the chemical environment and the dynamics of the biological system.
2. To elucidate the interrelationships of the various pathways.
3. To learn the structure and functions of carbohydrates.
4. To acquire knowledge on lipids.
5. To study amino acids and their metabolism.
6. To study the structure and functions of proteins.

Unit-I:

Carbohydrates: Homoglycans: chemical structure and functions of starch, glycogen, cellulose, dextrin and inulin. Heteroglycan: chemical structure and functions of agar, alginic acid (sea weed polysaccharide), glycosaminoglycans and pectins. Glycocalyx oligosaccharide. Over view of metabolism of carbohydrate.

Unit-II:

Lipids and Biomembranes: Triglycerides, phosphoglycerols, derived lipids - steroids, prostaglandins and leukotrienes. Structure of membrane model, lipid bilayer. Structure of membrane proteins and membrane receptors: adrenalin receptors, acetylcholine receptors and insulin receptors. Over view of metabolism of lipids.

Unit-III:

Amino acids and peptides: Amino acids: general structure and classification. Glutathione: structure, metabolism and function. Biology of cyclosporin. Metabolism of phenylalanine and tyrosine; glycine, cysteine and methionine. Over view of metabolism of vitamins.

Unit-IV:

Proteins: The peptide bond and primary structure. Secondary structure, domain, motif and backbone folding. Tertiary structure and stabilizing forces in collagen. Quaternary structure of haemoglobin and its regulatory features. Protein sequencing strategies - chemical and enzymic. Ramachandran plot.

Unit-V:

Enzymes: Principles of catalysis, activation barrier and energy changes in reaction profile, initial velocity and principles of enzyme kinetics: Michaelis-Menten Equation, K_M and V_{Max} measurements - LB blot; active site organization; and role of cofactors/vitamins. Enzyme regulation: pH, temperature and substrate concentration. Inhibitions and regulation of glutamine synthetase.

Books:

1. Stryer Lubert, 2005, Biochemistry, W.H. Freeman & Co., NY.

Reference:

1. Apps *et al.*, 1992, Biochemistry, ELBS
2. Caret *et al.*, 1993, Inorganic, Organic and Biological Chemistry, WMC Brown, USA
3. Rawn, David, 1989, Biochemistry, Neil Patterson USA

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

Semester II	Code 18PB02108	Title of the Paper BIOCHEMISTRY										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		
CO1	5	3	4	4	4	4	4	4	4	4	4	4.0	
CO2	4	4	3	3	5	3	5	5	4	5	5	4.1	
CO3	5	3	4	4	4	5	3	4	3	4	4	3.9	
CO4	5	4	3	5	4	4	4	5	3	5	4	4.1	
CO5	5	5	4	4	3	5	4	4	4	3	3	4.0	
CO6	4	4	3	5	3	3	4	5	4	3	3	3.7	
Overall Mean Score for COs												4.0	

Result: The Score for this Course is 4.0 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PBO2109

Hours/Week: 3
Credits : 3

Laboratory Course-4 BIOCHEMISTRY

Course Outcomes

1. To understand the principle and the hereditary mechanisms.
2. To study the structure and functions of genetic materials.

Experiments

1. Estimation of glycogen / total polysaccharides
2. Estimation of hexosamine
3. Determination of total proteins (Bradford's / Lowry's)
4. Study of Enzyme Kinetics (experiments with acid phosphatase)
5. Effect of temperature on enzyme activity.
6. Effect of pH on enzyme activity.
7. Effect of [E] on enzyme activity.
8. Effect of [S] on enzyme activity; measurement of V_{max} and K_m .
9. Estimation of Ascorbic acid (Calorimetric / volumetric)
10. Estimation of Riboflavin
11. Estimation of Phenolics (Folin – Ciocalteu)
12. Estimation of Tannins (Folin-Denis / Vanillin hydrochloride)
13. Estimation of total lipids and cholesterol

Semester II
18PBO2110

Hours/Week: 5
Credits : 5

CELL AND MOLECULAR BIOLOGY

Course Outcomes:

1. To understand the structural organization and function of different cell organelles.
2. To study the cell cycle.
3. To understand the phenomenon of cell signaling
4. To acquire knowledge on genetic code
5. To study the mechanism of transcription in prokaryotes
6. To study the mechanism of translation in eukaryotes
7. To understand post-translation mechanism
8. To understand the principles of gene regulation.

Unit-I

Phases and control system of Cell cycle, Cell cycle checkpoints-DNA damage, centrosome duplication, spindle assembly. Cyclins and Cyclin-dependent kinases, apoptosis. Cytoskeleton structure and functions: actin filaments (microfilaments), microtubules, and intermediate filaments.

Unit-II

Cell communication: general principles. Signaling molecules and their receptors. Receptors: Cell surface receptors-ion-channel linked receptors, G-protein coupled receptors, and Tyrosine-kinase linked receptors (RTK). Programmed cell death.

Unit-III

Transcription: Genetic code, cracking the genetic code. Important features of the genetic code, proof for the triplet code, exceptions to the standard code. RNA polymerases and their role. Transcription signals-promoters and terminators. Detailed account of transcription in *E. coli* and differences in eukaryotes.

Unit-IV

Transcription in eukaryotes: transcription factors, initiation, elongation and termination. Post-transcriptional events: Split genes, splicing signals, splicing mechanisms. Alternative splicing, exon shuffling, cis&trans splicing. Organization of mRNA, RNA editing, mRNA export. Translation: features of mRNA-ORF and ribosomal binding site (RBS).

Unit-V

Stages in translation: Initiation (initiation factors in prokaryotes and eukaryotes, Kozak and Shine-Dalgarno sequences); Elongation (process of polypeptide synthesis, active centers in ribosome, elongation factors) and Termination (process of termination, release factors, ribosome recycling). Protein sorting and translocation: Post-translational modification of proteins. Protein folding-self assembly and role of chaperones. Principles of gene regulation: *lac* and *trp* operons of *E. coli*. Gene families and hormonal control in eukaryotes.

Books

1. Freifelder D. 1987, Molecular Biology. Jones and Bartlett, Boston, USA

Reference

1. Cooper GM 2000. The Cell-a molecular biology approach. 2nd e. Sinauer Associates.
2. Lodish *et al* 2004. Molecular Cell Biology, COH freeman & Co. New York.
3. De Robertis & De Robertis 1990. Cell and Molecular Biology, Saunders College, Philadelphia
4. Weaver RF & Hedrick PW 1989. Genetics. Wm, C. Brown Pub, Dubuque
5. Watson JD *et al*. 2004. Molecular biology of the gene, Pearson education, Singapore.
6. Gardner *et al*. 2004. Principles of genetics. John Wiley & Sons Inc. Singapore.

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

Semester II	Code 18PBO2110	Title of the Paper CELL AND MOLECULAR BIOLOGY										Hours 5	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		
CO1	5	5	4	5	5	5	3	3	3	3	4	4.09	
CO2	5	5	5	4	3	5	3	4	5	4	5	4.36	
CO3	5	3	4	4	4	5	3	4	3	4	4	3.90	
CO4	5	4	3	5	4	4	4	5	3	5	4	4.18	
CO5	5	4	5	5	4	3	4	5	5	4	5	4.45	
CO6	5	5	4	3	4	5	4	5	4	5	5	4.45	
CO7	5	5	4	5	5	5	3	3	3	3	4	4.09	
CO8	5	4	5	5	4	3	4	5	5	4	5	4.45	
Overall Mean Score for COs													4.24

Result: The Score for this Course is 4.24 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PBO2111

Hours/Week: -
Credits : 2

Self-paced Learning:
PLANT BREEDING AND EVOLUTION

Course Outcomes:

1. To study the progress made in the field of plant breeding.
2. To understand the principles, techniques and applications of plant breeding.
3. To understand the modes of reproduction in crops
4. To learn the hybridization techniques
5. To acquire knowledge on heterosis, mutation and polyploidy
6. To study the theories of evolution

Unit-I:

Plant Breeding: Historical aspect of plant breeding and genetic basis. Objectives of plant breeding-Modes of reproduction in relation to breeding methods, sexual, asexual and apomitic reproduction-Floral Biology in relation to selfing and crossing techniques. Breeding Methods: Plant introduction-Types and procedures-Centres of diversity and origin of cultivated plants.

Unit-II:

Hybridization: Objectives-Choice of parents-problems and causes of failure of hybridization-incompatibility and sterility. Methods of handling genetic consequence of hybridization-method of handling segregation material for isolation of superior strains-Bulk method and pedigree method of selection-Role of interspecific and intergeneric hybridization in plant improvement.

Unit-III:

In breeding depression and heterosis: Genetic basis and application in plant breeding. Steps in the production of single cross, double cross, three way cross and synthetics-induced polyploidy in plant breeding; role of auto and allopolyploidy-Heteroploids-Mutagen and crop improvement. Population genetics: Hardy-Weinberg principle; gene frequencies; and the factors that change it.

Unit-IV:

Back Crossing: Theory and procedure for transferring various types of character. Preservation and utilization of germplasm. Breeding of rice, sugarcane, groundnut and maize. Breeding for disease resistance and drought tolerance.

Unit-V:

Evolution: Origin of life, theories of evolution of life forms: Lamarkism, Darwinism and Speciation. Variations-Definition, causes and types, Mutations (Principles of Hugo de'Vries), Role of mutations in speciation. Evidences for evolution, adaptive radiation, biological evolution. Impact of evolution on human life.

Books:

1. Chaudhari, H.K., (1995) Revised Ed., Elementary Principles of Plant Breeding.

Reference:

1. Chandrasekaran & Parthasarathy, (1990). Cytogenetics and Plant Breeding.
2. Sinha, U. and Sinha, S. (1992). Cytogenetics, Plant Breeding and Evolution.
3. Sharma, J. R. (1996) Principles and Practice of Plant Breeding.

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

Semester II	Code 18PBO2111	Title of the Paper Self-phased Learning: PLANT BREEDING AND EVOLUTION										Hours -	Credits 2
Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	4	3	5	3	2	1	4	5	3	4	2	4	3
CO2	5	3	5	3	4	3	4	4	2	3	3	4	5
CO3	4	3	2	5	3	3	2	3	2	2	3	3	2
CO4	5	4	3	3	2	2	5	3	3	5	4	3	3
CO5	4	3	5	2	3	2	2	3	3	3	2	4	3
CO6	5	3	5	4	3	4	3	2	4	3	3	3	4
Overall Mean Score for COs													3.4

Result: The Score for this Course is 3.4 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PBO2202A

Hours/Week: 4
Credits : 4

Core Elective-2: BIOPHYSICS AND INSTRUMENTATION

Course Outcomes:

1. To understand the importance of Biophysics in modern biology.
2. To study the laws of thermodynamics.
3. To understand the concept of redox potential in biological system.
4. To study various types of microscopy and their applications.
5. To study various types of centrifugation.
6. To acquire knowledge on spectroscopy and tracer techniques.

UNIT I

Introduction to biophysics, its importance in modern biology. *Bioenergetics*: First and second law of thermodynamic, internal energy, enthalpy, entropy, concept of free energy, standard free energy change of a chemical reaction, ATP and high energy phosphate compounds.

UNIT II

Biophotonics: Redox potential, Oxidation and reduction, redox potential and its calculation by Nernst equation, examples of redox potential in biological system. Osmosis and osmotic pressure, the role of osmosis in cell volume regulation. The iso, hypo, and hypertonic solutions, their influence on the cell. Ionic diffusion. Active and passive bioelectric properties of membranes.

Unit III

Microscopy: Bright field microscopy-magnification, resolving power, contrast. Dark field microscopy, phase-contrast microscopy, fluorescent microscopy, electron microscopy (SEM and TEM).

Unit IV

Centrifugation: Principle, procedure and application. Types of centrifugation- density gradient centrifugation, ultracentrifugation and differential centrifugation. *Chromatography*: Principles, instrumentation, and applications of Paper, thin layer, column chromatography, gas chromatography, HPTLC and GC-MS.

Unit V

Spectrophotometry: principles and instrumentation of UV/Vis, Atomic absorption spectrophotometer (AAS), NMR, ESR. *Tracer*

techniques: Important stable radioisotopes and their uses in research. Radiation hazards and precautions in handling radioisotopes. Measurement of radioactivity-autoradiography, GM counter and scintillation counter.

Book

1. Pranab Kumar Banerjee (2008) Introduction to Biophysics, S. Chand, New Delhi.

Reference

1. Roy R.N. A text book of Biophysics. New Central Book Agency Pvt. Ltd, Calcutta.
2. Upadhyay, Upadhyay&Nath Biophysical Chemistry. Himalaya Publ. House, Bangalore.
3. Mohan Arora Biophysics. Himalaya Publishing House, Bangalore.
4. Budhiraja R.P. Separation chemistry. New age international (P) Ltd, New Delhi.

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

Semester II	Code 18PBO2202A	Title of the Paper Core Elective-2: BIOPHYSICS AND 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		
CO1	5	4	5	4	4	4	4	5	3	4	4	4.18	
CO2	4	4	4	5	3	3	4	4	5	5	5	4.18	
CO3	5	3	5	3	4	5	4	3	5	4	5	4.18	
CO4	4	5	4	5	4	4	4	4	3	5	4	4.18	
CO5	4	3	3	4	5	5	4	5	5	3	4	4.09	
CO6	5	4	5	5	5	4	4	4	5	4	5	4.54	
Overall Mean Score for COs												4.22	

Result: The Score for this Course is 4.22 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PBO2202B

Hours/Week: 4
Credits : 4

Core Elective-2:
PLANT PATHOLOGY

Course Outcomes:

1. To study the process of plant pathogenesis and disease establishment
2. To understand the basis of defence mechanism against pathogens
3. To acquire knowledge on the effect of infection on host physiology
4. To understand the various types of defence mechanism
5. To acquire knowledge on some common plant diseases
6. To learn the different types of disease control mechanism

Unit-I:

Introduction - scope, significance and terminology of plant pathology. Diseases- concepts, components and causes. Classification of diseases: necrosis, hypertrophy, hyperplasia and hypoplasia.

Unit-II:

Pathogenesis- pathogens and their mode of dissemination, pre-penetration, penetration and post penetration, entry through natural openings, wounds and intact plant surfaces, role of enzymes and toxins in disease development.

Unit-III:

Effect of infection on physiology of host viz. photosynthesis, respiration, carbohydrate metabolism, nitrogen metabolism, phenols, shikimic acid pathway, importance of phenol oxidation in plant diseases.

Unit-IV:

Defense mechanisms in plants, morphological and structural defense mechanisms, defense structures, existing before infection, biochemical defense mechanisms, pre-existing defense mechanisms. Phytoalexins, defense through induced synthesis of proteins and enzymes.

Unit-V:

Plant diseases: causal organisms, symptoms, disease cycle and control measures for the following diseases: rots, damping off, rusts, wilt, root rot, leaf spot and leaf blight (one example for each type). Control of plant diseases: biological, cultural and chemical methods, fungicidal, chemotherapy. Biotechnology in relation to Plant pathology. Agricultural terrorism.

Books:

1. Mehrotra R.S., 1994, Plant pathology, Tata Mc Grew publishing company Ltd.

Reference:

1. Rangasamy G. 1998. Diseases of crop plants in India. Prentice- Hall of India, New Delhi
2. Sharma P.D., 2001, Microbiology and plant physiology Rastogi publications.
3. Harsfall JG & Cowling E B. 1979. Plant Disease, an advanced Treatise. Academic Press, NY.
4. Mukherjee KG and Jayanti Bhasin, 1986. Plant diseases of India. Tata MacGraw-Hill publishing company Ltd. New Delhi.

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

Semester II	Code 18PBO2202B	Title of the Paper Core Elective-2: PLANT PATHOLOGY										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		
	CO1	5	4	5	4	4	4	4	5	3	4	4	4.18
CO2	4	4	4	5	3	3	4	4	5	5	5	4.18	
CO3	5	3	5	3	4	5	4	3	5	4	5	4.18	
CO4	4	5	4	5	4	4	4	4	3	5	4	4.18	
CO5	4	3	3	4	5	5	4	5	5	3	4	4.09	
CO6	5	4	5	5	5	4	4	4	5	4	5	4.54	
Overall Mean Score for COs												4.22	

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Result: The Score for this Course is 4.22 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
18PSS2301

Hours/Week: 4
Credits : 4

IDC: SOFT SKILLS

Course Outcomes:

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

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

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

Module III: Group Discussion: Group Discussion Basics, GD Topics for Practice, Points for GD Topics, Case-Based and Article based Group Discussions, Points for Case Studies, and Notes on Current Issues for GDS & Practicum with video coverage. **Team Building:** Team Vs Group – Synergy,

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Stages of Team Formation, Broken Square-Exercise, Win as much as you win- Exercise, Leadership – Styles, Work ethics.

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

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

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

Non-Verbal Reasoning: Series, Classification

Text Book

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

References

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

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

Semester III
18PBO3112

Hours/Week: 5
Credits : 5

PLANT SYSTEMATICS

Course Outcomes:

1. To understand the relevance of molecular techniques in plantsystematics.
2. To study the classical taxonomy with reference to differentparameters.
3. To contrast keys to classify plants
4. To understand the principles of phylogenetic systematics
5. To understand principles of biological classification and nomenclature
6. To recognize important families of angiosperms.
7. To understand various evidences in support of classification.
8. To understand salient features of selected families.

Unit-I:

Taxonomic History: Natural systems; Phyletic systems - APG;Phenetics; Cladistics. *Concepts of Taxonomic hierarchy:* Species, Genus, Family and other categories; species concept and infraspecific categories - subspecies, varieties and forms. *Botanical nomenclature:* History of ICN aims and principles; rule of priority, nomenclatural types, author citation, retention, rejection and changing of names, naming a new species, synonyms, effective and valid publication.

Unit-II:

Plant Identification: Taxonomic keys, written description, specimen comparison. *Taxonomic tools:* Herbaria and data information, Floras and Botanical gardens. *Systematic Evidence:* Morphology, anatomy, palynology, embryology, cytology, phytochemistry.

Unit-III:

Molecular systematics-plant genomes: nuclear, chloroplast and mitochondria. Molecular markers, generating molecular data, restriction site mapping, gene sequencing, analysis of molecular data, alignment of sequences, methods of phylogeny reconstruction.

Unit-IV:

Study of the following families (Bentham & Hooker) in detail with special reference to their salient features, interrelationships, evolutionary trends &

economic significance: Menispermaceae, Capparaceae, Caryophyllaceae, Meliaceae, Aizoaceae, Convolvulaceae.

Unit-V:

Scrophulariaceae, Acanthaceae, Verbenaceae, Loranthaceae, Hydrocharitaceae, Commelinaceae and Cyperaceae.

Books:

1. Davis, P.H. & Heywood, V.M 1963, Principles of Angiosperm Taxonomy, Oliver & Boyd.
2. Crawford, D.J. 2003. Plant Molecular Systematics. Cambridge University Press, Cambridge, UK.
3. Heywood, V.K & Moore, D.M., 1984, Current Concepts in Plant Taxonomy, AP, London.

Reference:

1. Burkill, I.H., 1965, Chapters of the history of Botany in India, Government of India Press, Nasik, The Manager of Publications.
2. Grant, W.F., 1984, Plant Biosystematics, Acad Press Inc., Canada.
3. Harborne, J.B. & Turner, B.L, 1984, Plant Chemosystematics, Acad. Press, London.
4. Hillis, D.M., Moritz, C & Mable, B.K (eds) 1996, Molecular Systematics, Sinauer Associates, Sunderland, USA
5. Jain, S.K., 1981, Glimpses of Indian Ethnobotany, Oxford & IBH Publ. Co., New Delhi.

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

Semester III	Code 18PBO3112	Title of the Paper PLANT SYSTEMATICS										Hours 5	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		
CO1	4	3	5	4	5	4	5	4	5	4	3	4.18	
CO2	5	3	3	5	5	4	4	5	4	3	5	4.18	
CO3	5	4	5	4	5	4	4	5	4	3	5	4.36	
CO4	4	5	4	4	4	5	4	3	3	5	4	4.09	
CO5	5	4	3	5	4	3	3	4	4	3	5	3.90	
CO6	5	5	4	4	5	4	4	5	4	4	5	4.45	
CO7	4	3	5	4	5	4	5	4	5	4	3	4.18	
CO8	5	4	3	5	4	3	3	4	4	3	5	3.90	
Overall Mean Score for COs												4.19	

Result: The Score for this Course is 4.19 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
18PBO3113

Hours/Week: 4
Credits : 3

Laboratory Course-5 PLANT SYSTEMATICS

Course Outcomes

1. To understand the relevance of molecular techniques in plant systematics.
2. To study the classical taxonomy with reference to different parameters

Exercises

- I. Binomial identification using flora.
- II. Study of the following families with reference to their South Indian representatives and minimum of one member each to be taxonomically described, dissected and sketched (to scale): Menispermaceae, Nymphaeaceae, Capparaceae, Caryophyllaceae, Meliaceae, Aizoaceae, Rubiaceae, Asteraceae, Convolvulaceae, Solanaceae, Scrophulariaceae, Acanthaceae, Verbenaceae, Lamiaceae, Loranaceae, Euphorbiaceae, Hydrocharitaceae, Commelinaceae, Araceae, Cyperaceae
- III. Exercises in key-making.
- IV. Exercises in the important Articles of the Code.
- V. Submission of 5 herbarium sheets and digital description of any 5 plant species.
- VI. Field Trip Report

Semester III
18PBO3114

Hours/Week: 3
Credits : 3

GENETICS

Course Outcomes:

1. To understand the principle and the hereditary mechanisms.
2. To study the structure and functions of genetic materials.
3. To acquire knowledge on linkage and crossing over
4. To understand the organization of prokaryotic and eukaryotic genomes
5. To understand the mechanism of DNA repair
6. To acquire knowledge on population genetics

Unit-I

Mendel and his work: Laws of inheritance. Back cross and Test cross. Gene interaction and Modified Mendelian ratios. Quantitative inheritance and multiple alleles. Problem solving in genetics.

Unit-II

Linkage and crossing over, 3-point cross and gene mapping methods. DNA is the genetic material: proof: Griffith's, Avery *et al.*, and Hershey and Chase.

Unit-III

Organization of eukaryotic and bacterial genomes. Watson and Crick model of DNA helix. Semi-conservative replication mechanism of DNA: replication of linear and circular DNA. Replication of RNA genomes.

Unit-IV

Molecular mechanisms of DNA repair (mismatch and proof reading, photoreactivation, excision, recombination and SOS repair). Mobile genetic elements- IS elements and transposons in maize and bacteria.

Unit-V

Population genetics: gene frequency, gene pool, Hardy-Weinberg equilibrium. Gene frequencies-conservation and changes. Decline of human gene pool and eugenics. Genomics: Arabidopsis genome and rice genome.

Book

1. Malacinski GM and Freifelder D 2008 Essentials of Molecular Biology, 4th E Jones & Bartlett.
2. Verma, P.S. & V.K. Agarwal, 2003, Genetics. S. Chand, New Delhi.

Reference

1. Gardner E J, Simmons M J, Snustad D P (1991). Principles of Genetics (III Edn).John Wiley and Sons Inc. 8th Edn., New York.
2. Snustad D P, Simmons M J (2000). Principles of Genetics (III Edn).John Wiley and Sons.
3. Strickberger (2005). Genetics (III Edn).Prentice Hall of India Pvt. Ltd.
4. William S Klug, Michael R Cummings (1994). Concepts of Genetics.Prentice Hall.
5. Robert J Brooker (2009). Genetics: Analysis and principles (III Edn). McGraw Hill.
6. Daniel L Hartl, Elizabeth W Jones (2009). Genetics: Analysis of Genes and Genomes (VII Edn). Jones and Bartlett publishers.
7. D Peter Snustad and Michael J Simmons (2010). Principles of Genetics. John Wiley & Sons

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

Semester III	Code 18PB03114	Title of the Paper GENETICS										Hours 3	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	3	5	4	5	4	5	4	5	4	5	4.36	
CO2	5	3	3	5	4	4	3	4	3	4	5	3.90	
CO3	4	4	4	4	3	3	4	5	5	3	4	3.90	
CO4	5	5	4	5	4	5	3	3	4	5	5	4.36	
CO5	5	4	3	5	4	3	3	4	4	3	5	3.90	
CO6	4	3	3	3	5	4	5	4	5	4	4	4.00	
Overall Mean Score for COs												4.07	

Result: The Score for this Course is 4.07 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**Inder Disciplinary Core:
SOLID WASTE MANAGEMENT**

Course Outcomes:

1. To understand the importance of solid waste management.
2. To study the methods of collection of wastes.
3. To acquire knowledge on decomposition of organic matter.
4. To know the methods of solid waste management.
5. To learn the technology of vermicomposting.
6. To learn the technique of Mushroom cultivation.
7. To understand the importance and medicinal values of mushroom.
8. To understand the preparation of recipes of mushroom

Unit-I

Definition-scope and importance of solid waste management-Types of solid wastes-garbage, rubbish, agricultural, hospital and domestic wastes. Collection-transport and processing of solid wastes.Waste as a resource-organic compost-process of composting-Role of microbes in composting. Significance of organic compost.

Unit-II

Organic matter decomposition- Decomposition of litter, cellulose, hemicelluloses, lignin, water soluble components and proteins. Carbon assimilation and immobilization. Microbes associated with organic matter decomposition. Factors affecting organic matter decomposition.

Unit-III

Solid waste management- methods of solid waste management- open dumping, land filling, incineration, pyrolysis Biogas production-mechanism of methane gas formation. Factors affecting methane formation Utilization of Biogas.

Unit-IV

Vermicomposting-Earthworm and its characteristics-internal anatomy-digestive, excretory, respiratory and reproductive systems. Preparatory methods of vermiculture. Economic and ecological importance of vermicompost and vermi wash.

Unit-V

Mushroom culture- classification-Tests for identification-Characteristics of common edible mushrooms-Nutritive value of mushrooms. Culture techniques-preparation of spawn- Preparation compost- spawn running and harvesting. Preservation and storage. Recipes of mushroom.

Text Book

1. Dubey, RC. (2009). A Text book of microbiology, S. Chand & Co. Ltd, New Delhi.

Reference

1. NIIR Board, 2004, The Complete Technology Book on Biofertilizers and Organic Farming, National Institute of Industrial Research.
2. Mohoney, R. Lab Techniques in Zoology, (UK: Butterworth, 1966)
3. Vasantaraj David, S. and Kumaraswamy, T. Elements of Economic Entomology, (Chennai: Popular Book Depo, 1998).

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

Semester III	Code 18SBS3101	Title of the Paper SOLID WASTE MANAGEMENT												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	4	5	4	3	3	4	5	3	4	4	4	4	4.0	
CO2	5	3	5	3	4	3	4	4	2	3	3	4	5	3.7	
CO3	4	3	3	5	3	3	4	3	4	4	3	3	4	3.5	
CO4	5	4	3	3	2	2	5	3	3	5	4	3	3	3.5	
CO5	4	3	5	3	3	3	3	3	3	3	3	4	3	3.3	
CO6	5	3	5	4	3	4	3	2	4	3	3	3	4	3.5	
CO7	4	3	5	2	2	5	3	5	3	4	5	4	2	3.7	
CO8	4	5	3	5	3	5	2	4	2	5	3	3	4	3.7	
Overall Mean Score for COs														3.5	

Result: The Score for this Course is 3.5 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
18PBO3203A

Hours/Week: 4
Credits : 4

Core Elective-3: PHARMACOGNOSY

Course Outcomes:

1. To study the different systems of Indian medicines and the bioactive principles
2. To know the pharmacological importance of medicinal plants
3. To study the classification of drugs
4. To acquire knowledge on collection and processing of herbal drugs
5. To know about some important medicinal plants with their binomial and uses
6. To acquire knowledge on phytochemicals and their applications

Unit I

Traditional and alternative system of medicine-Principle, practice, short history and merits of herbal medicine- naturopathy, Chinese medicine, folk medicine, Ayurveda, Siddha, Unani, Homeopathy, Aromatherapy and acupuncture. Global trend in herbal market. Status of Indian medicinal plant trade, medicinal plants prohibited from export, leading companies in India in trade of medicinal plants. WHO regulation of herbal medicine.

Unit II

Classification of crude drugs - alphabetical, taxonomical, morphological, chemical, pharmacological (therapeutic). Cultivation-sexual and asexual method of propagation, fertilizer and manure, pest and its control, collection, processing of herbal drugs-harvesting, drying, dressing, packing and storage. Conservation of medicinal plants.

Unit III

Medicinally useful plant parts-Root -*Hemidesmus indicus*, *Withaniasomnifera*, *Rauvolfiaserpentina*; Rhizome -*Zingiber officinalis*, *Acorus calamus*, *Curcuma longa*; Stem- *Tinosporacordifolia*, *Santalum album*, *Cinchona officinalis*; Bark - *Terminalia arjuna*, *Cinnamomum verum*, *Saraca asoca*; Leaf -*Adhatodavasica*, *Ocimum sanctum*, *Cynodondactylon*; Flowers -*Crocus sativus*, *Syzygium aromaticum*, *Leucas aspera*; Fruits - *Phyllanthus emblica*, *Piper longum*, *Terminalia chebula*; Seeds - *Azadirachta indica*, *Vernonia anthelmintica*, *Ricinus communis*.

Unit IV

Herbal preparation methods-bolus, capsules, compresses, creams, decoctions, extracts, infusions, herbal tea, ointments, massage oils, medicinal vinegar, poultice & plasters, powders, salves, syrups, tinctures, tonic, maceration and baths and bathing remedies and dry extract (pills or capsules).

Unit V

Pharmaceutical plant products- alkaloids, glycosides, terpenoids, tannins, flavonoids, lipids, proteins. Nutraceuticals, cosmeceuticals, pharmaceuticals- fibre, sutures, surgical dressings, adaptogens, rasayana. Drug adulteration and methods of evaluation-physical, chemical and microscopic.

Books

1. Evans, 2009. Pharmacognosy, Elsevier Publications, Edinburgh.
2. James Green, 2000 Herbal Medicine-Maker's Handbook, Crossing Press, U.S.
3. Weiss, Rudolf Fritz 2000 Herbal Medicine, 2nd Edition Thieme Medical Publishers
4. Kokate CK, Purohit AP and Gokhale, 2006. Pharmacognosy, Nirali Prakashan.
5. Somasundara, S 1997. *Maruththuva Thavaraiyal*, Ilangoan Padhippagam, Palayamkottai

Online Resources

<http://www.gallowglass.org/jadwiga/herbs/preparations.html>
<http://shawnacohen.tripod.com/thetribaltraditions/id51.html>
<http://www.vasundharaorissa.org/Research%20Reports/Globalisation And MedicinalplantsOfOrissa.pdf>
http://www.emea.europa.eu/docs/en_GB/document_library/Scientific_guideline/2009/09/WC500003393.pdf

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

Semester III	Code 18PBO3203A	Title of the Paper Core Elective-3: PHARMACOGNOSY										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		
CO1	5	4	5	4	4	4	4	5	3	4	4	4.18	
CO2	4	4	4	5	3	3	4	4	5	5	5	4.18	
CO3	5	3	5	3	4	5	4	3	5	4	5	4.18	
CO4	4	5	4	5	4	4	4	4	3	5	4	4.18	
CO5	4	3	3	4	5	5	4	5	5	3	4	4.09	
CO6	5	4	5	5	5	4	4	4	5	4	5	4.54	
Overall Mean Score for COs												4.22	

Result: The Score for this Course is 4.22 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Core Elective-3:
BIOINFORMATICS AND BIONANOTECHNOLOGY

Course Outcomes:

1. To know importance of Bioinformatics in Biology
2. To know the various data bases available
3. To understand the basic concepts of Nanotechnology
4. To acquire knowledge on synthesis of green nano-particles
5. To study the characteristics of nanoparticles
6. To understand the interaction of nanoparticles with living system.

Unit-I

Overview of Bioinformatics-Need for Bioinformatics technology-Data format and processing-secondary resources and applications-Role of structural bioinformatics-Biological data integration system. Bioinformatics and its applications.

Unit-II

Bioinformatics data bases-Genomic data bases-NCBI, EMBL,DDBJ and Gen-Bank. Proteomic data bases-Swiss-Prot, Uni-Prot, ExPASy and PDB. RNA data bases-Rfam and GtRNA. Phylogenetic analysis-Construction of Phylogenetic tree with reference to DNA and Protein sequences.Biological importance of computerized Phylogenetic analysis.

Unit-III

Nanotechnology - origin, scope and importance. Nanoparticles-definition. Principles: quantization effects - inverse relationship between size and reactive surface area. Properties: surface effects, the effects of size, shape and surface area. Advances made with plant nanobionics-bomb detection, glowing plants, augmented photosynthesis, *etc.* Essentials of nanostructure generation: top-down vs. bottom-up. Physical, chemical and biogenic synthesis of nanomaterials-biomimetics, green plants and microorganisms. Role of biomolecules - reducing and/or capping agents: proteins, viruses and carbohydrates.

Unit-IV

Detection and measurement of nanoparticles-physical characterization by UV, FTIR, SEM, FESEM, DLS, X-ray diffraction and Zeta potential.Targeted

nanoparticles: active & passive targeting. Application: medicine, manufacturing & materials, delivery vehicles, cancer therapy, tissue engineering, fluorescent biological labels, biological assays, imaging agents, biosensors, manipulation of cells and biomolecules.

Unit-V

Interactions between nanoparticles and living systems, interaction with cells, exposure of living systems to nanomaterials - toxicity effects.Mediators of the toxicity of particles. Factors influencing the interaction of nanomaterials over mammalian cells: uptake, transport and biodistribution of nanoparticles in living system, toxicity on cellular processes. Overview of EU regulatory aspects.

Book

1. Sharon, M. & Sharon, M 2012. Bio-Nanotechnology- Concepts and Applications, CRC Press.
2. Atkinson WI.2011. *Nanotechnology*.Jaico Book House, New Delhi.

References

1. Barbara Panessa-Warren, 2006 Understanding cell- nanoparticle interactions making nanoparticles more biocompatible. Brookhaven National Laboratory
2. European Commission, SCENIHR, 2006. Potential risks associated with engineered and adventitious products of nanotechnologies, European Union
3. Gysell Mortimer, 2011. The interaction of synthetic nanoparticles with biological systems PhD Thesis, School of Biomedical Sciences, Univ. of Queensland.
4. Jain K.K. Nanobiotechnology molecular diagnostics: Current techniques and application (Horizon Bioscience) 2006 Taylor & Francis 1st edition.
5. Volker Mailänder and Katharina Landfester 2009 Interaction of nanoparticles with cells biomacromolecules, 10 (9): 2379-2400 DOI: 10.1021/bm900266r

Online Resources

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/>
2. <https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html>
3. <http://www.particle-works.com/applications/controlled-drug-release/Applications>

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

Semester III	Code 18PBO3203B	Title of the Paper Core Elective-3: BIOINFORMATICS AND BIONANOTECHNOLOGY											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			
CO1	5	4	5	4	4	4	4	5	3	4	4	4.18		
CO2	4	4	4	5	3	3	4	4	5	5	5	4.18		
CO3	5	3	5	3	4	5	4	3	5	4	5	4.18		
CO4	4	5	4	5	4	4	4	4	3	5	4	4.18		
CO5	4	3	3	4	5	5	4	5	5	3	4	4.09		
CO6	5	4	5	5	5	4	4	4	5	4	5	4.54		
Overall Mean Score for COs												4.22		

Result: The Score for this Course is 4.22 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
18PBO3301

Hours/Week: 4
Credits : 4

IDC-2 (WS): BIOPROCESS TECHNOLOGY

Course Outcomes:

1. To introduce the principle, importance and components of a fermenter.
2. To study the basic concepts of unit operations and unit processes.
3. To understand the chemical engineering and its relation to other disciplines.
4. Ability to list chemical Monitoring process, units, and the corresponding equipment.
5. To study the production strategies of commercial products.
6. To understand the separation techniques, types and various effluent treatment process.

Unit-I:

Principles of fermentation process, Bioprocess vs Chemical process, Media formulation-Growth factors, Buffers, O₂, Antifoams and Media Optimization. Cell growth and quantitation-density, cell mass, growth pattern, yield factors and environmental conditions. Batch, Continuous and Fed batch culture.

Unit-II:

Bioreactor design, parts and functions, sterilization, impellers, baffles and sparger. Types of reactor-submerged reactor, mechanically stirred draught-tube reactor, continuous flow stir type reactor, airlift reactor, jet loop reactor, surface reactor and packed bed reactor.

Unit-III:

Bioprocess control and monitoring variables: O₂ requirement and uptake-factors affecting KLa-aeration, agitation, pressure and pH, medium rheology. Computers in bioprocess. Flow measurement and control, control system-manual and automatic PID control.

Unit-IV:

Bioconversion and biocatalysts: Immobilization of cells and enzymes-methods and advantages. Selection of industrially important microorganisms. Strain improvement preservation and properties of industrial strains. Production strategies for insulin, lactic acid and vinegar.

Unit-V:

Downstream processing: recovery of microbial cells and products- Precipitation. Filtration and Centrifugation. Cell disruption-physical and chemical methods. Chromatography. Membrane processes, drying and crystallization.

Books

1. Stanbury, P F & Whitaker, A, 1995, Principles of Fermentation Technology, Pergamon.

References

1. Schuler ML & Fikret Kargi, 2002, Bioprocess Engg: Basic Concepts, Prentice Hall, NJ.
2. WulfCrueger & AnnelieseCruger, 2004, Biotechnology: A Textbook of Industrial Microbiology, 2nd Edn., Panima Publishing Co.
3. E.MT. El-Mansi & C F A Bryce, 2002, Fermentation Microbiology and Biotechnology, Taylor & Francis Co., USA.
4. Bailey & Ollis, 1986, Biochemical Engg Fundamentals, McGraw Hill, New York.
5. Coulson, J M & Richardson, S F, 1984, Chemical Engg, Pergamon Press.
6. Mooyoung (ed.), 1985, Comprehensive Biotechnology, Vol. I, II, III & IV, Pergamon Press.

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

Semester III	Code 18PB03301	Title of the Paper IDC-2 (WS): BIOPROCESS TECHNOLOGY											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			
CO1	4	5	5	4	5	5	5	4	4	3	5	4.45		
CO2	5	3	3	5	4	4	4	3	5	3	5	4.00		
CO3	4	4	4	4	3	4	4	5	4	3	5	4.00		
CO4	4	5	4	5	4	5	5	4	5	5	5	4.63		
CO5	5	5	5	5	4	4	4	4	4	3	5	4.36		
CO6	4	4	4	4	5	4	5	5	5	3	5	4.36		
Overall Mean Score for COs												4.30		

Result: The Score for this Course is 4.3 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
18PBO3302

Hours/Week: 4
Credits : 4

**IDC-3 (BS):
HORTICULTURE AND LANDSCAPING**

Course Outcomes:

1. To understand the importance and divisions of horticulture
2. To learn the various methods of plant propagation
3. To know the art of indoor gardening
4. To acquire knowledge on floriculture
5. To study the types and components of gardens
6. To acquire knowledge on landscaping

Unit-I:

Importance and scope of horticulture; divisions of horticulture; climate, soil and nutritional needs. Water irrigation; plant propagation methods-Cutting, Grafting, Budding and Layering. Role of Tissue Culture in Horticulture plants.

Unit-II:

Indoor gardening-foliage, flowering plants and hanging basket. Bonsai plants-training and pruning. Floriculture –cultivation of commercial flower crops; rose, jasmine and chrysanthemum. Flower decoration-dry and wet. Role of Orchids in Cut flower industries.

Unit-III:

Fruit crops-induction of flowering, flower thinning, fruit setting, fruit development. Cultivation of important fruit crops-Mango and Guava. Field visit: Horticulture Department or Garden.

Unit-IV:

Landscaping principles-planning designs for house gardens, institutional and industrial gardens-bioaesthetic, avenue planting, railway planting-trees, shrubs, climbers, herbs and ground covers suited for different situations their culture, training and pruning-tree transplantation.

Unit-V:

Lawns: different grasses, maintenance of lawns and turf in play grounds, gardens and golf courses; special types of gardens: traffic islands, vertical garden, roof/terrace garden, bog garden, water garden, planning parks and public garden.

Books:

1. Arora JS. 1992. Introductory Ornamental Horticulture, Kalyani Publishers, New Delhi.
2. George Acquaah. 2002. Horticulture Principles and Practices, 2nd Edn. Pearson Edn, Delhi.

References:

1. Manibushan Rao K. 1991. Text book of horticulture. MacMillan Publishing Co., New York.
2. Edmond JB *et al.*, 1977. Fundamentals of horticulture. Tata McGraw Hill Ltd., New Delhi.
3. Rao KM. 2000. Text Book of Horticulture, MacMillan India Ltd., New Delhi.
4. Gopalswamy Iyyengar, 1970. Complete gardening in India, Kalyan Printers, Bangalore..

Semester IV
18PBO4115

Hours/Week: 5
Credits : 4

MICROBIOLOGY AND IMMUNOLOGY

Course Outcomes:

1. To study the microorganisms and their activities.
2. To study the structure and organization of bacteria and viruses.
3. To understand the application of microbes in food and dairy microbiology.
4. To exploit their potentialities in agriculture, industry and therapeutic aspects.
5. To study the production and applications of antibiotics.
6. To understand the role of soil microbes in biogeochemical cycles.
7. To understand the basic concepts of the immune system.
8. To acquire knowledge on types and properties of antigens and antibodies.

Unit-I:

General microbiology; scope, branches and history. Structure and organization of Bacteria, Actinomycetes. Brief study on Spirochetes, Rickettsias, Chlamydias and Mycoplasmas, Viruses – Structure, organization, Classification and replication. Brief account on Viroids, virusoids and prions. Culture of microorganisms, synchronous, batch and continuous culture. Chemostat and turbidostat, preservation of microbes.

Unit-II:

Food, dairy and environmental microbiology. Microbial contamination of food; food poisoning, food-borne infections and food preservation. Microbial contamination of milk, milk-borne diseases - preservation of milk and dairy products. Aquatic microbiology - fresh water and marine microbes. Treatment and disposal of contaminated waters and sewage. Soil microbes and their role in biogeochemical cycling.

Unit-III:

Industrial microbiology: selection of industrially useful microbes, fermentation processes, recovery of end products; production of alcohol, insulin, lactic acid, vinegar, hydrocarbons, single cell oil and single cell protein. Common immunizations, antibiotics and other chemotherapeutic agents and their mode of action. Drug resistance in microbes.

Unit-IV:

Immunology-Immune system: structure and functions of primary and secondary lymphoid organs - immune cells - haematopoiesis - detailed study of T and B cells, MHC molecules and antigen processing and presentation. General structure of antibodies - classes - Generation of antibody diversity. Monoclonal antibodies.

Unit-V:

Antigens-types, antigenicity and immunogenicity. Antigen-antibody interaction. Types of immunity - innate and adaptive - emphasis on cell mediated and humoral immune responses. Immune response during bacterial (Tuberculosis) parasitic (malaria) and viral (HIV) infections. Autoimmune disorders. Vaccines - Immunization schedule.

Books:

1. Prescott *et al.*, 2009 7e, Microbiology. Wm. C. Brown Publishers.
2. Kuby J, 2000, Immunology, 4th edition, W H Freeman

Reference:

1. Pelczarek *et al.* 1998, Microbiology - Concepts & Applications. Tata McGraw Hill New Delhi.
2. Adams MR and Moss MO, 2008, Food Microbiology. Royal Soc. Chem., Cambridge, UK.
3. Dickinson M. 2003. Molecular Plant Pathology. BIOS Scientific Publishers, London.
4. Janeway and Travers, Immunobiology, 3rd edition Garland Pub. Inc. NY.
5. Nandini Shetty 1996, Immunology - An introductory Text Book, New Age Intl (P) Ltd.
6. Roitt *et al.*, 1998, Immunology 5th edition, Mosby International Ltd. London. UK.

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

Semester IV	Code 18PBO4115	Title of the Paper MICROBIOLOGY AND IMMUNOLOGY										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		
CO1	4	5	3	5	5	5	5	5	5	4	5	4.63	
CO2	5	5	4	3	4	3	5	4	5	5	5	4.36	
CO3	4	4	4	4	3	4	4	5	4	4	5	4.09	
CO4	4	5	4	5	4	5	5	4	5	5	5	4.63	
CO5	5	5	5	5	4	4	4	4	4	3	5	4.36	
CO6	4	4	4	4	5	4	5	5	5	3	4	4.27	
CO7	5	5	5	5	4	4	4	4	4	3	5	4.36	
CO8	4	4	4	4	5	4	5	5	5	3	4	4.27	
Overall Mean Score for COs												4.37	

Result: The Score for this Course is 4.37 (High Relationship)

Note:

Mapping 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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
18PBO4116

Hours/Week: 5
Credits : 4

GENETIC ENGINEERING AND BIOTECHNOLOGY

Course Outcomes:

1. To understand the role of enzymes in genetic engineering
2. To acquire knowledge in various cloning vectors
3. To understand the role of engineered vectors in bioremediation
4. To acquire knowledge on GM foods and their impact
5. To know the art of recombining genes and traits.
6. Understanding the revolutions that unfold in biotechnology

Unit-I:

Crown gall and *Agrobacterium*; generation of bacterial genes (restriction enzymes) and eukaryotic (cDNA). Joining DNA molecules and the strategies - *E. coli* and T₄ DNA ligases, linkers and homopolymers.

Unit-II:

Cloning vectors: ideal cloning vehicles: Natural vectors (*E. coli* and *Agrobacterium* based), *in vitro* vectors (pBR), ssrDNA vectors (M13) and shuttle vectors. Expression of cloned genes - problems and solution. Cloning strategies - cDNA libraries and genomic libraries.

Unit-III:

Metagenomics. Engineered microbes - bioremediation of oil spills: oil-eating super bugs (*B. megatarium*, *P. putida*, & *A. borkumensis*); Bt crops, golden rice technology, plantibodies and edible vaccines. Strategies for crop improvement: engineering for resistance against herbicides and diseases. Antisense RNA technology. CRISPR

Unit-IV:

Technology protection systems (GURT) - the terminator. Biosafety aspects of GMOs and GM foods. Principles of biosafety; potential risks; environmental impacts; safety of food and animal feed derived from GM crops; and patterns of gene flow. Issues concerning release of Bt brinjal. Essentials of IPRs and patents.

Unit-V:

Synthetic biology - scope and importance. Artificial DNA and synthetic genome. Contribution of JC Venter. Minimal genome, expanded gene pool.

Creation of synthetic organisms: top-down and bottom-up approaches. Potentials and applications; ethical issues of synthetic organisms.

Books:

1. Old RN and Primrose S B. 2004, Principles of Gene Manipulation - Blackwell Sci.,USA.
2. Watson JD *et al.*, 2005. Recombinant DNA. Blackwell Science Publ.USA.

Reference:

1. Adrian Slater *et. al.*, 2003, Plant Biotechnology, Oxford University Press, U.K.
2. Glick BJ & Pasternack JJ. 2004. Molecular Biotechnology. Panima Publ. Bangalore.
3. European Commission Report of a NEST High-Level Expert Group, 2005. Synthetic Biology: Applying Engineering to Biology.
4. Presidential Commission for the Study of Bioethical Issues, 2010. (www.bioethics.gov)
5. ETC Group, Canada, 2010. Extreme Genetic Engg - an introduction to synthetic biology.
6. Young, E and Alper, H, 2010. Synthetic Biology: A Review. *Journal of Biomedicine and Biotechnology*.
7. Benner SA. & Sismour AM, 2005. Synthetic Biology, *Nature Reviews, Genetics*, 6:533

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

Semester IV	Code 18PB04116	Title of the Paper GENETICS ENGINEERING AND BIOTECHNOLOGY										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		
CO1	5	4	4	4	3	4	4	5	4	5	5	4.27	
CO2	5	5	5	5	5	5	5	5	4	5	5	4.90	
CO3	5	5	5	5	5	5	5	5	5	5	5	5.00	
CO4	5	5	4	5	4	5	5	5	5	5	5	4.81	
CO5	5	5	5	5	4	4	5	5	5	5	5	4.81	
CO6	4	4	5	5	5	4	5	5	5	5	4	4.63	
Overall Mean Score for COs												4.74	

Result: The Score for this Course is 4.74 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
18PBO4117

Hours/Week: 4
Credits : 3

Laboratory Course-7
MICROBIOLOGY, IMMUNOLOGY,
GENETIC ENGINEERING AND BIOTECHNOLOGY

Course Outcomes:

1. To learn various techniques of isolation and enumeration of microorganisms from various sources.
2. To understand the immunological techniques.
3. To learn the technique of isolation of DNA.
4. To develop protocols for plant tissue culture and synthetic seed production.

Experiments

1. Isolation and enumeration (CFU) of microorganisms in soil by serial dilution.
2. Bacterial staining - Simple, Gram's staining.
3. Isolation of bacteria from skin, mouth and urine.
4. Potability test of water - presumptive, confirmative and completed tests.
5. Quantitative estimation of bacteria in milk.
6. Testing quality of milk by methylene blue reductase (MBRT) and phosphatase test.
7. Morphological and biochemical identification of bacteria - indole test, methyl red test, Voges-Proskauer test, Citrate utilization test, TSI agar test.
8. Blood grouping
9. WIDAL- test for typhoid
10. RPR- test for syphilis
11. RF- test for rheumatoid arthritis
12. Immunoelectrophoresis
13. ELISA-Demo
14. Identification of local crop diseases (sugar cane, paddy, banana, brinjal and citrus).
15. Callus induction and regeneration.
16. Clonal propagation.
17. Embryo culture
18. Electrophoretic separation of DNA, protein and restriction digestion.
19. Preparation of synthetic seeds.

Semester IV
18PBO4118

Hours/Week: 4
Credits : 4

RESEARCH METHODOLOGY

Course Outcomes:

1. To identify the influencing factors of research parameters
2. To understand the types and objectives of research.
3. To acquire knowledge on sampling techniques.
4. To acquire knowledge on Literature collection and thesis writing.
5. To test the significance, validity and reliability of the research
6. To acquire knowledge on basic concepts in Biostatistics.

Unit-I:

Research - types, objectives and approaches. Census method, Sample - types; Sampling techniques. Hypothesis: definition, characteristics, types, significance. Methods of collecting data: primary and Secondary- merits and demerits, Code of research ethics.

Unit-II:

Literature collection: Books, Research articles and e-resources. Structure of thesis & research article. Manuscript for publication and proof correction. Structure and components of research proposal, National and International funding sources.

Unit-III:

Bibliometrics: definition and relevance; Bibliometrics databases, h-index, SNIP, Page Rank, Impact Factor and evaluation. The use of bibliometrics in research: Citation Research, Science Citation Index. The Institute for Scientific Information (ISI), Thomson Reuter's Webmetric and ORCID. Plagiarism, Tailored Research and Retraction. Indian Patent Act.

Unit-IV:

Biostatistics: Introduction, Classification of data; Frequency Distribution: Discrete, Continuous and Cumulative Frequency Distributions-Tabulation of data- Diagrammatic and graphic representation of data; Histogram, Frequency polygon, Frequency curve, Ogive curve, Bar Charts: Simple, Multiple, Subdivided, Pie diagram.- Measures of Central values: Mean, Median and Mode- Measures of Dispersions, : Range, Mean Deviation, Standard Deviation.

Unit-V:

Skewness and Kurtosis. Probability: binomial, poisson and normal distributions. Correlation: types, methods, Regression analysis, Large sample (Z), small sample testing: t-test, chi-square and F test. ANOVA - one and two way, Duncan Multiple Range Test. Principles of experimental design - randomization, replication, local control, size and shape of the plot, CRD, RBD.

Books

1. Kothari, C. R. 2000. Research Methodology-Methods & Techniques. Wishwa Prakashan
2. Misra, R.P, 2000. Research Methodology - A Handbook, Concept Pub. Company, New Delhi.
3. Gupta, S.P., 1990. Statistical Methods, Sultan Chand & Sons, New Delhi.
4. Pillai and Bagavathi, 2008 Statistics, S.Chand & Company Ltd, New Delhi
5. Nageswara Rao, G. 1983. Statistics for Agricultural Science Oxford & IBH, New Delhi
6. Gupta, S.C, 2013. Fundamentals of statistics, Himalaya Publishers, Mumbai.

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

Semester IV	Code 18PBO4118	Title of the Paper RESEARCH METHODOLOGY										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		
CO1	4	4	4	5	4	4	4	3	4	5	4	4.09	
CO2	4	4	5	4	4	4	4	4	4	5	5	4.27	
CO3	4	5	5	4	4	5	4	5	4	4	5	4.45	
CO4	5	5	3	5	5	4	5	4	4	4	5	4.45	
CO5	4	5	5	5	4	5	5	5	5	5	5	4.81	
CO6	4	4	5	5	5	4	5	5	5	5	5	4.72	
Overall Mean Score for COs												4.70	

Result: The Score for this Course is 4.7 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
18PBO4119

Hours/Week: -
Credits : 2

COMPREHENSIVE EXAMINATION

Course Outcomes:

1. To acquire knowledge for attending competitive exams in biology.
2. To study the structure and function of biomolecules.
3. To understand the mechanism of DNA replication and repair.
4. To learn the technique of synthesizing rDNA.
5. To understand the mechanism of photosynthesis.
6. To understand components of ecosystem.

Unit-I:

Structure and function of biomolecules; metabolism; principles of enzyme catalysis; protein & nucleic acids; bioenergetics; membrane structure and function; intracellular organelles; cell division and cell cycle; genes and chromosomes.

Unit-II:

Mendelian inheritance; quantitative genetics; mutation; DNA replication, repair and recombination; DNA damage and repair mechanisms; gene expression-transcription & translation; RNA synthesis and processing; protein synthesis and processing.

Unit-III:

Recombinant DNA methods; transgenic organisms; and Bioremediation. Gametogenesis and fertilization; embryogenesis; seed formation and germination; meristem and morphogenesis; organogenesis in plants.

Unit-IV:

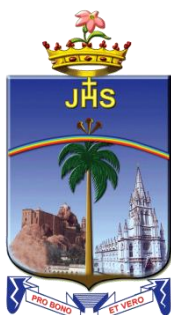
Photosynthesis; Respiration; nitrogen metabolism; plant hormones; sensory photobiology; solute transport and photo-assimilate translocation; secondary metabolites; stress physiology; principles and methods of taxonomy; concepts of species and hierarchical taxa.

Unit-V:

Major habitat types of the subcontinent, geographic origins and migrations of species; Environment; Species interactions; Ecological succession; Ecosystem structure and function; Biogeography; Climate change; Conservation Biology; Evolutionary thoughts.

M.Sc. BOTANY
LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE
WITH CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF BOTANY
SCHOOL OF BIOLOGICAL 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 TANSCH 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) 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	K1	K2	K3	K4	K5	K6	Total Marks
SECTIONS							
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	K1	K2	K3	K4	K5	K6	Total Marks	
SECTIONS								
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:

$GPA = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$	$WAM \text{ (Weighted Average Marks)} = \frac{\sum_{i=1}^n C_i M_i}{\sum_{i=1}^n C_i}$
<p>Where,</p> <p>C_i is the Credit earned for the Course i</p> <p>G_i is the Grade Point obtained by the student for the Course i</p> <p>M_i is the marks obtained for the course i and</p> <p>n is the number of Courses Passed in that semester.</p>	

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
5.00 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 is done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

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

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

Mean Scores of COs = $\frac{\text{Sum of values}}{\text{Total No.of POs \& PSOs}}$		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 is done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

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

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

Mean Scores of COs = $\frac{\text{Sum of values}}{\text{Total No.of POs \& PSOs}}$		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 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 imbued with ethical values and social concern will be able to understand and appreciate cultural diversity, social harmony and ensure sustainable environment.

Programme Specific Objectives (PSOs)

1. Graduates are prepared to be creators of new knowledge in the field of life sciences, causing innovation and entrepreneurship, employable in various sectors such as private, government, and clinical /biomedical research organizations.
2. Graduates are trained to study and evolve the biomolecular mechanisms for the life processes in health and diseases.
3. Graduates are groomed to carry on research in biology on chemical basis, by exploring their knowledge independently.
4. Graduates are encouraged to design and conduct experiments, to analyze and interpret biological problems behind the research.
5. Graduates ought to have the ability of effectively communicating the findings of Biological sciences with existing knowledge ethically.

M.Sc BOTANY					
PROGRAMME STRUCTURE					
Sem.	Specification	No. of Courses	No. of Hours	Credits	Total Credits
I-IV	Core Courses : Theory	11	54	46	67
I-IV	Core Courses : Practical	7	23	20	
III	Field Visit	-	-	1	
II	Self-paced learning	1	-	2	2
IV	Comprehensive Examination	1	-	2	2
IV	Project work & Viva Voce	1	7	7	7
I-IV	Discipline Specific Elective	4	20	16	16
I	Ability Enhancement Course	1	4	3	3
II	Skill Enhancement Course (Soft Skills)	1	4	3	3
III	Generic Elective IDC (WS)	1	4	3	3
IV	Generic Elective IDC (BS)	1	4	3	3
II-IV	Online courses (MOOC)	3	-	(6)	(6)
I-IV	Outreach Programme	-	-	4	4
	Total		120		110(6)

M.Sc. BOTANY							
PROGRAMME PATTERN							
Course Details					Scheme of Exams		
Sem	Code	Course Title	Hrs	Cr	CIA	SE	Final
I	21PBO1CC01	Plant Diversity-I: Thallophytes and Bryophytes	5	4	100	100	100
	21PBO1CC02	Plant Diversity-II: Pteridophytes, Gymnosperms & Paleobotany	5	4	100	100	100
	21PBO1CC03	Plant Anatomy, Embryology and Morphogenesis	5	4	100	100	100
	21PBO1CP01	Laboratory Course-1: Thallophytes, Bryophytes, Pteridophytes, Gymnosperms And Palaeobotany	4	4	100	100	100
	21PBO1CP02	Laboratory Course-2: Plant Anatomy, Embryology And Morphogenesis	2	2	100	100	100
	21PBO1ES01A	DSE-1: Ecology and Phytogeography	5	4	100	100	100
	21PBO1ES01B	DSE-1: Forestry and Wood Science					
	21PBO1AE01	AEC : Horticulture and Landscape designing	4	3	50	50	50
Total			30	25			
II	21PBO2CC04	Plant Physiology	6	6	100	100	100
	21PBO2CC05	Biochemistry	5	5	100	100	100
	21PBO2CP03	Laboratory Course -3: Plant Physiology	3	3	100	100	100
	21PBO2CP04	Laboratory Course -4: Biochemistry	3	3	100	100	100
	21PBO2SP01	Self-Paced learning: Plant Breeding and Evolution	-	2	50	50	50
	21PBO2ES02A	DSE-2: Biophysics and Instrumentation	5	4	100	100	100
	21 PBO2ES02B	DSE-2: Plant Pathology					
	21PSS2SE01	SEC: Soft skills	4	3	100	-	100
	21PBO2EG01	GE- 1(WS): Medicinal Botany	4	3	100	100	100
		Extra Credit courses (MOOC)-1	-	(2)			
	Total		30	29(2)			
III	21PBO3CC06	Plant Systematics	5	5	100	100	100
	21PBO3CP05	Laboratory Course -5: Plant Systematics	4	3	100	100	100
	21PBO3CC07	Research Methodology	5	4	100	100	100
	21PBO3CC08	Pharmacognosy	4	3	100	100	100
	21PBO3CP06	Laboratory Course -6: Research Methodology	3	2	100	100	100
	21PBO3ES03A	DSE-3: Organic Farming	5	4	100	100	100
	21PBO3ES03B	DSE-3: Bioinformatics and Bionanotechnology					
	21PBO3EG02	GE-2 (BS): Horticulture and Landscaping	4	3	100	100	100
	21PBO3FV01	Field Visit		1	100	-	100
		Extra Credit Courses (MOOC)-2		(2)			
Total			30	25(2)			
IV	21PBO4CC09	Microbiology and Immunology	5	5	100	100	100
	21PBO4CC10	Genetic Engineering and Biotechnology	5	5	100	100	100
	21PBO4CC11	Cell and Molecular Biology	4	3	100	100	100
	21PBO4CP07	Laboratory Course- 7: Microbiology, Immunology, Genetic Engineering And Biotechnology	4	3	100	100	100
	21PBO4ES04A	DSE-4: Intellectual Property Rights	5	4	100	100	100
	21PBO4ES04B	DSE-4: Genetics					
	21PBO4PW01	Project work & Viva voce	7	5	100	100	100
	21PBO4CE01	Comprehensive Examination	-	2	50	50	50
		Extra Credit courses (MOOC)-3		(2)			
	Total		30	27(2)			
I-IV	21PCW4OR01	Outreach programme (SHEPHERD)		4			
Total (Four Semesters)			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	Credits
I	21PBO1CC01	CORE-1: PLANT DIVERSITY-I: THALLOPHYTES AND BRYOPHYTES	5	4

CO. No.	CO- Statements	Cognitive Levels (K- levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge about the structure, reproduction and life cycle of Algae, Fungi, Lichen and Bryophytes.	K1
CO-2	learn the major classes and types of Algae, Fungi, Lichen and Bryophytes and their variations in life cycles and life history.	K2
CO-3	recognize the economic importance and biomedical applications of Algae, Fungi, Lichen and Bryophytes.	K3
CO-4	comprehend the structural organization of gametophyte and sporophyte in different classes of Bryophytes.	K 4
CO-5	apply the ICT tools for identification of lower plants.	K5 & K6

Unit-I: (15 Hours)

Algae: Phycology- Introduction and brief history, Algology in India (Contributions of eminent Indian Algologists, Classification of algae (F. E. Fritsch, 1945), Types of Life cycle. General characteristics, thallus organization, occurrence, reproduction and economic importance of algae.

Unit-II: (15 Hours)

Chlorophyta: Detail study of structure, reproduction and life cycle of *Chlamydomonas*, *Volvox*, *Cladophora*, *Ulva*, *Caulerpa*, *Oedogonium* and *Spirogyra*. **Phaeophyta:** Detail study of structure, reproduction and life cycle of *Ectocarpus*, *Padina* and *Sargassum*. **Rhodophyta:** Detail study of structure, reproduction and life cycle of *Batrachospermum*, *Gracillaria* and *Polysiphonia*. Centric and Pinnate Diatoms.

Unit-III: (15 Hours)

Fungi: General features, occurrence and distribution, Mode of nutrition and reproduction in fungi (vegetative, asexual and sexual), Classification of fungi (Ainsworth, 1973; Alexopoulos and Mims, 1979). General characters of major divisions-Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Ecology of fungi, Spore dispersal mechanisms, Economic importance of fungi.

Unit-IV: (15 Hours)

Heterothallism; parasexuality; sex hormones in fungi; interrelationship of Myxomycetes, Oomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes, Fossil Fungi. Lichens - Classification of Lichens (Hale, 1969), Nature of association of phycobionts and mycobionts, structure and reproduction in *Usnea*, Economic and ecological importance of lichens, Identification of lichens: MATLAB software, Image processing techniques.

Unit-V:**(15 Hours)**

Bryophyta: Classification (Rothmaler, 1951), general and reproductive characters of major classes, Distribution of bryophytes, Comparative study of gametophytes and sporophytes of major classes: Hepaticopsida: *Marchantia*, *Porella*, Anthocerotopsida: *Anthoceros*, *Notothylus*, Bryopsida: *Sphagnum*, *Polytrichum*. Economic importance of bryophytes.

Books for Study

1. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.
2. Vashishta, B. R. and Sinha, A. K. 2007. Botany for Degree Students - Fungi. S. Chand, New Delhi.

Books for Reference

1. Hale, Jr. M. E., 1983, Biology of Lichens. Edward Arnold, Mayland.
2. Alexopoulos, C. J. and Mims, C. W. 1979. Introductory Mycology. Wiley Eastern Ltd., NY.
3. Bessey, E. A. 1979. Morphology and Taxonomy of Fungi. Vikas Pub, NewDelhi.

Semester	Course Code					Title of the Course					Hours	Credits
I	21PBO1CC01					CORE-1: PLANT DIVERSITY-I: THALLOPHYTES AND BRYOPHYTES					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	2	3	2	2	1	2	2	2	2	2	2.2	
CO-2	2	3	2	2	1	2	2	2	2	3	2.1	
CO-3	2	2	3	2	2	2	2	2	2	1	2.0	
CO-4	2	2	2	3	2	2	2	2	2	3	2.2	
CO-5	2	2	2	2	3	1	2	2	2	2	2.2	
Mean Overall Score											2.1	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PBO1CC02	CORE-2: PLANT DIVERSITY-II: PTERIDOPHYTES, GYMNOSPERMS & PALEOBOTANY	5	4

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge on fossilization and geological period.	K1
CO-2	understand and analyse the characteristic features of lower vascular plants.	K2 & K3
CO-3	comprehend the economic importance of Pteridophytes and Gymnosperms.	K4
CO-4	apply interrelationships to form the life cycle patterns.	K5
CO-5	create the evolutionary trends and classification of organism.	K6

Unit-I: (15 Hours)

Pteridophytes - General characters, Reimer's classification (1954) and life cycle. Theories of origin of sporophyte, Telome concept, Sporangium development - eusporangiate and leptosporangiate type, Apogamy and Apospory. Detailed account on stelar and soral evolution in Pteridophytes, Heterospory and seed habit.

Unit-II: (15 Hours)

Morphology, anatomy, reproduction and evolution of gametophytes and sporophytes of the following genera: *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Alsophila* and *Marsilea*.

Unit-III: (15 Hours)

Gymnosperms - General characters, Classification of gymnosperms (Sporne, 1965). Phylogeny and comparative study of Cycadopsida, Coniferopsida and Gnetopsida. Salient features of Pteridospermales, Bennettitales, Pentaxylales, Cycadales, Cordaitales, Coniferales and Gnetales. Economic importance of gymnosperms.

Unit-IV: (15 Hours)

A general account on distribution, morphology, anatomy, reproduction and life cycle of the following genera: Cycadopsida – *Cycas*; Coniferopsida -*Taxus*; Gnetopsida - *Gnetum*.

Unit-V: (15 Hours)

Palaeobotany - Geological time scale, fossilization and types of fossil, Carbon dating. Indian fossil flora – Rajmahal hill flora and the Deccan Intertrappean flora. Detailed study of the fossil forms: Pteridophytes –*Rhynia*, *Lepidodendron* and *Calamites*; Gymnosperms - *Lyginopteris*, *Williamsonia* and *Cordaites*.

Books for Study

1. Sharma, O.P. 2017. Pteridophyta, McGraw Hill Education, New York.
2. Bhatnagar, S.P. and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru.

Books for Reference

1. Rashid.A. 2007. An Introduction to Pteridophyta, Vikas publications, NewDelhi.
2. Johri , RM, Lata S , Tyagi K (2005), A text book of Gymnosperms, Dominate pub and Distributer, New Delhi.
3. Vasista PC, Sinha AK and Anilkimar. 2005. Botany for degree students, Gymnosperms, S Chand, NewDelhi.

Semester	Course Code					Title of the Course					Hours	Credits
I	21PBO1CC02					CORE-2: PLANT DIVERSITY-II: PTERIDOPHYTES, GYMNOSPERMS & PALEOBOTANY					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	2	2	1	2	2	2	3	2	2.1	
CO-2	2	2	2	1	1	2	1	2	2	2	1.7	
CO-3	2	2	2	2	1	1	2	2	2	2	1.8	
CO-4	3	2	2	1	2	2	2	2	2	2	2.1	
CO-5	2	3	2	2	1	3	2	2	2	1	2.0	
Mean Overall Score											1.94	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PBO1CC03	CORE-3: PLANT ANATOMY, EMBRYOLOGY AND MORPHOGENESIS	5	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge about the tissues of stem, root and leaves in plants.	K1
CO-2	describe the primary and secondary structure of dicots and monocots with reference to root, stem and leaves.	K2
CO-3	attain basic knowledge of the structure and development of male and female gametophytes in plants.	K3 & K4
CO-4	Compare and determine the structure and development of dicot and monocot embryos.	K5
CO-5	integrate the morphogenesis, endosperm development and polyembryony.	K6

Unit-I: (15 Hours)

General account on theories of organization of shoot and root apical meristem, quiescent centre. Structural diversity and phylogenetic trends of specialization of xylem and phloem, Cambium – origin, cellular structure, cell division, storied and non-storied types. Cambium in budding and grafting - wound healing role. Trichomes, periderm and lenticels.

Unit-II: (15 Hours)

Anatomical characteristics and vascular differentiation in primary and secondary structure of root and stem (Dicot and Monocot), Origin of lateral roots, Root stem transition, Anatomy of Dicot and Monocot leaf. Leaf abscission, stomata types, nodal anatomy, petiole anatomy, vascularization of flower and seedling.

Unit-III: (15 Hours)

Microsporangium – Microsporogenesis, Microspores – morphology, ultrastructure, Microgametogenesis, Pollen-Stigma Incompatibility, Methods to overcome incompatibility. Megasporangium – Megagametogenesis, Female gametophyte – Monosporic, Bisporic and Tetrasporic, Nutrition of embryo sac and fertilization.

Unit-IV: (15 Hours)

Endosperm – Types, haustoria, Cytology and physiology and functions of endosperms, Embryo development - Dicot and Monocot, Nutrition of embryo. Polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement programs and seed development.

Unit-V: (15 Hours)

Morphogenesis- Definition, morphogenesis and its relation to morphology, Turing's diffusion reaction theory, Morphogenetic factors - growth regulators, genetic and environment, polarity. Molecular basis of morphogenesis, Cellular level morphogenesis, Asymmetric divisions and their significance, Morphogenesis at tissue level - Differentiation, dedifferentiation and redifferentiation of vascular tissue *in vitro* and *in vivo* and in wounds. Plant galls and their importance in morphogenesis.

Books for Study

1. Fahn, A. 1989. Plant Anatomy. Maxwell Pvt. Ltd., Singapore.

2. Bhojwani, S. S. and Bhatnagar, S. P. 1981. Embryology of Angiosperms. Vikas Publishing House Pvt. Ltd., New Delhi.

Books for Reference

1. Bard, J. 1990. Morphogenesis. Cambridge University Press, London.
2. Agarwal, S. B. 1990. Embryology of Angiosperms - a fundamental approach, Sahitya Bhawan, Agra.
3. Pandey, B. P. 1989. Plant Anatomy. S. Chand and Co. Ltd., New Delhi.

Semester	Course Code					Title of the Course					Hours	Credits
I	21PBO1CC03					CORE-3: PLANT ANATOMY, EMBRYOLOGY AND MORPHOGENESIS					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	2	2	3	2	2	2	2	2.3	
CO-2	2	3	2	2	1	2	3	2	2	2	2.1	
CO-3	2	2	3	2	1	3	3	2	3	1	2.2	
CO-4	3	3	2	1	1	3	2	2	1	2	2.1	
CO-5	2	3	2	2	3	2	3	2	2	3	2.6	
Mean Overall Score											2.3	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credit
I	21PBO1CP01	LABORATORY COURSE 1: THALLOPHYTES, BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY	4	4

Algae:

Ulva, Caulerpa, Padina, Sargassum, Batrachospermum, Gracilaria, Nostoc and Oscillatoria.

Fungi:

Plasmodiophora, Rhizopus, Fusarium, Pilobolus, Xylaria, Aspergillus, Penicillium, Agaricus and Peziza.

Lichen:

Usnea, Parmelia.

Bryophytes:

Reboulia, Anthoceros, Pogonatum and Polytrichum

Pteridophytes:

Psilotum, Lycopodium, Selaginella, Equisetum, Alsophila and Marsilea.

Gymnosperms:

Cycas, Cupressus, Gnetum.

Palaeobotany:

Rhynia, Lepidodendron, Calamites, Lyginopteris, Williamsonia, Cordaites.

Field Trip and Report submission.

Semester	Course Code	Title of the Paper	Hours	Credit
I	21PBO1CP02	LABORATORY COURSE 2: PLANT ANATOMY, EMBRYOLOGY AND MORPHOGENESIS	2	2

Plant Anatomy and Embryology

- Study of cambium - non storied and storied.
- Study the anomalous primary and secondary features in *Aristolochia* and *Bignonia*.
- Micrometry of xylem elements.
- Study of leaf anatomy-structure, stomata, trichomes, types of stomata, study of pollen morphotypes (Malvaceae and Asteraceae)
- Isolation of different stages of embryo and polyembryony in citrus, Jamun (*Syzygium cumini*)
- Tests for pollen viability using stains and *in vitro* germination, Pollen germination using hanging drop technique.

Semester	Course Code	Title of the Course	Hours	Credits
I	21PBO1ES01A	DSE-1: ECOLOGY & PHYTOGEOGRAPHY	5	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	describe the basic concepts of ecosystem and energy flow.	K1
CO-2	apply the knowledge gained on population dynamics to manage social dynamics.	K2 & K3
CO-3	evaluate the causes and consequences of climate change.	K4
CO-4	analyse the importance of biodiversity to human development.	K5
CO-5	create strategies to conserve local biodiversity.	K6

Unit-I: (15 Hours)

Introduction to ecology, Ecosystem structure and dynamics - food chain and food webs, energy flow. Mineral cycling (C, N & P). Plant succession – types and mechanism, Concept of climax vegetation, ecological indicators. Characteristics and dynamics of population- population size, growth, density and age structure.

Unit-II: (15 Hours)

Greenhouse effect - global warming, global climatic changes and consequences. Climate change conferences - role of UNFCCC and IPCC. Paris 2015 COP21: legality and respective capabilities, long-term goal, mitigation, carbon markets, transparency, compliance, adaptation. Carbon economy and carbon credits.

Unit-III: (15 Hours)

Biodiversity: types - species, genetic, ecosystem and habitat. Importance of genetic diversity with reference to crops and farm animals. Preserving the crop genetic resources-germplasm collections and the Svalbard Global Seed Vault. Centres of origin of diversity - Vavilov's and FAO's.

Unit-IV: (15 Hours)

Conservation: approaches - *in situ* and *ex situ* and their evaluation. Biodiversity - importance, assessment, loss and conservation. World organization for conservation of biodiversity, biodiversity act (2002), Red List categories of IUCN, means and ways for conservation.

Unit-V: (15 Hours)

Phytogeography: geographical history, continental drift hypothesis, land bridges and shifting of poles. Phytogeographic regions of India. Theory on plant distribution - Age and area theory, Tolerance. Concepts of endemism and hotspots, invasive and exotic species.

Books for Study

Kormondy, E.J. 2017. Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

Books for References

1. Sharma, P.D. 2010. Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
2. Eugene Odum, 2017. Fundamentals of Ecology 5th Ed. Cengage, Bengaluru.
3. Sharma P.D. 2019. Plant ecology and phytogeography, Rastogi Publications, Meerut.
4. Alexander von Humboldt, Aime Bonpl and, Stephen T. Jackson (eds.) 2013. Essay on the Geography of Plants, University of Chicago Press.

Semester	Course Code					Title of the Course					Hours	Credits
I	21PBO1ES01A					DSE-1: ECOLOGY & PHYTOGEOGRAPHY					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	2	2	2	3	2	2	2	2	2.2	
CO-2	2	3	2	2	3	3	2	2	2	2	2.3	
CO-3	2	3	2	2	2	2	2	2	2	2	2.1	
CO-4	2	2	3	2	2	2	2	2	2	3	2.2	
CO-5	2	2	2	3	3	2	3	2	2	2	2.3	
Mean Overall Score											2.22	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PBO1ES01B	DSE-1: FORESTRY AND WOOD SCIENCE	5	4

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	outline the physical, chemical and mechanical properties of commercial wood.	K1 & K2
CO-2	acquire knowledge on wood substitution.	K3
CO-3	evaluate the raw materials needed for industries.	K4
CO-4	conserve and plan sustainable utilization of forests resources.	K5
CO-5	relate the gained skills for careers in the forest service and wood processing industry.	K6

Unit-I: (15 Hours)

World and Indian forest scenario; Forest types of India; Factors that influences forest and forest protection. Rare and endangered species. Conservation strategies; Exotics and its significance; Silviculture - principles and practices; Genetic Engineering and its application in forestry; remote sensing and GIS in forestry.

Unit-II: (15 Hours)

Forest Resources and utilization; Forest products; Forest laws and policies, people and Forest; Social and community forestry; Forest industries; Role of social forestry in cottage industry; Role of forestry in Indian economy. Biomass conversion strategies-energy plantations.

Unit-III: (15 Hours)

Nature and properties of wood - physical, chemical, mechanical and anatomy of wood, Durability of wood, Wood seasoning and preservation. Defects and abnormalities of wood; types of commercial wood species of India.

Unit-IV: (15 Hours)

Wood deterioration - fungi, insects and other agents; Wood protection - Practical methods for preserving and protection, Chemical processing of wood.

Unit-V: (15 Hours)

Composite wood: adhesives - manufacture, properties and uses; manufacture and uses of plywood, fibre boards and particle boards. Present status of composite wood, paper and rayon industries. Present position of supply of raw materials to industries and wood substitution.

Books for Study

1. Franz F. P. Kollmann, Wilfred A. Jr. Cote. 2012. Principles of Wood Science and Technology: I Solid Wood, Springer.
2. J. L. Bowyer, R. Shmulsky and J. G. 2007. Haygreen. Forest Products and Wood Science: An Introduction, Blackwell Publishing Professional.
3. De Vere Burton L. 2000. Introduction to Forestry Science, Delmar publishers, NY

Books for Reference

1. Jha, L. K. 1996. Forestry for rural development, APH Publishing Corporation, New Delhi.
2. Negi, S. S. 1994. India's Forests, Forestry and Wildlife, Indus Publishing Co., New Delhi.

Semester	Course Code					Title of the Course					Hours	Credits
I	21PBO1ES01B					DSE-1: FORESTRY AND WOOD SCIENCE					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	3	2	2	3	2	2	1	2.2	
CO-3	2	2	3	2	1	3	3	2	3	1	2.2	
CO-4	3	3	2	3	2	3	2	2	3	2	2.5	
CO-5	2	3	2	3	1	2	3	2	3	1	2.4	
Mean Overall Score											2.4	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21PBO1AE01	AEC: HORTICULTURE AND LANDSCAPE DESIGNING	4	3

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	learn the brief history, divisions, classification and structure of horticultural and production of horticultural crops.	K1 & K2
CO-2	highlight the aesthetics of horticulture and post-harvest handling of techniques and marketing.	K3
CO-3	analyse plant growth environment in relation with soil, nutrients, fertilizers and nursery techniques.	K4
CO-4	design propagation methods and propagation through various specialized underground structures.	K5
CO-5	develop practical skills in micro propagation techniques, bonsai, topiary techniques and wet and dry flower decorations.	K6

Unit-1: (12 Hours)

Importance and scope of horticulture, Divisions of horticulture, Famous gardens in world & India; Tools & Implements used in horticulture, Plant Propagation: Vegetative Propagation - Cutting, Layering, Grafting & Budding. Cultural practices: Thinning, Training, Trimming & Pruning.

Unit-II: (12 Hours)

Role of tissue culture in Horticulture; Hydroponics. Nursery: definition, objectives and scope and building up of infrastructure for nursery, Preparation of Nursery beds, Transplantation – steps and Methods, Techniques of Bonsai, terrarium and topiary.

Unit-III: (12 Hours)

Cultivation Crops: Cardamom, pepper, ginger, and turmeric, Post-harvest and Conservation management, IPR issues, Import and export marketing. Floriculture: Cultivation of commercial flower crops – Rose, Orchids and *Anthurium*– economic important vegetable and fruit crops; citrus, banana, and cucurbits. Flower decoration – Dry and wet decoration.

Unit-IV: (12 Hours)

Gardening: Definition, objectives and scope, different types of gardening. Principles, methods and types of gardens and garden implements, Designing outdoor garden– hedges, edges, fences, trees, climbers, rockeries, arches, Roof garden, Indoor gardening and kitchen garden.

Unit-V: (12 Hours)

Lawn making and maintenance, water garden – cultivation of water plants, common water plants, glass house, Ornamental plants, hanging basket establishment and plant protection measures. Parks: components, types of parks, Xeriscaping. Field Visit to Horticultural station.

Books for Study

1. Subba Rao, N. S. 1997. Biofertilizers in Agriculture and Forestry. India Book House Limited, Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
2. Bose, T. K., Maiti, R. G., Dhua, R. S. and Das, P. 1999. Floriculture and Landscaping. Naya Prokash, Calcutta.

Books for Reference

1. Acquaah, G. 2002. Horticulture principles and practices (2nd.ed.), Pearson Education (Singapore) Pvt. Ltd.
2. Tolanus, S. 2006. Soil fertility, Fertilizer and Integrated Nutrient management. International Book Distributory Co.

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO1AE01					AEC: HORTICULTURE AND LANDSCAPE DESIGNING					4	3
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	2	2	3	3	2	3	2	2.5	
CO-2	2	3	2	3	3	2	3	2	3	3	2.6	
CO-3	2	3	3	2	3	3	3	2	3	2	2.6	
CO-4	3	3	3	3	2	3	3	3	2	2	2.7	
CO-5	2	2	3	2	3	3	2	3	2	3	2.5	
Mean Overall Score											2.6	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2CC04	CORE-4: PLANT PHYSIOLOGY	6	6

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	Gain a cognizance of the metabolic and physiological process unique to plants.	K1
CO-2	Impart an insight into the various plant water relations and mineral nutrition.	K2
CO-3	Comprehend the interaction between the environment and plant growth and development.	K3
CO-4	Assimilate with critical insight and in-depth analysis of main themes of plants physiology at the molecular level.	K4
CO-5	Demonstrate testable hypotheses, design targeted experiments, analyze data and present in a scientific manuscript.	K5 & K6

Unit-I (18 Hours)

Water and Plant cells: Diffusion and osmosis, water potential. Water balance of plants: absorption by roots, transport through the xylem, transpiration. Mineral nutrition: essential nutrients, deficiencies, plant disorders. Solute transport: passive and active transport, molecular basis of inter and intra cellular uptake and transport. Pattern, pathway and mechanism of translocation in the phloem.

Unit-II (18 Hours)

Photosynthesis: The light reactions- nature of light, properties and various roles of pigments, organisation of photosynthetic apparatus and light absorbing antenna systems, molecular basis of electron transport and its coupling to ATP synthesis. The carbon reactions- The Calvin-Benson cycle, photorespiration, inorganic carbon concentrating mechanisms (The C₄ carbon cycle, Crassulacean Acid Metabolism), and carbon allocation (starch and sucrose).

Unit-III (18 Hours)

Respiration: Glycolysis, gluconeogenesis and their regulation. Oxidation of pyruvate and the Citric Acid cycle. Pasteur effect, anaplerotic reactions, amphibolic nature of the Citric Acid cycle. Oxidative pentose phosphate pathway and its roles. Respiratory chain complexes and oxidative phosphorylation, internal and external NAD(P)H dehydrogenase, alternative oxidase. Non phosphorylating mechanisms and their roles. Bottom-up regulation of plant respiration. The Glyoxylate cycle.

Unit-IV (18 Hours)

Nitrogen in the environment; assimilation of nitrate and ammonium - GS- GOGAT; biological nitrogen fixation. Plant responses to light signals: the phytochromes and the blue-light responses

(cryptochromes, phototropins and zeaxanthin). Biosynthesis, metabolism, transport, physiological and developmental effects of auxin, gibberellin, cytokinin, ethylene and abscisic acid.

Unit-V

(18 Hours)

Flowering and fruit development: Floral evocation, Circadian rhythm, photoperiodism, vernalisation. Physiology of fruit development and ripening. Physiology of seed development, maturation, dormancy, germination and tropisms. Ageing and senescence-types and physiological/ biochemical changes. Abiotic stress (drought, heat and salinity): Plant responses and mechanisms of tolerance.

Books for Study

1. William G. Hopkins and Norman P.A. Huner 2009. Introduction to Plant Physiology - 4th ed. John Wiley & Sons, Inc.USA.
2. Lincoln Taiz, Eduardo Zeiger, Ian Max Moller and Angus Murphy, 2015. Plant Physiology. 6th Ed., Sinauer Associates.

Books for Reference

1. Noggle, G.R. and Fritz, G.J. 2001, Introductory Plant Physiology, Prentice-Hall, India.
2. Devlin, R.M., 2000, Plant Physiology, Affiliated East West Press Pvt.Ltd.
3. Epstein, E., 2000, Mineral Nutrition in Plants-Principles and Perspectives, Wiley.
4. Frank B. Salisbury & Cleon W. Ross, 1992, Plant Physiology 4th Edition, Wadsworth Publishing Co., Belmont.

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO2CC04					CORE-4: PLANT PHYSIOLOGY					6	6
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO1	3	3	3	2	2	3	3	3	2	3	2.7	
CO2	3	3	3	2	2	3	3	3	2	2	2.6	
CO3	3	3	3	3	3	3	3	3	2	3	2.9	
CO4	3	3	3	2	2	3	3	3	2	2	2.6	
CO5	3	3	3	3	3	3	3	3	3	3	3	
Mean Overall Score											2.76	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2CC05	CORE-5: BIOCHEMISTRY	5	5

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	describe the classification and structural organization of proteins.	K1
CO-2	identify the enzyme kinetics and illustrate the regulatory process.	K2
CO-3	apply basic principles of chemistry to biological systems.	K3
CO-4	infer the metabolism of amino acids and its regulation.	K4
CO-5	design biochemical techniques to carry out experiments.	K5 & K6

Unit-I: (15 Hours)
Carbohydrates: Homoglycans: chemical structure and functions of starch, glycogen, cellulose, dextrin and inulin. Heteroglycan: chemical structure and functions of agar, alginic acid (sea weed polysaccharide), glycosaminoglycans, proteoglycanas, glycoproteins and pectins. Glycocalyxoligo saccharide. Over view of metabolism of carbohydrate.

Unit-II: (15 Hours)
Lipids and Biomembranes: Triglycerides, phosphoglycerols, derived lipids- steroids, prostaglandins, spingolipids, leukotrienes and lipopoly saccharides. Structure of membrane model, lipid bilayer. Structure of membrane proteins and membrane receptors: adrenalin receptors, acetylcholine receptors and insulin receptors. Over view of metabolism of lipids.

Unit-III: (15 Hours)
Amino acids and peptides: Amino acids: general structure and classification. Glutathione: structure, metabolism and function. Biology of cyclosporin. Metabolism of phenylalanine and tyrosine; glycine, cysteine and methionine. Over view of metabolism of vitamins.

Unit-IV: (15 Hours)
Proteins: The peptide bond and primary structure. Secondary structure, domain, motif and backbone folding. Tertiary structure and stabilizing forces in collagen. Quaternary structure of haemoglobin and its regulatory features. Protein sequencing strategies - chemical and enzymatic. Ramachandran plot.

Unit-V: (15 Hours)
Enzymes: Principles of catalysis, activation barrier and energy changes in reaction profile, initial velocity and principles of enzyme kinetics: Michaelis-Menten Equation, K_M and V_{Max} measurements - LB blot; active site organization; and role of cofactors/vitamins. Enzyme regulation: pH, temperature and substrate concentration. Inhibitions and regulation of glutamine synthetase. Industrial applications of enzymes.

Books for Study

1. Stryer Lubert, 2005, Biochemistry, W.H. Freeman & Co., NY.
2. Lehninger, Principles of Biochemistry by Nelson, D. L., Lehninger, A. L., & Cox, M. M.(2008), 5th Edition, ISBN: 978-0-230-22699-9, Publisher: W. H. Freeman and Company, New York, p: 677-878.
3. Biochemistry by Donald Voet, Judith G. Voet, Publisher: John Wiley & Sons (2011), Fourth Edition, ISBN-10: 0071737073, ISBN-13: 978-0071737074.

Books for Reference

1. Caret et al., 1993, Inorganic, Organic and Biological Chemistry, WMC Brown, USA
2. Biochemistry Seventh Edition by Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, 74 Publisher: W. H. Freeman; Seventh Edition (December 24, 2010).

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO2CC05					CORE-5: BIOCHEMISTRY					5	5
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	2	3	3	2	1	2	3	2	2	3	2.3	
CO-2	1	3	2	2	2	3	3	1	2	3	2.1	
CO-3	2	2	3	2	3	2	3	3	2	1	2.3	
CO-4	3	1	3	3	1	2	2	2	3	2	2.2	
CO-5	1	3	2	2	2	2	3	1	2	3	2.1	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2CP03	LABORATORY COURSE 3: PLANT PHYSIOLOGY	3	3

Experiments

1. Determination of water potential (Shardakov's method).
2. Determination of solute potential.
3. Hills reaction.
4. Estimation of total acidity in CAM plants.
5. Apparent photosynthesis.
6. Effect of CO₂ concentration on photosynthesis
7. Effect of quality of light on photosynthesis
8. Estimation of total free aminoacids and proline.
9. In vivo assay of NR and NiR.
10. Estimation of IAA.
11. Estimation of starch by perchloric method.
12. Estimation of nitrogen (Nessler's method).
13. Determination of activity of peroxidase and lipase

Semester	Course Code	Title of the Course	Hours	Credit
II	21PBO2CP04	LABORATORY COURSE 4: BIOCHEMISTRY	3	3

Experiments

1. Estimation of glycogen / total polysaccharides
2. Estimation of hexosamine
3. Determination of total proteins (Bradford's / Lowry's)
4. Study of Enzyme Kinetics (experiments with acid phosphatase)
5. Effect of temperature on enzyme activity.
6. Effect of [S] on enzyme activity; measurement of V_{\max} and K_m .
7. Estimation of Ascorbic acid (Calorimetric /volumetric)
8. Estimation of Phenolics (Folin –Ciocalteu)
9. Estimation of Tannins (Folin-Denis / Vanillin hydrochloride)
10. Estimation of cholesterol
11. Thin Layer Chromatography
12. Native-PAGE

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2SP01	SELF-PACED LEARNING: PLANT BREEDING AND EVOLUTION	-	2

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	outline the progress made in the field of plant breeding.	K1
CO-2	comprehend the principles, techniques, modes of reproduction in crops and applications of plant breeding.	K2
CO-3	demonstrate the theories of evolution.	K3
CO-4	analyse the hybridization techniques.	K4 & K5
CO-5	Test the knowledge on heterosis, mutation and polyploidy.	K6

Unit-I:

Plant Breeding: Historical aspect of plant breeding and genetic basis. Breeding methods- sexual, asexual and apomitic reproduction. Floral Biology in relation to selfing and crossing techniques. Centres of diversity and origin of cultivated plants. Role of National and International Institutes.

Unit-II:

Hybridization: Objectives, Choice of parents, problems and causes of failure of hybridization. Incompatibility and sterility, Methods of handling genetic consequence of hybridization, method of handling segregation material for isolation of superior strains - Bulk method and pedigree method of selection. Role of interspecific and intergeneric hybridization in plant improvement.

Unit-III:

Inbreeding depression and heterosis: Genetic basis and application in plant breeding. Steps in the production of single cross, double cross, three way cross; induced polyploidy in plant breeding; role of auto and allopolyploidy, Heteroploids; Mutation and crop improvement. Population genetics: Hardy-Weinberg principle; gene frequencies and the factors that change it.

Unit-IV:

Back Crossing: Theory and procedure for transferring various types of character. Preservation and utilization of germplasm. Breeding of rice, sugarcane, groundnut and maize. Application of biotechnology to plant breeding - embryo rescue, somaclonal variation, doubled haploid, protoplast fusion and transgenic.

Unit-V:

Evolution: Origin of life, theories of evolution of life forms: Lamarkism, Darwinism and Speciation. Variations-Definition, causes and types, Mutations (Principles of Hugo de'veries), Role of mutations in speciation. Evidences for evolution, adaptive radiation, biological evolution. Impact of evolution on human life.

Books for Study

1. Chaudhari, R. C. 2017. Introductory Principles of Plant Breeding, Kindle Edition.
2. Singh, P. 2017. Fundamentals of Plant Breeding, Kalyani Publishers,
3. Manokaran, K. V. 2010. Essentials of Plant Breeding. PHI Learning Private Limited Publishers.

Books for Reference

1. Brown, PC and Campos, H. 2014. Introduction to Plant Breeding. 2nd Edition, Wiley Blackwell Publishers.
2. Izak Bos and Caligari, P. 2007. Selection Methods in Plant Breeding. Springer.

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO2SP01					SELF-PACED LEARNING: PLANT BREEDING AND EVOLUTION					-	2
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	3	2	2	2	2	3	3	1	2	2.3	
CO-2	2	3	2	2	3	2	3	2	3	1	2.3	
CO-3	2	3	2	3	1	2	3	3	2	3	2.4	
CO-4	1	3	2	3	2	2	3	2	3	2	2.3	
CO-5	2	2	2	3	2	2	3	2	3	3	2.4	
Mean Overall Score											2.4	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2ES02A	DSE-2: BIOPHYSICS AND INSTRUMENTATION	5	4

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge on various types of centrifugation, spectroscopy and tracer techniques.	K1 & K2
CO-2	relate the importance of biophysics in modern biology.	K3
CO-3	explain the laws of thermodynamics.	K4
CO-4	evaluate and illustrate the concept of redox potential in biological system.	K5
CO-5	integrate various types of microscopy and their applications.	K6

Unit-I: (15 Hours)

Introduction to biophysics, its importance in modern biology. Bioenergetics: First and second law of thermodynamic, internal energy, enthalpy, entropy, concept of free energy, standard free energy change of a chemical reaction, ATP and high energy phosphate compounds.

Unit-II: (15 Hours)

Biophotonics: Redox potential, Oxidation and reduction, redox potential and its calculation by Nernst equation, examples of redox potential in biological system. Osmosis and osmotic pressure, the role of osmosis in cell volume regulation. Theiso, hypo, and hypertonic solutions, their influence on the cell. Ionic diffusion. Active and passive bioelectric properties of membranes.

Unit-III: (15 Hours)

Microscopy: Bright field microscopy-magnification, resolving power, contrast. Dark field microscopy, phase-contrast microscopy, fluorescent microscopy, electron microscopy (SEM and TEM). Electrophoresis: AGE, PAGE, SDS-PAGE.

Unit-IV: (15 Hours)

Centrifugation: Principle, procedure and application. Types of centrifugation- density gradient centrifugation, ultracentrifugation and differential centrifugation. Chromatography: Principles, instrumentation, and applications of Paper, thin layer, column chromatography, gas chromatography, HPTLC and GC-MS.

Unit-V: (15 Hours)

Spectrophotometry: principles and instrumentation of UV/Vis, Atomic absorption spectrophotometer (AAS), NMR, ESR. Tracer techniques: Important stable radioisotopes and their uses in research. Radiation hazards and precautions in handling radioisotopes. Measurement of radioactivity- autoradiography, GM counter and scintillation counter.

Books for Study

1. Banerjee, PK (2008) Introduction to Biophysics, S. Chand, New Delhi.
2. McMahon, G. (2007) Analytical Instrumentation: A Guide to Laboratory, Portable and Miniaturized Instruments. John Wiley & Sons, Ltd. ISBN: 9780470027950.

Books for Reference

1. Roy R.N. A text book of Biophysics. New Central Book Agency Pvt. Ltd, Calcutta.
2. Upadhyay, Upadhyay & Nath Biophysical Chemistry. Himalaya Publ. House, Bangalore.
3. Mohan Arora Biophysics. Himalaya Publishing House, Bangalore.

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO2ES02A					DSE-2: BIOPHYSICS AND INSTRUMENTATION					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	3	2	1	2	2	3	2	1	2	2.1	
CO-2	2	3	2	2	3	2	3	2	2	1	2.2	
CO-3	2	2	3	2	1	2	2	3	2	2	2.1	
CO-4	1	2	2	3	2	1	3	2	3	2	2.1	
CO-5	1	2	2	3	2	2	3	2	2	3	2.2	
Mean Overall Score											2.1	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2ES02B	DSE-2: PLANT PATHOLOGY	5	4

CO. No.	CO-Statements	Cognitive Levels (K- levels)
On successful completion of this course, students will be able to		
CO-1	acquire knowledge on pathogenesis and disease establishment in plants	K1
CO-2	learn the process of plant pathogenesis and disease establishment	K2
CO-3	recognize the effect of Microbe infection on host physiology	K3
CO-4	comprehend the various different types of disease control mechanism	K4
CO-5	familiarize the concepts in plant immunity and various defence mechanism in plants	K 5 & K6

Unit-I: (15 Hours)
 Concept of plant disease – definitions of disease, disease cycle and pathogenicity. General symptoms and Classification of plant diseases. History of Plant Pathology with special references to Indian work.

Unit-II: (15 Hours)
 Pathogenesis- pathogens and their mode of dissemination, pre-penetration, penetration and post penetration changes. Role of Chemical Weapons (Enzymes, Toxins and Growth regulators) in disease development.

Unit-III: (15 Hours)
 Effect of infection on physiology of host viz. photosynthesis, respiration, carbohydrate metabolism, nitrogen metabolism, phenols, shikimic acid pathway, importance of phenol oxidation in plant diseases.

Unit-IV: (15 Hours)
 Plant diseases: causal organisms, symptoms, disease cycle and control measures for the following diseases: White rust of Crucifers, Bacterial blight of paddy, yellow vein Mosaic of Bhindi, covered smut of Barley, Spike disease in Sandal. Integrated Disease Management (IDM) –Plant diseases control: Cultural, physical, chemical and biological methods.

Unit-V: (15 Hours)
 General concepts on plant immunity: morphological, structural defence mechanisms and biochemical defence mechanisms, pre-existing defence mechanisms. Phytoalexins, defence through induced synthesis of proteins and enzymes. Molecular Basis of Defence Mechanism: Signal Transduction, Recognition of the pathogen by the host, transmission of the alarm signal to the host defence providers.

Books for Study

1. Singh, RS. 2018. Introduction to Principles of Plant Pathology, 4th ed. Scientific International, Bengaluru, India.
2. Mehrotra, RS and Aggarwal, A. 2017. Plant Pathology. McGraw Hill Publisher Co. Ltd., New Delhi.

Books for Reference

1. Sharma PD. 2001. Microbiology and plant pathology, Rastogi publications, Meerut.
2. Rangasamy G. 1998. Diseases of crop plants in India. Prentice- Hall of India, New Delhi.
3. Mukherjee KG and Jayanti Bhasin, 1986. Plant diseases of India. Tata MacGraw-Hill, New Delhi.
4. Harsfall JG and Cowling EB. 1979. Plant Disease, an Advanced Treatise. Academic Press, NY.

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO2ES02B					DSE-2: PLANT PATHOLOGY					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	2	2	2	2	2	3	3	3	2	2	2.3	
CO-2	2	3	2	2	2	3	2	2	2	3	2.3	
CO-3	2	2	2	2	2	3	3	2	2	2	2.5	
CO-4	2	2	2	2	2	3	3	3	2	2	2.2	
CO-5	2	2	3	2	2	2	3	3	2	2	2.3	
Mean Overall Score											2.3	
Result											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)

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

- exposed and trained in various nuances of Soft Skills in a Professional manner responding to the requirements of national and international market
- synthesize the knowledge and practical skills learnt to be personal effective in any managerial positions
- construct plans and strategies to work for better human society
- illustrate the problems at work and home and design solutions and maintain a balance of work and home
- 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

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

Books for References

1. Aggarwal, R.S. *Quantitative Aptitude*, S.Chand & Sons.
2. Aggarwal, R.S. (2010). *A Modern Approach to Verbal and Non Verbal Reasoning*. S.Chand & CO, Revised Edition.
3. Covey, Stephen. (2004). *7 Habits of Highly effective people*, Free Press.
4. Egan, Gerard. (1994). *The Skilled Helper* (5th Ed). Pacific Grove, Brooks/Cole.

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

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

Semester	Course Code	Title of the Course	Hours	Credits
II	21PBO2EG01	GENERIC ELECTIVE 1 (WS): MEDICINAL BOTANY	4	3

CO. No.	CO- Statements	Cognitive Levels (K- levels)
On successful completion of this course, students will be able to		
CO-1	obtain the knowledge about understanding of principle and treatment methods of various Traditional system of medicines.	K1 & K2
CO-2	comprehend the current trade status and role of medicinal plants in socio economic growth.	K3
CO-3	investigate the suitable conservation method for medicinal plants using modern biotechnology tools to ensure the sustainable utilization.	K4
CO-4	evaluate the Ethno botany knowledge based drug products efficacy and its various applications in drug industries.	K 5
CO-5	create new drug formulations using therapeutically valuable phytochemical compounds for the healthy life of society.	K6

Unit I:

(12 Hours)

Key Historical events, Scope and importance of medicinal plants. Traditional medicinal systems: Siddha, Ayurvedha, Homeopathy, Chinese medicine, Unani, Naturopathy and Aromatherapy. Status of Indian medicinal plant trade, medicinal plants prohibited from export, leading companies in India in trade of medicinal plants.

Unit II:

(12 Hours)

Classification of herbal drugs based on the Alphabetical, Morphological, Taxonomical, Chemical and pharmacological. Collection and processing of herbal raw materials for drugs preparation-Post Harvesting care, Drying, Dressing, Packing and Storage. Conservation and mass propagation of important medicinal plants through *In vitro* propagation methods. Role of NMPB, CDRI and CIMAP on medicinal plants conservation and research development. WHO regulation and Guidelines for quality control and trade of herbal medicine.

Unit III:

(12 Hours)

Ethnobotany - concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Role of ethnobotany in modern Medicine Medico-Ethnobotanical sources – Eg. Contribution of Kani Tribes. Ethnobotany and plant genetic resources conservation of medicinal plants with special reference to India. Major tribes of South India and their ethno botanical knowledge.

Unit IV:

(12 Hours)

Phytotherapeutic compounds of medicinal plants - Alkaloids, Glycosides, Terpenoids, Tannins, Flavonoids and Phenols. Patent guidelines for Phytotherapeutic compounds. Identification and utilization of the medicinal herbs in curing various ailments – *Catharanthus roseus* (Anti-cancer), *Aegle marmelos* (Cardiotonic), *Withania somnifera* (Drugs acting on nervous system), *Cardiospermum halicacabum* (Anti-rheumatic) and *Centella asiatica* (Memory booster), *Phyllanthus emblica* (Rejuvenating) and *Phyllanthus niruri* (Hepato-protective).

Unit V:**(12 Hours)**

Medicinally useful plant parts: Root – *Hemidesmus indicus* and *Rauvolfia serpentina*; Rhizome – *Acorus calamus* and *Curcuma longa*; Stem- *Tinospora cordifolia* and *Santalum album*; Bark – *Terminalia arjuna* and *Saraca asoca*; Leaf – *Andrographis paniculata* and *Cynodon dactylon*; Flowers – *Crocus sativus* and *Syzygium aromaticum*; Fruits - *Piper longum* and *Terminalia chebula*; Seeds – *Azadirachta indica* and *Trigonella foenum-graecum*.

Books for Study

1. Evans, 2009. Pharmacognosy, Elsevier Publications, Edinburgh.
2. James Green, 2000 Herbal Medicine-Maker's Handbook, Crossing Press, U.S.
3. Weiss, Rudolf Fritz 2000 Herbal Medicine, 2nd Edition Thieme Medical Publishers
4. Kokate CK, Purohit AP and Gokahale, 2006. Pharmacognosy, Nirali Prakashan.
5. Somasundara, S 1997. Maruththuva Thavaraiyal, Ilangovan Padhippagam, Palayamkottai.
6. Cultivation of Medicinal and Aromatic crops by A.A. Farooqui and B.S. Sreeramu (2004).
7. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
8. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd Edn. Agrobios, India.
9. Quality control and evaluation of Herbal Drugs by Pulok.K. Mukarjee (2019).

Web Resources

1. <http://www.gallowglass.org/jadwiga/herbs/preparations.html>
2. <http://shawnacohen.tripod.com/thetribaltraditions/id51.html>
3. <http://www.vasundharaorissa.org/Research%20Reports/GlobalisationAndMedicinalplantsOfOrissa.pdf>
4. http://www.emea.europa.eu/docs/en_GB/document_library/Scientific_guideline/2009/09/WC500003393.pdf

Semester	Course Code					Title of the Course					Hours	Credits
II	21PBO2EG01					GENERIC ELECTIVE 1 (WS): MEDICINAL BOTANY					4	3
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	1	3	3	3	1	2	2	2.3	
CO-2	3	2	3	3	3	1	2	3	3	2	2.5	
CO-3	3	3	3	2	3	2	3	3	2	3	2.7	
CO-4	3	1	3	2	3	2	3	1	2	2	2.2	
CO-5	2	3	2	2	3	1	1	2	3	2	2.1	
Mean Overall Score											2.36	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3CC06	CORE-6: PLANT SYSTEMATICS	5	5

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	perceive interdisciplinary approaches on classification of angiosperms.	K1
CO-2	gain confidence and proficiency in evaluating comparative data and in making sound taxonomic judgements.	K2
CO-3	demonstrate specific mastery in recognise, compare and contrast distinctive attributes among the major groups of angiosperms.	K3
CO-4	acquire the vital skills for conducting extensive field and herbarium studies.	K4 & K5
CO-5	equip themselves with skills in writing short species description, illustration, field identification and scientific photography.	K6

Unit-I: (15 Hours)

Overview of Plant Systematics - Phenetics (artificial, natural classification) and Cladistics (Phylogenetic systematics): terms and concepts, taxon selection, character analysis, cladogram construction, cladogram analysis - Angiosperm Phylogeny Group classification: principles of APG system, short version of APG I, APG II and APG III, detailed version of APG IV.

Unit-II: (15 Hours)

Taxonomic hierarchy: principal ranks - species concept and infraspecific categories (subspecies, varieties and forms) - genus concept and infrageneric categories (subgenus, section and series) - family concept and infrafamily categories (subfamily, tribe and sub tribe).

Unit-III: (15 Hours)

Botanical nomenclature: ICN principles; scientific names; authorship; nomenclatural types; valid publication; priority of publication; conservation of names; retention and rejection; taxonomic revision; synonyms; names of hybrids and cultivated plants.

Unit-IV: (15 Hours)

Plant identification: field inventory; herbarium techniques, Flora (e-flora), monographs; journals; taxonomic key. Systematic evidence: morphology; anatomy; palynology; embryology; cytology; phytochemistry.

Unit-V:**(15 Hours)**

Molecular systematics: Plant genomes- nuclear, chloroplast and mitochondria. Molecular markers, generating molecular data, restriction site mapping, gene sequencing, analysis of molecular data, alignment of sequences, methods of phylogeny reconstruction.

Books for Study

1. Michael G. Simpson. 2019. Plant Systematics - 3rd ed., Academic Press, New York, USA.
2. Crawford, D.J. 2003. Plant Molecular Systematics, Cambridge University Press, Cambridge, UK.
3. Heywood, VK & Moore, DM. 1984. Current Concepts in Plant Taxonomy, Academic Press, London.

Books for Reference

1. Grant, WF. 1984. Plant Biosystematics, Academic Press Inc., Canada.
2. Harborne, JB. & Turner, BL. 1984. Plant Chemosystematics, Academic Press, London.
3. Hillis, DM, Moritz, C & Mable, BK. 1996. Molecular Systematics, Sinauer Associates, Sunderland, USA.

Semester	Course Code					Title of the Course					Hours	Credits
III	21PBO3CC06					CORE-6: PLANT SYSTEMATICS					5	5
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO1	3	3	2	2	2	3	3	3	2	2	2.5	
CO2	3	3	3	2	3	3	3	3	3	3	2.9	
CO3	3	3	3	2	3	3	3	3	3	3	2.9	
CO4	3	3	3	3	3	3	3	3	3	3	3.0	
CO5	3	3	3	2	2	3	3	3	3	3	2.8	
Mean Overall Score											2.82	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3CP05	LABORATORY COURSE 5: PLANT SYSTEMATICS	4	3

PRACTICALS:

1. Exercise in key making.
2. Binomial identification using Flora.
3. Study and submission of digital description of the following families with reference to their South Indian representatives and minimum of one member each to be described, dissected and sketched to scale (classification based on APG IV, 2016):

BASAL ANGIOSPERM: Nymphaeales - Nymphaeaceae

MAGNOLIIDS: Peperales - Aristolochiaceae

MONOCOTS: Alismatales - Araceae, Hydrocharitaceae, **Commelinales** – Commelinaceae, **Poales** - Cyperaceae

EUDICOTS: Ranunculales - Menispermaceae

ROSIDS: Malpighiales - Passifloraceae, **Sapindales** - Meliaceae, **Brassicales** - Cleomaceae

SUPERASTERIDS: Santalales - Loranthaceae, **Caryophyllales** - Caryophyllaceae, Aizoaceae

ASTERIDS: Solanales - Convolvulaceae, **Lamiales** - Scrophulariaceae, Acanthaceae, Verbenaceae

4. Exercise in the important Articles of the Code.
5. Cladogram construction and analysis.
6. Submission of herbaria of any five plant species.
7. Field trip report.

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3CC07	CORE-7: RESEARCH METHODOLOGY	5	4

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	Obtain knowledge on basic concepts in Research and in Biostatistics.	K1
CO-2	Acquire knowledge on sampling techniques, evaluate literature, collection of data and thesis writing..	K2
CO-3	Analyze the significance of databases and Citation Index.	K3
CO-4	Acquire skill in writing research articles and formatting the papers.	K4
CO-5	Solve and statistically analyse the data of variables	K5 & K6

Unit-I: (15Hours)

Research - types, objectives and approaches. Census method, Sample -types; Sampling techniques. Hypothesis: definition, characteristics, types, significance. Methods of collecting data: primary and Secondary- merits and demerits, Code of research ethics. Literature collection: Books, Research articles and e-resources.

Unit- II (15Hours)

Structure of thesis & research article. Journals in Life Sciences, Impact factor of Journals, Ethical issues related to publishing, Plagiarism and Software. Manuscript for publication and proof correction. Structure and components of research proposal, National and International funding sources.

Unit-III: (15Hours)

Bibliometrics: definition and relevance; Bibliometrics databases, h-index, SNIP, Page Rank, Impact Factor and evaluation. The use of bibliometrics in research: Citation Research, Science Citation Index. The Institute for Scientific Information (ISI), Thomson Reuter's Webmetric and ORCID. Tailored Research and Retraction. Indian Patent Act.

Unit-IV: (15Hours)

Biostatistics: Introduction. Classification of data; Frequency Distribution: Discrete, Continuous and Cumulative Frequency Distributions; Tabulation of data; Diagrammatic and graphical representation of data: Bar Charts: Simple, Multiple & Sub divided, Histogram, Frequency polygon, Ogive curve, Pie diagram. Measures of Central values: Mean, Median and Mode. Measures of Dispersions: Range, Mean deviation and Standard deviation.

Unit-V: (15Hours)

Skewness and Kurtosis. Probability: Binomial, Poisson and Normal distributions. Correlation: types, methods. Regression analysis, Large sample (Z), small sample testing: Test of Significance; t-test, chi-square and F test. ANOVA - one and two way, Duncan Multiple Range Test. Principles of experimental design - randomization, replication, local control, size and shape of the plot, CRD, RBD.

Books for Study

1. Kothari, C. R. 2014. Research Methodology-Methods & Techniques. WishwaPrakashan.
2. Misra, R. P, 2000. Research Methodology - A Handbook, Concept Pub. Company, NewDelhi.
3. Pillai and Bagavathi, 2008 Statistics, S. Chand& Company Ltd, NewDelhi.

Books for Reference

1. Gupta, SP. 1990. Statistical Methods, Sultan Chand & Sons, NewDelhi.
2. Nageswara Rao, G. 1983. Statistics for Agricultural Science Oxford & IBH, NewDelhi
3. Gupta, SC. 2013. Fundamentals of statistics, Himalaya Publishers,Mumbai.

Semester	Course Code					Title of the Course					Hours	Credits
III	21PBO3CC07					CORE-7: RESEARCH METHODOLOGY					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	2	2	3	2	2	3	2	2.4	
CO-2	2	3	2	3	2	3	2	3	2	1	2.3	
CO-3	2	2	3	2	1	3	3	2	3	1	2.2	
CO-4	3	3	2	3	2	3	3	2	3	2	2.6	
CO-5	2	2	3	2	1	3	2	3	2	1	2.1	
Mean Overall Score											2.4	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3CC08	CORE-08: PHARMACOGNOSY	4	3

CO. No.	CO- Statements	Cognitive Levels (K- levels)
After the successful completion of the course, student will be able to		
CO-1	acquire the knowledge about understanding of Principle and Treatment methods of various Traditional system of medicines.	K1 & K2
CO-2	learn the identification, pharmacological importance and processing of medicinal plants based on their classification and characterization.	K3
CO-3	analyze the suitable conservation method for medicinal plants using modern biotechnology tools to ensure the sustainable utilization.	K4
CO-4	evaluate the medicinal plants based drug efficacy and its various applications for different ailments	K5
CO-5	create new drug formulations using phytochemical compounds for the healthy life of society.	K6

Unit-I (12 Hours)

Traditional and alternative system of medicine-Principle, practice, short history and merits of herbal medicine- Siddha, Ayurveda, Homeopathy, Chinese medicine, Unani, Naturopathy, Aromatherapy and acupuncture. Status of Indian medicinal plant trade, medicinal plants prohibited from export, leading companies in India in trade of medicinal plants.

Unit-II (12 Hours)

Classification of crude drugs - alphabetical, taxonomical, morphological, chemical, pharmacological (therapeutic). Medicinal plants - Mass Cultivation methods for sustainable utilization, Collection and processing of herbal raw material for drugs Preparation-Post Harvesting care, Drying, Dressing, Packing and Storage. Conservation and mass propagation of important medicinal plants through *In vitro* propagation methods.

Unit-III (12 Hours)

Medicinally useful plant parts: Root –*Hemidesmus indicus*, *Withania somnifera* and *Rauvolfia serpentina*; Rhizome - *Zingiber officinalis*, *Acorus calamus* and *Curcuma longa*; Stem- *Tinospora cordifolia*, *Santalum album*; Bark – *Terminalia arjuna*, *Cinnamomum verum* and *Saraca asoca*; Leaf – *Adhatoda vasica*, *Ocimum sanctum* and *Cynodon dactylon*; Flowers – *Crocus sativus*, *Syzygium aromaticum* and *Leucus aspera*; Fruits – *Phyllanthus emblica*, *Piper longum* and *Terminalia chebula*; Seeds – *Azadirachta indica*, *Trigonella foenum-graecum* and *Ricinus communis*.

Unit-IV (12 Hours)

Herbal preparation methods - bolus, capsules, compresses, creams, decoctions, extracts, infusions, herbal tea, ointments, massage oils, medicinal vinegar, poultice & plasters, powders, salves, syrups, tinctures, tonic, maceration and baths and bathing remedies and

dry extract (pills or capsules). Application of herbal formulations for the treatment of certain diseases- Jaundice, Fever, Cardiac, Infertility, Diabetics, Blood pressure, Skin care and Respiratory diseases.

Unit-V

(12 Hours)

Pharmaceutical plant products- alkaloids, glycosides, terpenoids, tannins, flavonoids, lipids, proteins. Nutraceuticals, cosmeceuticals, pharmaceuticals - fibre, sutures, surgical dressings, adaptogens, rasayana. Drug adulteration and methods of evaluation-physical, chemical and microscopic. NMPB, CDRI, CIMAP, CIPLA; WHO regulation and Guidelines for quality control and trade of herbal medicine.

Books

1. Evans, 2009. Pharmacognosy, Elsevier Publications, Edinburgh.
2. James Green, 2000 Herbal Medicine-Maker's Handbook, Crossing Press, U.S.
3. Weiss, Rudolf Fritz 2000 Herbal Medicine, 2nd Edition Thieme Medical Publishers
4. Kokate CK, Purokit AP and Gokahale, 2006. Pharmacognosy, NiraliPrakashan.
5. Somasundara, S 1997. Maruththuva Thavaraiyal, Ilangovan Padhippagam, Palayamkottai
6. Cultivation of Medicinal and Aromatic crops by A.A. Farooqui and B.S. Sreeramu (2004)
7. Quality control and evaluation of Herbal Drugs by Pulok.K. Mukarjee (2019)

Online Resources

1. <http://www.gallowglass.org/jadwiga/herbs/preparations.html>
2. <http://shawnacohen.tripod.com/thetribaltraditions/id51.html>
[http://www.vasundharaorissa.org/Research%20Reports/Globalisation And](http://www.vasundharaorissa.org/Research%20Reports/Globalisation%20And)
3. http://www.emea.europa.eu/docs/en_GB/document_library/Scientific_guideline/2009/09/WC500003393.pdf

Semester	Course Code					Title of the Course					Hours	Credits
III	21PBO3CC08					CORE-08: PHARMACOGNOSY					4	3
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	1	3	3	3	1	2	2	2.3	
CO-2	2	2	3	1	2	1	3	3	2	3	2.2	
CO-3	3	3	3	2	3	2	3	3	2	3	2.7	
CO-4	3	1	3	2	3	2	3	1	2	2	2.2	
CO-5	2	3	2	2	3	1	1	2	3	2	2.1	
Mean Overall Score											2.30	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3CP06	LABORATORY COURSE 6: RESEARCH METHODOLOGY	3	2

Research Methodology

1. Sampling
2. Collection of data
3. Classification of data
4. Diagrammatic representation of data
5. Measures of central value
6. Measures of dispersion
7. Test of significance
8. Bibliometrics
9. H-Index

Pharmacognosy

1. Chromatographic separation of amino acids (paper) and lipids (TLC).
2. Spectrophotometry: Standard graphs for proteins. (BSA), Glycine and Glucose.
3. Sampling
4. Classification of data.
5. Diagrammatic representation of data.
6. Measures of Central values.
7. Measures of dispersion.
8. Test of significance.
9. Identification and uses of locally available medicinal plants parts – Leaf: *Andrographis paniculata*, *Cardiospermum helicacabum* and *Cymbopogon citratus*. Rhizome: *Acorus calamus*, *Alpinia galanga* and *Curcuma longa*. Tubers: *Asparagus racemosus*, *Gloriosa superba* and *Withania somnifera*. Root: *Hemidesmus indicus*, *Vetiveria zizanioides* and *Achyranthus aspera*. Flower: *Syzygium aromaticum*, *Cassia auriculata* and *Hibiscus rosa-sinensis*. Bark: *Cinnamomum verum*, *Terminalia arjuna* and *Saraca asoca*. Seeds: *Ocimum basilicum*, *Trigonella foenum-graecum*, and *Trachyspermum ammi*. Fruits: *Piper longum*, *Ficus racemosa* and *Garcinia gummi-gutta*.
10. Preparation of aqueous, methanolic and ethanolic leaf extracts of medicinal plants using soxhlet apparatus.
11. TLC separation of plant components.
12. Antimicrobial screening of bioactive principles of medicinal plants.
13. Preparation of ointment using plant materials.
14. Preparation of rejuvenating herbal foods.
15. Qualitative analysis of phytochemicals (Brinda *et al.*, 1981).

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3ES03A	DSE-3: ORGANIC FARMING	5	4

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	summarize the aims and objectives of organic farming and identify the regulations governing organic farming.	K1 & K2
CO-2	apply the acquire knowledge about organic Certification process and procedure.	K3
CO-3	integrate the skill to become an entrepreneur.	K4
CO-4	check the practices involved in maintaining soil fertility and plant productivity.	K5
CO-5	plan a proper pest management strategy for various crops.	K6

Unit- I (15 Hours)

Concepts and scope of organic farming, Requirements for organic farming, Farm components for an organic farm. Conversion to organic farming- Process, green card systems and subsidies. Fundamentals of Livestock farming, animal behavior, Poultry management.

Unit-II (15 Hours)

Types of Farming, Concept of different cropping systems in relation to Organic Farming (Inter cropping), nutrient uptake and balanced nutrient supply, organic manure, green and liquid manure, biofertilizers and their method of use, Compost: decomposition, manure – Types vermicompost: Scope and importance, use of vermi castings in organic farming, Potentials and constraints for vermiculture in India.

Unit-III (15 Hours)

Soil formation, types of soil according to composition, methods of increasing soil productivity and fertility, Cultivation of crops with organic inputs: field crops and leguminous crops. Plant protection measures: integrated pest and disease management, biopesticides, treatment methods, importance of neem in organic agriculture.

Unit-IV (15 Hours)

Organic crop production methods- sugarcane, mango, ginger, medicinal and ornamental crops. Green labels, Bio-fuel crops. Integrated Nutrient Management (INM) and Integrated Plant Nutrient Supply System (IPNS). Organic produce quality considerations, certification, accreditation process, marketing and Economics.

Unit-V (15 Hours)

National and international status of organic farming. Agencies and institutions related to organic farming. Organic Food Quality and Human Health. Entrepreneurship Development- Concept, characteristics and approaches. Income generation activities: Apiculture, Mushroom production, Organic milk production.

Books for Study

1. S.P. Palaniappan and K. Annadurai. 2007 Organic Farming – Theory and Practice. Scientific Publishers (India).
2. Lakshmi, Narasaiah M. 2010. Agriculture and Water Management. Discovery publishing House, New Delhi

Books for Reference

1. P.K. Gupta. 2012. Vermicomposting for sustainable Agriculture. Agrobios.
2. N. Kumar. 2010. Introduction to Horticulture. Oxford & Ibh Publishing Co. Pvt. Ltd.
3. Kristensen, P., Taji, A. and Reganold, J. (2006). Organic Agriculture: A Global Perspective. CSIRO Press, Victoria, Australia.

Semester	Course Code					Title of the Course					Hours	Credits
III	21PBO3ES03A					DSE-3: ORGANIC FARMING					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	2	3	2	3	2	2	3	1	2	3	2.3	
CO-2	1	2	3	2	2	3	2	3	2	2	2.2	
CO-3	1	2	3	2	2	3	3	2	2	3	2.3	
CO-4	3	2	2	3	1	3	3	1	2	3	2.3	
CO-5	2	3	2	1	3	1	2	2	3	3	2.2	
Mean Overall Score											2.3	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3ES03B	DSE-3: BIOINFORMATICS AND BIONANOTECHNOLOGY	5	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	study the basic elements of interface, concepts between biology and nanotechnology.	K1
CO-2	outline the basics of sequence alignment and analysis.	K2
CO-3	classify different types of biological databases.	K3
CO-4	explain the synthesis approaches for nanomaterial and its characterization.	K4
CO-5	construct various types of nanomaterial for application and evaluate the impact on environment.	K5 & K6

Unit-I (15 Hours)

Overview of Bioinformatics, Need for Bioinformatics technology, Data format and processing, secondary resources and applications. Role of structural bioinformatics, Biological data integration system. Bioinformatics and its applications. Biological Database Retrieval System - NCBI, PUBMED, EBI, EMBL, DDBJ and Gen- Bank.

Unit-II (15 Hours)

Database searches for homology using BLAST and FASTA. Proteomic data bases - Swiss-Prot, Uni-Prot, ExPASy and PDB. RNA data bases-Rfam and GtRNA. Phylogenetic analysis- Construction of Phylogenetic tree with reference to DNA and Protein sequences. Biological importance of computerized Phylogenetic analysis.

Unit-III (15 Hours)

Nanotechnology – definition, origin, scope and importance. Principles: quantization effects - inverse relationship between size and reactive surface area. Properties: surface effects, the effects of size, shape and surface area. Advances made with plant nanobionics-bomb detection, glowing plants, augmented photosynthesis, etc. Essentials of nanostructure generation: top-down vs. bottom-up. Physical, chemical and biogenic synthesis of nanomaterials - biomimetics, green plants and microorganisms. Role of biomolecules - reducing and/or capping agents: proteins, viruses and carbohydrates.

Unit-IV (15 Hours)

Detection and measurement of nanoparticles - physical characterization by UV, FTIR, SEM, FESEM, DLS, X-ray diffraction and Zeta potential. Targeted nanoparticles: active & passive targeting. Application: medicine, manufacturing & materials, delivery vehicles, cancer therapy, tissue engineering, fluorescent biological labels, biological assays, imaging agents, biosensors, manipulation of cells and biomolecules.

Unit-V (15 Hours)

Interactions between nanoparticles and living systems, interaction with cells, exposure of living systems to nanomaterials - toxicity effects. Mediators of the toxicity of particles. Factors influencing the interaction of nanomaterials over mammalian cells: uptake, transport and

biodistribution of nanoparticles in living system, toxicity on cellular processes. Overview of EU regulatory aspects.

Books for Study

1. Sharon, M. & Sharon, M 2012. Bio-Nanotechnology- Concepts and Applications, CRC Press.
2. Atkinson WI.2011. Nanotechnology. Jaico Book House, New Delhi.
3. Imtiaz Alam Khan. (2005). Elementary bioinformatics. Pharma Book Syndicate, Hyderabad.
4. Rastogi, S.C., Medirattta, N. and Rastogi. P. (2004). Bioinformatics, methods and applications, genomics, proteomics and drug discovery, Prentice hall of India, Pvt. Ltd., New Delhi.
5. Nalwa HS. 2005. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology. American Scientific Publ.
6. Niemeyer CM & Mirkin CA. 2005. Nanobiotechnology. Wiley Interscience.
7. Introduction to Nanoscience, S.M. Lindsay, Oxford universal Press, First Edition, 2010
Nanotechnology: Understanding small system, Ben Rogers, Sumita Pennathur and Jesse Adams, CRC Press, Second edition, 2011.

Books for References

1. Barbara Panessa-Warren, 2006 Understanding cell-nanoparticle interactions making nanoparticles more biocompatible. Brookhaven National Laboratory
2. European Commission, SCENIHR, 2006. Potential risks associated with engineered and adventitious products of nanotechnologies, European Union
3. Gysell Mortimer, 2011. The interaction of synthetic nanoparticles with biological systems PhD Thesis, School of Biomedical Sciences, Univ.of Queensland.
4. Jain K.K. Nanobiotechnology molecular diagnostics: Current techniques and application (Horizon Bioscience) 2006 Taylor & Francis 1st edition.

Web Resources

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/>
2. <https://phys.org/news/2014-10-endless-possibilities-bio-nanotechnology.html>
3. <http://www.particle-works.com/applications/controlled-drug-release/Applications>

Semester	Course Code					Title of the Course					Hours	Credits
III	21PBO3ES03B					DSE-3: BIOINFORMATICS AND BIONANOTECHNOLOGY					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	3	2	1	2	2	3	2	1	2	2.1	
CO-2	2	3	2	2	2	2	3	2	2	3	2.3	
CO-3	2	2	3	2	1	2	2	3	2	2	2.1	
CO-4	1	2	2	3	2	2	3	2	3	2	2.2	
CO-5	1	2	2	3	2	2	3	2	1	3	2.1	
Mean Overall Score											2.2	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21PBO3EG02	Generic Elective - 2 (BS): HORTICULTURE AND LANDSCAPING	4	3

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	learn the brief history, divisions, classification and structure of horticultural and production of horticultural crops.	K1
CO-2	highlight the aesthetics of horticulture and post-harvest handling of techniques and marketing.	K2
CO-3	evaluate and analyse different landscaping and planting techniques.	K3 & K4
CO-4	develop practical skills in micro propagation techniques, bonsai, topiary techniques and wet and dry flower decorations.	K5
CO-5	design propagation methods and propagation through various specialized underground structures.	K6

Unit-I: (12 Hours)

Importance and scope of horticulture; divisions of horticulture; climate, soil and nutritional needs. Plant propagation methods - Cutting, Grafting, Budding and Layering. Natural horticultural gardening in India.

Unit-II: (12 Hours)

Indoor gardening - foliage, flowering plants and hanging basket. Terrarium, Bonsai and topiary plants. Floriculture –cultivation of commercial flower crops - rose, orchids and *Anthurium*. Flower decoration-dry and wet.

Unit-III: (12 Hours)

Fruit crops - induction of flowering, flower thinning, fruit setting and development. Cultivation of important fruit crops - Mango and Guava.

Unit-IV: (12 Hours)

Landscaping principles - planning design for house gardens, institutional and industrial gardens- bioaesthetic, avenue planting, railway planting- Avenue trees, shrubs, climbers, herbs and ground covers, pruning - tree transplantation.

Unit-V: (12 Hours)

Lawns: different grasses, maintenance of lawns and rockeries; special types of gardens - vertical garden, roof /terrace garden, bog garden, water garden, planning parks and public garden.

Books for Study

1. Arora JS. 1992. Introductory Ornamental Horticulture, Kalyani Publishers, New Delhi.
2. George Acquaah. 2002. Horticulture Principles and Practices, 2nd Edn. Pearson Edn, Delhi.

Books for References

1. Manibushan Rao K. 1991. Text book of horticulture. MacMillan Publishing Co., New York.
2. Edmond JB et al., 1977. Fundamentals of horticulture. Tata McGraw Hill Ltd., New Delhi.
3. Rao KM. 2000. Text Book of Horticulture, MacMillan India Ltd., New Delhi.
4. Gopalswamy Iyyangar, 1970. Complete gardening in India, Kalyan Printers, Bangalore.

Semester	Course Code					Title of the Course					Hours	Credits
III	21PBO3EG02					GENERIC ELECTIVE-2 (BS): HORTICULTURE AND LANDSCAPING					4	3
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	2	2	3	3	2	2	3	2	2.4	
CO-2	2	3	2	3	2	1	3	2	2	3	2.3	
CO-3	2	3	3	2	2	3	2	2	3	1	2.3	
CO-4	3	3	2	2	2	3	2	3	1	2	2.3	
CO-5	2	2	3	1	3	2	2	3	2	3	2.3	
Mean Overall Score											2.3	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4CC09	CORE-9: MICROBIOLOGY AND IMMUNOLOGY	5	5

CO No.	CO- Statements	Cognitive Levels (K- levels)
On successful completion of this course, students will be able to:		
CO-1	understand the various types of microbes in an environment and their importance.	K1
CO-2	demonstrate the role of microorganisms in food processing and spoilage, soil fertility and sewage disposal	K2
CO-3	assess role of microorganisms in industrial processing of microbial products	K3
CO-4	distinguish the structure and function of immune system in humans.	K4
CO-5	evaluate and justify the defence mechanism against infection in plants and humans.	K5 & K6

Unit-I: (15 Hours)

Scope, branches and history. Structure and organization of Bacteria, Actinomycetes. Brief study on Spirochetes, Rickettsias, Chlamydias and Mycoplasmas, Viruses – Structure, organization, replication. Brief account on Viroids, virusoids and prions. Culture of microorganisms: synchronous, batch and continuous culture. Chemostat and turbidostat, Methods of preservation of microbes.

Unit-II: (15 Hours)

Food, dairy and environmental microbiology. Source of Microbial contamination of food; food poisoning and food-borne infections. Methods of food preservation. Microbial contamination of milk, milk-borne diseases - preservation of milk and dairy products. Soil microbes and their role in biogeochemical cycling.

Unit-III: (15 Hours)

Industrial microbiology: selection of industrially useful microbes, fermentation processes, recovery of end products; production of alcohol, insulin, lactic acid, single cell oil and single cell protein. Common immunizations, antibiotics and other chemotherapeutic agents and their mode of action. Drug resistance in microbes.

Unit IV: (15 Hours)

Immunology: Role of genes in plant and animal immune system. Plant innate immunity: Role of Salicylic Acid, Jasmonate and Ethylene Signaling, Pre-existing-structural innate mechanisms: The wax layer and cuticle, Cytoskeleton, Hydathodes, Lenticles, Guard cells, Trichomes, Idioblasts. Pre-existing biochemical innate mechanisms: Anti-microbial compounds, Toxic inhibitors, Phytoanticipins and Phytohormones. Immune cells - haemopoiesis -detailed study of T and B cells, MHC molecules and antigen processing and presentation. General structure of antibodies. Immunological role of Monoclonal antibodies.

Unit V: (15 Hours)

Antigens - types, antigenicity and immunogenicity. Antigen-antibody interaction. Types of immunity - innate and adaptive - emphasis on cell mediated and humoral immune responses. Immune response during bacterial (Tuberculosis), parasitic (malaria) and viral (HIV) infections. Autoimmune disorders. Vaccines and their mode of action.

Books for Study

1. Sullia, S.B. and Shantharam, S. 1998. General Microbiology. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi **Unit-II and Unit-III**
2. Pelczar, M.J., Reid, R.D. and Chan, E.C.S. 1983. Microbiology, Tata McGraw Hill Publishing Co., New Delhi. **Unit I**
3. Prescott et al., 2009 7e, Microbiology. Wm. C. Brown Publishers.
4. Kuby J, 2000, Immunology, 4th edition, WH Freeman.

Books for Reference

1. Reed, G. 1983. Prescott & Dunn's Industrial Microbiology. 4th ed. AVI Publishing Co., Connecticut, USA.
2. Adams MR and Moss MO, 2008, Food Microbiology. Royal Soc. Chem., Cambridge, UK.
3. Dickinson M. 2003. Molecular Plant Pathology. BIOS Scientific Publishers, London.
4. Roitt et al., 1998, Immunology 5th edition, Mosby International Ltd. London. UK.
5. GUIDO SESSA 2013. Molecular Plant Immunity. John Wiley & Sons, Inc. USA
6. František Baluška 2015. Signaling and Communication in Plants, Springer, New York.

Semester	Course Code					Title of the Course					Hours	Credits
IV	21PBO4CC09					CORE-9: MICROBIOLOGY AND IMMUNOLOGY					5	5
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	3	2	2	2	3	3	3	2	2	2.5	
CO-2	2	3	2	2	2	2	2	2	2	3	2.2	
CO-3	3	3	3	2	2	3	3	2	2	2	2.5	
CO-4	3	3	3	3	1	3	3	3	3	1	2.6	
CO-5	2	2	2	2	3	2	2	2	2	3	2.2	
Mean Overall Score											2.4	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4CC10	CORE-10: GENETIC ENGINEERING AND BIOTECHNOLOGY	5	5

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, student will be able to		
CO-1	understand the principles of genetic engineering.	K1
CO-2	learn the types and application of cloning vectors.	K2 & K3
CO-3	study and analyse different types of gene transfer methods.	K4
CO-4	design protocol for plant tissue culture.	K5
CO-5	compile the principles and application of Intellectual Property Rights.	K6

Unit-I: (15 Hours)

Agrobacterium mediated gene transfer and Crown gall; **Nucleases:** Exonucleases and Endonucleases, **Restriction Enzymes:** (Type I - V), RNases and Eukaryotic (cDNA). **Methylases:** CpG Methylase, Dam Methylase, Dcm Methylase; Polymerases: DNA Pol I, Klenow Fragments, Reverse Transcriptase, Taq & Pfu Polymerases. **Ligases:** T4 DNA Ligase, E. coli DNA Ligase, T4 RNA Ligase **Topoisomerases:** Type I (A, B) & Type II (A, B) End Modifying Enzymes: Terminal Transferase, T4 Polynucleotide Kinase, Alkaline Phosphatases. Linkers and Homopolymers.

Unit-II: (15 Hours)

Features of Cloning vectors: ideal cloning vehicles: Natural vectors (E. coli and *Agrobacterium* based), *in vitro* vectors (pBR), ssrDNA vectors (M13) and shuttle vectors. Human Artificial Chromosomes (HACs). Expression of cloned genes - problems and solution. Cloning strategies - cDNA libraries and genomic libraries.

Unit-III: (15 Hours)

Metagenomics. Engineered microbes - bioremediation of oil spills: oil-eating super bugs (*B. megatarium*, *P. putida* & *A. borkumensis*); Bt crops, golden rice technology, plantibodies and edible vaccines. Strategies for crop improvement: engineering for resistance against herbicides and diseases. Antisense RNA technology, CRISPR

Unit-IV: (15 Hours)

Technology protection systems (GURT) - terminator gene technology. Biosafety aspects of GMOs and GM foods. Principles of biosafety; potential risks; environmental impacts; safety of food and animal feed derived from GM crops; and patterns of gene flow. Issues concerning release of Bt-brinjal. Essentials of IPRs and patents.

Unit-V: (15 Hours)

Synthetic biology-scope and importance. Artificial DNA and synthetic genome. Contribution of JC Venter. Minimal genome, expanded gene pool. Creation of synthetic and commercially available products. Potentials and applications; ethical issues of synthetic organisms.

Books for Study

1. Old RN and Primrose S B. 2004, Principles of Gene Manipulation - Blackwell Sci., USA.

2. JD Watson, MGilman, JWitkowski and MZoller 1992. Recombinant DNA (12th Edition), WH Freeman Co., New York.

Books for Reference

1. Presidential Commission for the Study of Bioethical Issues, 2010. (www.bioethics.gov)
2. ETC Group, Canada, 2010. Extreme Genetic Engg - an introduction to synthetic biology.
3. Young, E and Alper, H, 2010. Synthetic Biology: A Review. Journal of Biomedicine and Biotechnology.

Semester	Course Code					Title of the Course					Hours	Credits
IV	21PBO4CC10					CORE-10: GENETIC ENGINEERING AND BIOTECHNOLOGY					5	5
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	3	2	2	3	3	2	3	2	2.5	
CO-2	2	3	2	3	2	2	3	2	2	3	2.4	
CO-3	2	2	3	2	3	3	3	2	3	1	2.4	
CO-4	3	3	3	3	1	3	3	3	3	1	2.6	
CO-5	2	2	2	2	3	2	2	2	2	3	2.2	
Mean Overall Score											2.42	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4CC11	CORE-11: CELL AND MOLECULAR BIOLOGY	4	3

CO. No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	recognize the structural, organization and function of different cell organelles.	K1
CO-2	explain the genetic code and its perpetuation.	K2
CO-3	differentiate the basic cellular and molecular events.	K3
CO-4	apply the knowledge acquired to interpret the molecular mechanisms.	K4 & K5
CO-5	critique the principles of gene regulation.	K6

Unit-I (12 Hours)

Phases and control system of cell cycle, Cell cycle checkpoints - DNA damage, centrosome duplication, spindle assembly. Cyclins and Cyclin-dependent kinases, apoptosis. Cytoskeleton structure and functions: actin filaments (microfilaments), microtubules, and intermediate filaments.

Unit-II (12 Hours)

Cell communication: general principles, Signaling molecules and their receptors. Receptors: Cell surface receptors - ion-channel linked receptors, G-protein coupled receptors, and Tyrosine-kinase linked receptors (RTK), Programmed cell death.

Unit-III (12 Hours)

Transcription: RNA polymerases and their role. Transcription signals - promoters and terminators. Detailed account of transcription in *E. coli* and eukaryotes. Differences between the prokaryotic and the eukaryotic transcription, Post transcriptional modifications of mRNA (5'CAP formation, poly adenylation, spliciosome assembly, splicing editing). Organization of mRNA, RNA editing, mRNA export.

Unit-IV (12 Hours)

Translation: Genetic code – introduction, important features of the genetic code, exceptions to the standard code. Mechanism of translation in prokaryotes and eukaryotes. Differences between prokaryotic and eukaryotic protein synthesis. Protein sorting and translocation: Post-translational modification of proteins, Protein folding-self-assembly and role of chaperones.

Unit-V (12 Hours)

Gene regulation: Operon model - Inducible and repressible systems. Attenuation, positive and negative regulation. *lac* and *trp* operons of *E. coli*. Regulation of eukaryotic gene expression. Gene families and hormonal control in eukaryotes. Gene silencing: transcriptional and post transcriptional gene silencing.

Books for Study

Malacinski GM. 2015. Essentials of Molecular Biology. Jones and Bartlett, Boston, USA.

Books for Reference

1. Cooper M 2000. The Cell-a molecular biology approach. 2nd ed. Sinauer Associates, Massachusetts.
2. Lodish et al 2004. Molecular Cell Biology, COH freeman & Co. New York.
3. Watson JD et al. 2004. Molecular biology of the gene, Pearson education, Singapore.
4. Gardner et al. 2004. Principles of genetics. John Wiley & Sons Inc. Singapore.
5. Veer Bala Rastogi, 2016. Principles of Molecular Biology, Medtech publishers, New Delhi.

Semester	Course Code					Title of the Course					Hours	Credits
IV	21PBO4CC11					CORE-11: CELL AND MOLECULAR BIOLOGY					4	3
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	3	2	2	2	2	3	2	2	2	2	2.2	
CO-2	3	1	2	2	3	3	2	2	2	2	2.2	
CO-3	2	2	2	2	2	2	2	2	1	2	1.9	
CO-4	2	1	3	2	2	2	3	2	2	3	2.1	
CO-5	2	2	2	3	2	2	2	2	1	2	2.0	
Mean Overall Score											2.08	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4CP07	LABORATORY COURSE 7: MICROBIOLOGY, IMMUNOLOGY, GENETIC ENGINEERING AND BIOTECHNOLOGY	4	3

Experiments

1. Isolation and enumeration (CFU) of microorganisms in soil by serial dilution.
2. Bacterial staining: Differential staining – Gram's Staining.
3. Isolation of bacteria from skin, mouth and urine.
4. Potability test of water - presumptive, confirmative and completed tests.
5. Quantitative estimation of bacteria in milk.
6. Testing quality of milk by methylene blue reductase (MBRT) and phosphatase test.
7. Morphological and biochemical identification of bacteria - indole test, methyl red test, Voges-Proskauer test, Citrate utilization test, TSI agar test.
8. Blood grouping
9. WIDAL- test for typhoid
10. RPR- test for syphilis
11. RF- test for rheumatoid arthritis
12. Immuno-diffusion assay – single radial Immuno-diffusion
13. ELISA-Demo
14. Identification of local crop diseases (sugar cane, paddy, banana, brinjal and citrus).
15. Callus induction and regeneration.
16. Clonal propagation.
17. Embryo culture
18. Electrophoretic separation of DNA, protein and restriction digestion.
19. Preparation of synthetic seeds.

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4ES04A	DSE-4: INTELLECTUAL PROPERTY RIGHTS	5	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
On successful completion of this course, students will be able to		
CO-1	understand the concept and procedure of IPR.	K1
CO-2	know the status of IPR in India.	K2
CO-3	evaluate the difference between patent, copy right and trademark.	K3 & K4
CO-4	analyse the benefits of patent, copy right and trademark.	K5
CO-5	prepare applications for patent, copy right and GI.	K6

Unit-I (15 Hours)

Intellectual Property Rights – Introduction, Concept and Theories, Kinds of Intellectual Property Rights, Need for intellectual property right, Advantages and Disadvantages of IPR. International Regime Relating to IPR – TRIPS, WIPO, WTO, GATTs. IPR in India genesis and development.

Unit-II (15 Hours)

Patent – introduction, Patent acts and its amendments. Patentable and Non patentable inventions. Process and product patent, double patent, patent of addition. Patent application process - Searching a patent, Drafting of a patent, filling of a patent, Types of patent applications-national, regional and international, patent document: specification and claims. Infringement.

Unit-III (15 Hours)

Copy right – concepts and principles. Historical background and development of copyright law – Copy right act, Berne Convention, Universal Copyright Convention, WIPO Phonograms and Performances treaty. Conditions for grant of copyright. Copyright in Literary, Dramatic and musical works, sound recording, cinematograph films and computer programme. Right of Broadcasting and performers. Copyright Board - Power and functioning.

Unit-IV (15 Hours)

Trademark – introduction, examples of well-known trademark. Historical development of the concept of trademark and trademark law-National and International. Kinds of trademarks. Procedure for registration of trademark. Infringement of trademark.

Unit-V (15 Hours)

Geographical Indication – introduction, types. GI laws. Indian GI act. Traditional knowledge and IPR. Public health and Intellectual Property Rights – case study. New plant varieties protection laws – need and benefits. Patenting of microorganism. IPR and Climate change. Patents and Biotechnology.

Books for Study

Venkataraman M. 2015. An introduction to Intellectual property rights. Create space Independent Pub.North Charleston, USA.

Books for Reference

1. Gopalakrishnan N.S. & T.G. Agitha, (2009), Principles of Intellectual Property, Eastern Book Company, Lucknow.
2. Ramakrishna B and Anil Kumar, HS. 2017. Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers, Notion Press, Chennai.
3. James Boyle, Jennifer Jenkins, 2018. Intellectual Property: Law & the Information Society— Cases and Materials, Create space Independent Pub. North Charleston, USA.
4. Damodar Reddy S.V. 2019. Intellectual Property Rights -- Law and Practice, Asia Law House, Hyderabad.

Semester	Course Code					Title of the Course					Hours	Credits
IV	21PBO4ES04A					DSE-4: INTELLECTUAL PROPERTY RIGHTS					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	2	3	2	2	1	2	2	2	2	2	2.2	
CO-2	2	3	2	2	1	2	2	2	2	3	2.1	
CO-3	2	2	3	2	2	2	2	2	2	1	2.0	
CO-4	2	2	2	3	2	2	2	2	2	3	2.2	
CO-5	2	2	2	2	3	1	2	2	2	2	2.2	
Mean Overall Score											2.1	
Result											Medium	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4ES04B	DSE-4: GENETICS	5	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
Upon completion of this course, graduates will		
CO-1	understand the principles of linkage, crossing over and the hereditary mechanisms.	K1 & K2
CO-2	examine the structure and functions of genetic materials.	K3
CO-3	explain the organization of prokaryotic and eukaryotic genomes.	K4
CO-4	justify and outline the mechanisms of DNA repair.	K5
CO-5	compose the dynamics of genetic variation and data interpretation.	K6

Unit-I (15 Hours)

Mendel and his work: Laws of inheritance. Back cross and Test cross. Gene interaction and Modified Mendelian ratios. Quantitative inheritance and multiple alleles. Problem solving in genetics.

Unit-II (15 Hours)

Linkage and crossing over, 3-point cross and gene mapping methods. DNA is the genetic material: Griffith's experiment, Avery et al., and Hershey and Chase experiment; RNA as genetic material - Experiment of Fraenkel and Singer.

Unit-III (15 Hours)

Organization of eukaryotic and bacterial genomes- transformation, transduction (generalized and specialized), conjugation (F factor mediated, Hfr and Sexduction). Fine structure of the Gene: Cistron, muton and recon, Watson and Crick model of DNA helix, Semi-conservative replication mechanism of DNA: replication of linear and circular DNA, Replication of RNA genomes.

Unit-IV (15 Hours)

Molecular mechanisms of DNA repair (mismatch and proof reading, photo reactivation, excision, recombination and SOS repair). Mobile genetic elements- IS elements and transposons in maize and bacteria. Beneficial and harmful effects of mutations.

Unit-V (15 Hours)

Population genetics: gene frequency, gene pool, Hardy-Weinberg equilibrium. Gene frequencies-conservation and changes. Decline of human gene pool and eugenics. Genomics: Arabidopsis genome and rice genome. Gene therapy with reference to Haemophilia, Stem cells- Definition, types & sources.

Books for Study

1. Malacinski GM and Freifelder D 2008. Essentials of Molecular Biology, 4th E Jones & Bartlett.
2. Verma, P.S. & V.K. Agarwal, 2003, Genetics. S. Chand, New Delhi.

Books for References

1. Gardner E J, Simmons M J, Snustad D P (1991). Principles of Genetics (III Edn). John Wiley and Sons Inc. 8th Edn., New York.

2. Strickberger (2005). Genetics (III Edn).Prentice Hall of India Pvt. Ltd.
3. D Peter Snustad and Michael J Simmons (2010). Principles of Genetics. John Wiley & Sons

Semester	Course Code					Title of the Course					Hours	Credits
IV	21PBO4ES04B					DSE-4: GENETICS					5	4
Course Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean score of COs	
CO-1	2	2	2	2	3	2	2	3	2	2	2.2	
CO-2	3	2	2	1	2	1	3	3	2	3	2.2	
CO-3	1	2	3	2	3	2	3	2	3	2	2.3	
CO-4	2	2	1	3	2	2	3	2	3	3	2.3	
CO-5	2	2	2	2	3	1	3	2	3	3	2.3	
Mean Overall Score											2.3	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21PBO4CE01	COMPREHENSIVE EXAMINATION	-	2

Unit I:

Classification, structure and reproduction of Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms, Ecology and Evolutionary trends. Levels of organization of tissues, organs & systems. Nodal anatomy, stomatal types; Shoot and root development; floral meristems and floral development, microsporogenesis, endosperm, embryo development and apomixis.

Unit II:

Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle, structure & function of cytoskeleton, signaling through G-protein coupled receptors, signal transduction pathways; DNA replication, repair and recombination, Protein synthesis and gene expression; Methods of genetic transfers – transformation, conjugation, transduction, germinal verses somatic mutants, Structural and numerical alterations of chromosomes

Unit III:

Light harvesting complexes; mechanisms of electron transport, CO₂ fixation-C₃, C₄ and CAM pathways. Nitrogen metabolism, plant hormones- physiological effects, phytochromes, photoperiodism, Plant response to biotic and abiotic stress. Composition, structure and function of biomolecules (carbohydrates, lipids, proteins), Principles of catalysis, enzyme kinetics and enzyme regulation, Conformation of proteins (Ramachandran plot, secondary structure, domains, motif and folds).

Unit IV:

Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy of plants; Concept of habitat and niche, Ecosystem structure; ecosystem function; energy flow and mineral cycling, biogeographical zones of India. Rare, endangered species. Conservation strategies. Environmental pollution; global environmental change

Unit V:

Cells and molecules involved in innate and adaptive immunity, antigens, inflammation, hypersensitivity and autoimmunity; Microbial fermentation, Application of immunological principles, vaccines, diagnostics. Tissue and cell culture methods for plants and animals. Bioremediation and phytoremediation, Biosensors, RFLP, RAPD and AFLP techniques; Measures of central tendency and dispersal, Levels of significance; Regression and Correlation; t-test.

B.Sc. BOTANY
SYLLABUS - 2017

SCHOOLS OF EXCELLENCE
with
CHOICE BASED CREDIT SYSTEM (CBCS)



SCHOOL OF BIOLOGICAL 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 TANSCH 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 Practicals Project Work	11-16 3-6 1	90	60	98
	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)	
IV	VI	Internship	1	-	2	23
	V	Skilled Based Electives: Between Schools (BS)	1	2	2	
	VI	Within School (WS)	1	2	2	
	V	Inter Departmental Courses (IDC) Soft Skills / NCC	1	2	2	
	I	Non-Major Courses (NMC) Communicative English	1	-	5	
	II	Computer Literacy	1	2	2	
V	III	Environmental Studies (Partial Online Course)	1	2	2	5
	I-IV	Value Education	4	8	8	
	I-V	SHEPHERD & Gender Studies	-	-	-	
	I-V	AICUF, Fine Arts, Nature Club, NCC, NSS	-	-	-	
	V	Career Guidance & Training	-	-	-	150 (+4 extra credits)
		TOTAL		180	150	

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	UBO	1	3	2	01

For Example :

I B.Sc. Botany, first semester **Algae and Bryophytes**

The code of the paper is 17UBO130201.

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:

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

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 is adopted 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 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 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. BOTANY
Course Pattern - 2017 Set

Sem	Part	Code	Subject Title	Hr	Cr	
I	I	Language	17UGT110001	Language – I: (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE120101	General English I	5	3
	III	Core	17UBO130201	Algae and Bryophytes	5	3
			17UBO130202	Fungi, Plant Pathology and Lichens	5	3
			17UBO130203	Lab Course 1	3	2
		Allied	17UBO130401	Allied I: Zoology I: General Zoology	4	3
	17UBO130402		Allied I: Lab. Course: Zoology I	2	2	
	IV	NMC	17UCE140801	Communicative English	-	5
Val. Edn.	17UFC141001	Essentials of Humanity	2	2		
Total for Semester I				30	26	
II	I	Language	17UGT210002	Language – II: (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE220102	General English II	5	3
	III	Core	17UBO230204	Pteridophytes, Gymnosperms and Paleobotany	4	3
			17UBO230205	Anatomy and Embryology	4	3
			17UBO230206	Lab Course 2	3	2
		Allied	17UBO230403	Allied I: Zoology II: Agricultural Entomology	4	3
			17UBO230404	Allied I: Lab. Course: Zoology II	2	2
			IV	NMC	17UCE240802	Computer Literacy
	V. Edn.	17UFC241002	Fundamentals of Human Rights	2	2	
Total for Semester II				30	23	
III	I	Language	17UGT310003	Language – III: (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE320103	General English III	5	3
	III	Core	17UBO330207	Taxonomy of Angiosperms	5	3
			17UBO330208	Plant Breeding and Evolution	3	2
			17UBO330209	Lab Course 3	3	2
			17UBO330405A	Allied II: Chemistry for Biologists I (or)	4	3
		17UBO330405B	Allied II: Biometrics & Computer Applications I			
		17UBO330406	Allied II: Lab. Course 1			
		Extra Credit Course	17UBO330501	Massive Open Online Course	-	(2)
	IV	NMC	17UCE340901	Environmental Studies	2	2
	Val. Edn.	17UFC341003A	Formation of Youth-I (or)	2	2	
		17UFC341003B	Religious Doctrine-I			
Total for Semester III				30	22+(2)	

IV	I	Language	17UGT410004	Language – IV: (Tamil/Hindi/French/Sanskrit)	4	3
	II	English	17UGE420104	General English IV	5	3
	III	Core	17UBO430210	Cell Biology and Genetics	5	4
			17UBO430211	Molecular Biology	5	3
			17UBO430212	Lab Course 4	3	2
		Allied	17UBO430407A	Allied II: Chemistry for Biologists II (or)	4	3
			17UBO430407B	Allied II: Biometrics & Computer Applications II		
			17UBO430408A	Allied II: Lab Course 2 (or)	2	2
	IV	Val. Edn.	17UBO430408B	Allied II: Lab Course 2		
17UFC441004A			Formation of Youth-II (or)	2	2	
		17UFC441004B	Religious Doctrine-II			
Total for Semester IV					30	22
V	III	Core	17UBO530213	Biophysics and Biostatistics	6	3
			17UBO530214	Ecology and Climate Change	5	3
			17UBO530215	Lab. Course 5	3	2
			17UBO530216	Microbiology and Immunology	5	3
			17UBO530217	Lab. Course 6	3	2
			17UBO530218	Self-Paced Learning: Economic Botany	-	2
		Extra Credit Course	17UBO530502	Extra Credit Course	-	(2)
			Core Elec.	17UBO530301A	Biopesticides (or)	4
	17UBO530301B	Medicinal Botany				
		IV	SB Elec.	17UBO540601	(BS): Mushroom Culture	2
	IV	IDC	17USS540701A	Soft Skills	2	2
			17USS540701B	NCC		
Total for Semester V					30	23+(2)
VI	III	Core	17UBO630219	Internship	-	2
			17UBO630220	Plant Physiology	5	3
			17UBO630221	Lab. Course 7	3	2
			17UBO630222	Genetic Engineering & Biotechnology	5	3
			17UBO630223	Biochemistry	4	3
			17UBO630224	Lab. Course 8	3	2
			17UBO630225	Comprehensive Examination	-	2
			17UBP630226	Project Work (Group)	-	2
		Core Elec.	17UBO630302A	Bio-instrumentation (or)	4	4
			17UBO630302B	Bionanotechnology		
			17UBO630303A	Biological Techniques (or)	4	4
			17UBO630303B	Wood Technology		
	IV	S B Elec.	17UBO640602	(WS) Herbal Technology	2	2
Total for Semester VI					30	29
I-V	V		17UCW651101	Community Work (SHEPHERD) & Gender Studies		5
Total for all Semesters					180	150+(4)

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. Graduates will develop the basic knowledge needed to make substantial contributions to the conservation and sustainable exploitation of the planet.
2. Will learn about of role of genetics which play a role in shaping the future of medicine, health care and food production.
3. Identify and analyze the morphological and anatomical features of plants and plant structures as they enable plant function and reveal plant evolutionary history.
4. Gather, critically assess and utilize primary scientific literature to research a topic.
5. Use interdisciplinary approaches to work on biological problems.
6. Work safely and effectively in the laboratory to generate reproducible and reliable results.
7. Acquire knowledge on various techniques of breeding economically important crops.
8. Exploiting the potentiality of micro organisms for the welfare of human beings by genetic engineering principles.

பருவம்: 1
17UGT110001

மணி நேரம்: 4
புள்ளிகள்: 3

பொதுத்தமிழ்-I**பாடத்தின் விளைவு**

- சமூக மாற்றச் சிந்தனைகளை உள்ளடக்கிய தற்கால இலக்கியப்பரப்பை அறிதல்
- புதுக்கவிதை, சிறுகதை, உரைநடை ஆகியவற்றின் இலக்கியத்திறன் கண்டறிதல்.
- சந்திப்பிழையின்றி எழுதும் திறன் பெறுதல்.
- வாழ்க்கை வரலாற்றுக் கட்டுரைகளை வாசிக்கும் திறன் பெறுதல்.
- அன்றாடப் பயன்பாட்டிலுள்ள ஆங்கிலச்சொற்களுக்குப் பொருத்தமான சொற்களை உருவாக்கச்செய்தல்
- அரசுப்போட்டித் தேர்வுகளுக்கேற்ப தமிழ்மொழியில் பயிற்சி அளித்தல்.

அலகு-1 மகாகவி பாரதியார் கவிதைகள்

பாரதிதாசன் கவிதைகள்

நாமக்கல் கவிஞர் கவிதைகள்

உரைநடை - முதல் மூன்று கட்டுரைகள்

(12 மணி நேரம்)

அலகு-2 பாவலரேறு பெருஞ்சித்திரனார் பாடல்கள்

கண்ணதாசன் கவிதைகள்

இலக்கிய வரலாறு (பக். 239- 300)

இலக்கணம் -வலிமிகும் இடங்கள்

(14 மணி நேரம்)

அலகு-3 சமூகக்கவிதைகள்

இலக்கிய வரலாறு (பக்.300 -362)

சிறுகதை - முதல் ஆறு சிறுகதைகள்

(14 மணி நேரம்)

அலகு-4 அரசியல் கவிதைகள்

இலக்கணம் - வலி மிகா இடங்கள்

(10 மணி நேரம்)

அலகு-5 மொழிபெயர்ப்புக்கவிதைகள்

சிறுகதை- 7 முதல் 12 முடிய உள்ள 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, தாய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2
3. உரைநடை நூல் - தமிழாய்வுத்துறை வெளியீடு.
4. சிறுகதைத்தொகுப்பு : (நாட்டுடைமையாக்கப்பட்ட படைப்பாளர்களின் சிறுகதைகள்), தமிழாய்வுத்துறை வெளியீடு.

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

Semester I	Course Code 17UGT110001	Title of the Paper பொருத்தமிழி-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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semestre: I
17UGH110001

Hours/Week: 4
Credits : 3

HINDI

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-Maidan 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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semestre: I
17UGF110001

Heures/Semaine: 4
Points : 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 : A l'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, connaître

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: I
17UGS110001

Hours/Week: 4
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**

Shabdadayah – Aakaaraanta, ikaar aantah. ukaaraantah.

Shabdadayah – Aakaaraanta, iikaar aantah. uukaaraantah.

Unit-III **12**

Anuvaada Prayogah.

Unit-IV **14**

Lat Lakarh – Parasmai – Pada Prayogah = Vakyarupah.

Unit-V **14**

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: I
17UGE120101

Hours/Week: 5
Credits: 3

GENERAL ENGLISH-I

Course Outcome

- * Introduce themselves to the others
- * Narrate simple experiences in a coherent manner
- * Understand the underlying meaning in the text
- * Describe accurately what he/she observes and experiences
- * Converse with friends about their likes and dislikes
- * Write leave letters using the appropriate format and language

Unit-I:

01. Personal Details
02. Positive Qualities
03. Listening to Positive Qualities
04. Relating and Grading Qualities
05. My Ambition
06. Abilities and Skills
07. Self-Improvement Word Grid
08. What am I doing?
09. What was I doing?
10. Unscramble the Past Actions
11. What did I do yesterday?

Unit-II:

12. Body Parts
13. Actions and Body Parts
14. Value of Life
15. Describing Self
16. Home Word Grid
17. Unscramble Building Types
18. Plural Form of Naming Words
19. Irregular Plural Forms
20. Plural Naming Words Practice
21. Whose Words?

Unit-III:

22. Plural Forms of Action Words

23. Present Positive Actions
24. Present Negative Actions
25. Un/Countable Naming Words
26. Recognition of Vowel Sounds
27. Indefinite Articles
28. Un/Countable Practice
29. Listen and Match the Visual
30. Letter Spell - Check
31. Drafting Letter

Non-Detailed:

“The Merchant of Venice” from *Six Tales From Shakespeare*

Unit-IV:

32. Friendship Word Grid
33. Friends' Details
34. Guess the Favourites
35. Guess Your Friend
36. Friends as Guests
37. Introducing Friends
38. What are We Doing?
39. What is (s)he / are they Doing?
40. Yes / No Question
41. What was s/he doing?
42. Names and Actions
43. True Friendship
44. Know your Friends
45. Giving Advice/Suggestions
46. Discussion on Friendship
47. My Best Friend

Non-Detailed:

“The Taming of the Shrew” from *Six Tales From Shakespeare*

Unit-V:

48. Kinship Words
49. The Odd One Out
50. My Family Tree

51. Little Boy's Request
52. Occasions for Message
53. Words denoting Place
54. Words denoting Movement
55. Phrases for Giving Directions
56. Find the Destination
57. Giving Directions Practice
58. SMS Language
59. Converting SMS
60. Writing Short Messages
61. Sending SMS
62. The family debate
63. Family Today

Non-Detailed: "The Tempest" from *Six Tales From Shakespeare*

Textbook

1. Joy, J.L. & Peter, F.M. *Let's Communicate I*, New Delhi, Trinity Press, 2014. Print.

Non-Detailed Text

1. Dodd, E F. *Six Tales From Shakespeare*. London: Macmillan, 1987. Print. (First three tales)

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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester I
17UBO130201

Hours/Week: 5
Credit: 3

ALGAE AND BRYOPHYTES

Course Outcomes

1. To understand the salient features of algae and Bryophytes
2. To comprehend the structure and reproduction of various genera mentioned in the syllabus
3. To acquire the basic knowledge of the evolutionary relationship between algae and bryophytes
4. To understand the economical importance of algae and bryophytes
5. To learn the mass culture technique of commercially important algae
6. To conserve them in their natural environment.

Unit-I

General characteristics of algae. Classification (F.E. Fritsch). General characteristics of the various classes as per Fritsch's system. Cell structure of prokaryotic algae (cyanophyceae cell) and eukaryotic algae (chlorophyceae cell).

Unit-II

Thallus organization, mode of reproduction, algal life cycle patterns (haplontic, diplontic, haplo-diplontic and diplobiontic). Mass culture (*spirulina*), economic importance and BGA in *Azolla* as fodder and biofertilizer.

Unit-III

Detailed study of the following genera: occurrence, distribution, common species, structure and reproduction of *Oscillatoria*, *Oedogonium*, *Caulerpa*, *Cyclotella*, *Sargassum* and *Polysiphonia* (developmental studies on sex organs not required).

Unit-IV

General characteristics. Classification (Rothmaler, 1951), vegetative reproduction and economic importance. Evolution of gametophytes and sporophytes among bryophytes.

Unit-V

Detailed study of the following genera: occurrence, distribution, common species, structure and reproduction of *Marchantia*, *Anthoceros* and *Funaria* (developmental studies on sex organs not required).

Text Book

1. Pandey, BP. 2005. Simplified Course in Botany. S. Chand and Company, New Delhi.

Reference

1. Sharma, OP. 1992. Text Book of Algae. Tata Mc Graw Hill, New Delhi.
2. Gangulee, HC. & Kar, AK. 1989. College Botany, Vol-II, Books & Allied Pvt. Ltd., Calcutta.
3. Prem Puri. 1981. Bryophytes - Morphology growth and differentiation. Atma Ram & Sons. Lucknow.
4. Singh V, Pande PC and Jain OK. A text book of Botany, Rostogi Publications, Meerut.
5. Smith, GM. 1955. Cryptogamic Botany Vol-1&II, Mc Graw Hill, New York.

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

Semester	Course Code	Title of the Paper														Hours	Credits
I	17UBO130001	ALGAE AND BRYOPHYTES														5	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	5	3	2	1	4	5	3	4	2	4	3	3.3			
CO2	5	3	5	3	4	3	4	4	2	3	3	4	5	3.7			
CO3	4	3	2	5	3	3	2	3	2	2	3	3	2	2.9			
CO4	5	4	3	3	2	2	5	3	3	5	4	3	3	3.5			
CO5	4	3	5	2	3	2	2	3	3	3	2	4	3	3.0			
CO6	5	3	5	4	3	4	3	2	4	3	3	3	4	3.5			
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:

Mean Score of COs =	Total of Values	Mean Overall Score for COs =	Total of Mean Scores
	Total No. of POs & PSOs		Total No. of COs

Semester I
17UBO130202

Hours/Week: 5
Credit: 3

FUNGI, PLANT PATHOLOGY AND LICHENS

Course Outcomes

1. To understand the general characteristics of fungi and lichens
2. To acquire knowledge on the structure and reproduction of genera mentioned in syllabus
3. To acquire basic skills on etiology and control of various plant diseases.
4. To understand the disease cycle caused by the pathogens
5. To understand the ecological importance of lichens
6. To learn the economic importance of fungi and lichens.

Unit-I: Fungi: General characteristics - range of thallus organization, architecture of fungal cells and modes of nutrition. Classification (Alexopoulos and Ainsworth, 1972) and general characteristics of the Divisions and Classes in Fungi. Economic importance.

Unit II: Fungi: detailed study of morphology and reproduction of the following genera: *Penicillium*, *Albugo*, *Peziza*, *Puccinia*, *Rhizopus*, *Cercospora*.

Unit III: Plant Pathology: classification of diseases – general symptoms and methods of control of plant diseases: mechanical, chemical and biological. Defense mechanism in plants: structural morphological and biochemical.

Unit IV: Plant Pathology: Detailed study of the following plant diseases with reference to causes, symptoms, dissemination, control and preventive measures - mosaic disease of tobacco, citrus canker, late blight of potato, red rot of sugarcane, paddy blast, bunchy top of banana and little leaf of brinjal.

Unit V: Lichens: occurrence, distribution, classification, structure, vegetative and sexual reproduction (with reference to fruticose lichen - *Usnea*). Economic importance and role in succession and pollution monitoring.

Books

1. Singh V, Pande PC & Jain DK 2015. **A Text Book of Botany** (4th ed), Rastogi, Meerut

Reference

1. Sharma OP 1989. Text Book of fungi. Tata Mc Graw Hill, New York.
2. Vasishta BR & Sinha AK. 2003. Botany for degree students Fungi. S Chand New Delhi.
3. Mehrotra R S 1991. Plant Pathology, Tata McGraw-Hill Publishing, New Delhi
4. Hale ME, 1983 The Biology of Lichens, New Age International publishers, New Delhi.

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

Semester I	Course Code 17UBO130002	Title of the Paper FUNGI, PLANT PATHOLOGY AND LICHENS										Hours	Credits	
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	5	2	4	5	3	2	4	2	3	5	2	3.3
CO2	5	3	4	5	3	3	2	5	2	2	3	4	2	3.3
CO3	3	5	5	3	3	3	3	2	5	2	3	3	4	3.4
CO4	5	3	3	5	2	4	2	5	3	4	5	3	3	3.8
CO5	3	5	3	5	3	5	3	3	4	3	5	3	4	3.2
CO6	4	5	3	4	5	2	2	3	3	2	2	4	3	3.4
Mean Overall Score														3.9

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Result: The Score for this Course is 3.9 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester I
17UBO130203

Hours/Week: 3
Credit: 2

LABORATORY COURSE-I (Algae, Fungi, Bryophytes, Plant Pathology and Lichens)

Course Outcomes

- To study the internal structures of lower plant groups.
- To compare the external and internal structure of the plants.

Detailed study of the following genera:

Algae:

Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum and *Gracilaria*.

Bryophytes:

Marchantia, Anthoceros and *Funaria*.

Fungi:

Plasmodiophora, Albugo, Peziza, Puccinia and *Cercospora*.

Plant Pathology:

Tobacco Mosaic Virus, Citrus canker, Late blight of Potato, Red rot of Sugarcane, Bunchy Top of Banana, Little leaf of Brinjal, Paddy blast

Lichen:

Usnea

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Semester I
17UBO130401

Hours/Week: 4
Credit: 3

Allied: ZOOLOGY-I
(General Zoology)

Course Outcomes

1. To acquire basic knowledge on animal organization
2. To study the morphology and physiology of various organs of animals
3. To acquire knowledge on differences between the functions of various organs of animals and human beings
4. To study the salient features of all phyla of animal kingdom
5. To understand the mode of action of various hormones
6. To understand blood and its composition and mechanism of blood clotting

Unit I

Basic principles of zoological taxonomy and nomenclature. General classification of the animal kingdom (up to phylum with examples). Salient features of all phyla. General features of the subphylum Urochordata, Cephalochordata, Hemichordata and Vertebrates (Classes: Pisces, Amphibia, Reptilia, Aves and Mammalia)

Unit II

Type study of *Plasmodium vivax*, *Leucosolenia*, *Aurelia aurita*, *Taenia solium*, *Ascaris lumbricoides* and *Asterias rubensa* – morphology and life history. General topics – human diseases caused by protozoans; canal system of sponges.

Unit III

Principles of human physiology: Digestion - physiology of digestion, absorption and excretion of food – accessory glands and their role. Respiration: transport of oxygen and carbon dioxide, cellular oxidation, respiratory quotient, oxygen debt. Excretion: structure of a nephron, physiology of urine formation, physical characteristics and chemical composition of urine.

Unit IV

Circulation – structure and working of artery, vein and heart. Blood: haemopoiesis, types of blood cells, structure of haemoglobin; mechanism of blood clotting, functions of plasma proteins. Blood grouping, lymph and its

functions. Muscles: contraction. proteins involved and theories of contraction.

Unit V

Hormones: Types, control - and general mode of action of water soluble and steroid hormones. Reproduction – male and female reproductive organs and formation of gametes, Pregnancy and birth. Nervous control: Structure of neuron; Types of neurons; nerve impulse transmission, synaptic transmission.

Books

1. Ekambaranantha Ayyar & Ananthakrishnan. 1985. Outlines of Zoology - Vol.I, S. Viswanathan Pvt. Ltd., Chennai.

Reference

1. Rajan K . 2016. Manual of Zoology. Theory and practicals, Dept. of Botany, St. Joseph's College, Tiruchirappalli.
2. Gerard, J. Tortord, R.L.Evans & Anagnostakos, NP. 1982. Principles of Human Physiology, Harpor Roul Publishers, New York.
3. Jordan, E.L. & Verma, P.S. 1976 Invertebrate Zoology, S.Chand & Co. Ltd., 6th e, New Delhi.
4. Kotpal, RL 1976. Modern text book of Zoology (Invertebrate), Rastogi Publications, Meerat.
5. Nagabhushan & Kodarkar. 1976. Text Book of Animal Physiology, Oxford & IBH.
6. Paul B. Weisz. 1975. The Science of Biology, Tata McGraw Hill, 4th Edn., New Delhi.

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

Semester I	Course Code 17UBD130401	Title of the Paper Allied-1: ZOOLOGY: GENERAL ZOOLOGY													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	3	5	3	5	3	2	4	2	5	3	3	3	3	3.4		
CO2	4	3	3	2	2	3	2	3	3	3	4	2	4	2.9		
CO3	4	5	3	3	2	4	2	5	4	3	2	2	3	3.2		
CO4	5	3	3	2	5	3	3	2	5	4	3	4	2	3.4		
CO5	4	3	3	4	5	2	4	3	4	2	4	3	5	3.5		
CO6	5	5	3	2	4	3	3	5	3	2	4	2	3	3.4		
Mean Overall Score															3.3	

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Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**Semester I
17UBO130402**

**Hours/Week: 2
Credit: 2**

**Allied:
LABORATORY COURSE-I
(Zoology-I)**

Course Outcomes

1. To dissect the various system of earthworm and pila.
2. To study the different tissues of human blood.

Earthworm

External features and dissection of digestive and nervous systems – Mounting of body and Penial setae, Ovary and Spermatheca

Pila

- * Structure of shell – Dissection of mantle cavity and radula, dissection of digestive system.
- * Representative animal for each class in vertebrate, and invertebrate phyla. Different tissues. human blood cell identification. Campus fauna identification.
- * Visit to a vermin-compost farm and submission of report.

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Semester I
17UFC141001

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$		Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
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பருவம்: 2
17UGT210002

மணி நேரம்: 4
புள்ளிகள்: 3

பொதுத்தமிழ்-II

பாடத்தின் விளைவு

- சமூக மாற்றச் சிந்தனைகளை உள்ளடக்கிய தற்கால இலக்கியப்பரப்பை அறிதல்
 - பக்தி இலக்கியங்களின் வழி இறையியல் கோட்பாடுகளை அறிதல்
 - உரைநடைக் கட்டுரை எழுதும் திறன் பெறுதல்- இலக்கணமரபுகளை அறிதல்
 - பல்வேறு சமயங்களின் வாழ்வியல் கருத்துக்களை அறிந்து பின்பற்றுதல்
 - காப்பியங்களில் உள்ள சமுதாயக் கருத்துக்களை அறிந்துகொள்ளுதல்.
 - இதிகாசங்கள் உணர்த்தும் நீதிகளை அறியச்செய்தல்.
- அரசுப்போட்டித் தேர்வுகளுக்கேற்ப பொதுக்கட்டுரைகளும் மொழிப்பயிற்சியும் மாணவர்களுக்கு அளித்தல்.

அலகு: 1 (12 மணி நேரம்)

- சிலப்பதிகாரம் - அந்திமாலைச் சிறப்பு செய்காதை
இலக்கிய வரலாறு - சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய.
இலக்கணம் - எழுத்திலக்கணம்

அலகு: 2 (12 மணி நேரம்)

- மணிமேகலை - உலக அறவி புக்க காதை
பெரியபுராணம் - தடுத்தாட்கொண்ட புராணம்

அலகு: 3 (12 மணி நேரம்)

- கம்பராமாயணம் - கும்பகர்ணன் வதைப்படலம்
உரைநடை - 7 முதல் 9 முடிய உள்ள கட்டுரைகள்

அலகு: 4 (12 மணி நேரம்)

- சீறாப்புராணம் - மானுக்குப் பிணை நின்ற படலம்
இலக்கணம் - சொல்லிலக்கணம்
இலக்கிய வரலாறு - தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள் முடிய.

அலகு: 5 (12 மணி நேரம்)

- இரட்சணிய யாத்திரிகம் - மரணப்படலம்
உரைநடை - 10 முதல் 12 வரையிலான கட்டுரைகள்

பாடநூல்:

- செய்யுள் திரட்டு, தமிழாய்வுத்துறை வெளியீடு, 2017-10
- சமூகவியல் நோக்கில் தமிழ் இலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, தாய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2
- உரைநடை நூல் - தமிழாய்வுத்துறை வெளியீடு.

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
CO2	4	5	5	4	5	5	5	5	5	4	3	4	3
CO3	5	5	4	4	5	5	5	5	4	3	3	4	3
CO4	5	5	4	3	4	5	5	5	4	3	3	4	3
CO5	5	5	4	3	4	5	5	5	4	3	3	4	3
CO6	5	5	5	5	4	5	5	5	4	3	3	4	3
Mean Overall Score											4.2		

Result: The Score for this Course is 4.2 (Very High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$		Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
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Semestre: II
17UGH210002

Hours/Week: 4
Credits : 3

HINDI-II

Course Outcomes

At the end of the course, a student should be able to demonstrate...

- their effective communicative skills in Hindi
- the introduction of socially relevant subjects in Modern Hindi Literature
- to appreciate the features of Modern Hindi one act plays and short stories
- the ability to fill in application forms Hindi
- use Hindi vocabulary and grammar patterns in a culturally proper ways.
- the ability to write about famous Hindi authors .

Unit-I **8 hours**
Paeksha, 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.

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)						Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6		
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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semestre: II
17UGF210002

Heures /Semaine: 4
Points : 3

FRANÇAIS-I

Les résultats d'apprentissage: L' étudiant peut ...

- * 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, dire 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, adverbess, 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 chemin a quelqu'un, reprocher / conseiller, parler des activités du week-end, demander a quelqu'un de se taire

Grammaire: le passe compose, adverbess 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

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)							
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	Mean Score of COs	
	CO1	4	4	2	3	4	3	3	2	2	3	3	3.0
	CO2	3	3	3	3	4	3	3	2	2	3	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:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: II
17UGS210002

Hours/Week: 4
Credits : 3

SANSKRIT-II

Course Outcomes

At the end of the course, a student should be able to demonstrate...

- * knowledge and understanding of basic Sanskrit grammar
- * knowledge and understanding of essential Sanskrit vocabulary
- * knowledge and understanding of the appropriateness of basic Sanskrit structures and expressions in a given context
- * the ability to understand short passages in written Sanskrit on everyday topics
- * the ability to produce short passages in written Sanskrit on everyday topics
- * introduction of basic grammar (Avyaya Imperfect tense and Sandirules. Samasah.)

Unit-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	

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Result: The Score for this Course is 3.1 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: II
17UGE220102

Hours/Week: 5
Credits: 3

GENERALENGGLISH-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 monosyllabic 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

45

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. Humorous 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 Would 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)

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

Semester II	Course Code 17UGE120102	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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**Semester II
17UBO230204**

**Hours/Week: 4
Credit: 3**

PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Course Outcome

1. To understand the salient features of pteridophytes and gymnosperms
2. To trace the evolutionary relationship between pteridophytes and gymnosperms
3. To study the morphology, anatomy and reproduction of various genera mentioned in the syllabus
4. To acquire knowledge on fossils and fossilization process
5. To study the geological time scale along with some fossil representatives
6. To study the economic importance of pteridophytes and gymnosperms.

Unit I

Pteridophytes: general characteristics, classification (Reimer's System, 1954). General characteristics of major subdivisions: Psilopsida, Lycopsidea, Sphenopsida and Pteropsida. Stelar evolution, homosporous, heterosporous, seed habit and economic importance.

Unit II

Pteridophytes: a detailed study of morphology, anatomy and reproduction of *Lycopodium*, *Selaginella*, *Equisetum*, *Adiantum* and *Marsilea*.

Unit III

Gymnosperms: general characteristics, distribution and classification (Sporne, 1965). Salient features of Pteridospermales, Bennettitales, Cycadales, Cordaitales, Coniferales and Gnetales. Economic importance.

Unit IV

Gymnosperms: detailed study of morphology, anatomy, reproduction of the following genera: *Cycas*, *Pinus* and *Gnetum*.

Unit V

Paleobotany: fossils, fossilization process, types (compression, impression, petrification, coal balls). Geological time scale. A detailed study of external and internal morphology and reproduction in *Rhynia*, *Lepidodendron*, *Calamites*, and *Medullosa*.

Books

1. Vasishta BR, Sinha AK & Anilkumar. 2005. Botany for degree students: Pteridophytes. S Chand And Company Ltd., New Delhi.
2. Vasishta PC, Sinha AK & Anilkumar. 2005. Botany for degree students: Gymnosperms. S Chand And Company Ltd., New Delhi.
3. Pandey et al., 1998. A text book of Botany Vol. II. S. Chand & Co. Ltd. 1980

Reference

1. Rashid, A. 1976. An Introduction to Pteridophytes. Vikas Publishing House, New Delhi.
2. Sporne, KR.1967. The Morphology of Gymnosperms, Hutchinson & Co., London.
3. Sporne, KR.1975. The Morphology of Pteridophytes, Hutchinson & Co., London.

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

Semester II	Course Code 17UBO230204	Title of the Paper PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY												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	5	5	4	3	5	2	4	3	4	4	4	3.9	
CO2	3	4	3	4	2	5	3	4	2	4	2	5	4	3.5	
CO3	5	5	4	2	2	4	2	4	3	4	5	3	5	3.7	
CO4	3	4	5	3	5	2	2	5	4	4	5	3	4	3.8	
CO5	5	5	4	4	3	4	3	4	3	4	3	4	5	3.9	
CO6	3	4	3	5	4	5	4	4	5	3	4	4	4	4.0	
Mean Overall Score														3.8	

Result: The Score for this Course is 3.8 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
17UBO230205

Hours/Week: 4
Credit: 3

ANATOMY AND EMBRYOLOGY

Course Outcome

1. To understand various types of tissues present in plants
2. To acquire knowledge about the tissues of stem, root and leaves
3. To understand the primary and secondary structure of dicots and monocots with reference to root, stem and leaves
4. To acquire basic knowledge of the structure and development of male and female gametophytes in plants
5. To acquire knowledge on the structure and development of dicot and monocot embryos
6. To study apomixis and polyembryony and their significances.

Unit I

Tissues - definition, types - simple tissue - parenchyma, collenchyma, sclerenchyma. Fibres and scleroids - structure and functions. Complex tissues: xylem and phloem. Meristems - classifications. Vegetative shoot apex: and the theories: apical cell, histogen and tunica-corpus. Root apex: Korper – Kappe theory. Concept of totipotency, differentiation, dedifferentiation and redifferentiation.

Unit II

The stem - primary and secondary structure of dicotyledonous and monocotyledonous stems. Nodal anatomy: unilacunar, trilacunar and multilacunar. Leaf anatomy: monocot and dicot. The root: primary and secondary structure of dicotyledonous and monocotyledonous roots. Anomalous secondary growth.

Unit III

Wood anatomy – component of secondary xylem. Physical and chemical properties of wood. Classification of wood. Commercial wood species of South India (teak wood, rose wood, sandal wood and red sanders wood).

Unit IV

Microsporangium: microsporogenesis, development of male gametophyte. Megasporangium: megasporogenesis, development of female gametophyte. Monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*).

Unit V

Fertilization. Double fertilization. Development of dicot embryo (*Capsella*) & development of monocot embryo (*Sagittaria*). Endosperm function and types. Apomixis and polyembryony – types and significance. Parthenogenesis and its significance.

Books

1. Pandey B.P. 2007 Plant Anatomy, S. Chand & Co. De, New Delhi.
2. Bhojwani, S S. & Bhatnagar, SP. 2008. Embryology of Angiosperms, Vikas Publishing House (P) Ltd., New Delhi.
3. Brown *et al.*, 1981. Text book of Wood Technology, Mc Graw Hill Inc. New York.
4. Pullaiah, T., Lakshminarayana, K. and Hanumantha Rao, K. 2001. Text Book of Embryology of Angiosperms, Regency Publications, New Delhi.

References

1. Cutter, EG. 1969. Plant Anatomy - Part I Cells & Tissue. Edward Arnold Ltd., London.
2. Esau K. 1985. Plant Anatomy (2nd ed.) Wiley Eastern Ltd. New Delhi.

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

Semester II	Course Code 17UBD230205	Title of the Paper ANATOMY AND EMBRYOLOGY													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	4	5	3	3	5	3	5	4	3	5	4	4	4.0		
CO2	4	4	3	5	5	3	4	5	4	5	3	4	3	4.0		
CO3	5	3	4	3	4	5	5	4	3	3	5	2	4	3.8		
CO4	5	3	4	5	4	5	3	5	5	4	4	4	5	4.3		
CO5	5	4	5	4	5	4	5	4	5	3	5	4	5	4.5		
CO6	5	3	5	4	3	4	5	5	5	4	5	3	4	4.2		
Mean Overall Score														4.1		

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Result: The Score for this Course is 4.1 (Very High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
17UBO230206

Hours/Week: 3
Credit: 2

LABORATORY COURSE-II (Pteridophytes, Gymnosperms, Anatomy & Embryology)

Course Outcome

- To learn morphological and anatomical features of Pteridophytes and Gymnosperms.
- To learn anomalous secondary thickening in dicots and monocots

Detailed study:

Pteridophytes:

Lycopodium, Selaginella, Adiantum and Marsilea.

Gymnosperms:

Cycas, Pinus and Gnetum.

Fossils: *Rhynia, Lepidodendron, Calamites and Medullosa.*

Anatomy

Study of simple and complex tissue.

Internal structure of young and old dicot and monocot stem.

Internal structure of dicot and monocot root.

Anomalous secondary thickening in *Aristolochia, Bignonia, Boerhaavia, Thunbergia* and *Dracaena*.

Nodal anatomy: Uni, tri and multi lacunar.

Embryology

TS of mature anther. Types of ovule, dissection and isolation of developmental stages of dicot embryos.

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Semester II
17UBO230403

Hours/Week: 4
Credit: 3

Allied: ZOOLOGY-II
(Agricultural Entomology)

Course Outcomes

1. To acquire knowledge on classification of insects
2. To study the morphology and physiology of common selective insects
3. To understand the economical important insects
4. To study the destructive insects and the methods of pest control
5. To learn about integrated pest management
6. To study the pest of stored food materials and their control.

Unit I

General classification of insects. Morphology of insects: head, external structure. Mouth parts, tentorium, compound eye, types of antennae- thorax-tergum, sternum, pleuron. Wing structure and coupling mechanism, wing venation, Legs and their modification, Abdomen- abdominal appendages, Male and female external genitalia.

Unit II

Physiology of digestive, respiratory, circulatory, nervous and reproductive systems, Immature stages of insects – metamorphosis, types and hormonal regulation.

Unit III

Economically important insect (orders): Coleoptera, Dictyoptera, Diptera, Hemiptera, Hymenoptera, Isoptera and Lepidoptera. General characters and classification (upto Orders). Social behavior/life of insects.

Unit IV

Economic classification of insects: beneficial insects (predators, parasites, pollinators, weed killers and scavengers). Destructive insects, a general knowledge of apiculture, sericulture and lac culture. Recent trends in Integrated Pest Management. Plant protection - physical, chemical and biological methods of pest control.

Unit V

Pests of stored food materials (*Sitophilus oryzae*, *Rhizopertha dominica*, *Tribolium castaneum*, *Sitotroga cerealella*, *Oryzaephilus surinamensis*, *Trogoderma granarium*) and their control, Study of Bionomics and control

of pests of Paddy (*Tryporyza incertulas*, *Chilo polycharysa*, *Spodoptera mauritia*), Sugarcane (*Chilo infuscatellus*, *C. sacchariphagas*, *Tryporyza nivella*), Cotton (*Aphis gossypii*, *Amarasca biguttula*, *Thrips tabaci*), Coconut (*Oryctes rhinoceros*, *Rhycolophorus ferrugineus*, *Nephanthis serinopa*) and Spices pests.

Books

1. Ambrose, PD. 2004. The Insect: Structure, function and biodiversity, First edition. Kalyani Publishers, New Delhi.

Reference

1. Imms, AD. 1963. General Text Book of Entomology, Asia Publ House, New Delhi.
2. Daly, HV., Doyen, JT. & Ehrlich, PR. Introduction to Insect Biology Diversity, First Edition, McGraw Hill Book, New York.
3. Rajan, K & McConnell, MS. 2006. Manual of agricultural entomology - theory and practicals, Dept. of Plant biology & Plant biotechnology, St. Joseph's College, Trichy.
4. Nayar, KK., Ananthakrishnan, TN. & David, BV. 1976 General and Applied Entomology, Tata McGraw Hill, New Delhi.
5. Vasantharaj D B & Kumaraswami, T. 1978. Elements of Economic Entomology, Popular Book Department, Chennai.

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

Semester II	Course Code 17UBO230403	Title of the Paper Allied Zoology-II: AGRICULTURAL ENTOMOLOGY												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	3	5	5	5	3	5	3	5	3	5	4	4	4.2	
CO2	4	5	4	5	4	5	4	3	4	5	4	5	5	4.4	
CO3	5	4	4	3	5	5	3	5	4	4	4	5	5	4.3	
CO4	5	4	5	4	4	5	5	3	5	3	5	3	4	4.2	
CO5	4	4	5	4	5	4	4	5	3	5	4	5	3	4.2	
CO6	3	5	5	4	3	5	5	4	5	3	3	4	4	4.1	
Mean Overall Score														4.2	

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Result: The Score for this Course is 4.2 (Very High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester II
17UBO230404

Hours/Week: 2
Credit: 2

Allied:
LABORATORY COURSE-II
(Zoology-II)

Course Outcomes

1. To study the classification of insects
2. To study beneficial and harmful insects and various control measures of harmful insects.

Detailed study:

- * Study of distinguishing features of insects studied in theory and making sketches.
- * Field collection, identification and preservation of insects of agricultural importance, predators, pollinators, and weed killers – plant galls.
- * Study of different categories of insect pests and types of damage done by them in the field, go-down and warehouses.
- * Dissection of Cockroach to study the mouthparts, digestive, nervous and reproductive systems, Salivary gland, Haemocytes. Modification of Antenna, legs, mouth parts.
- * Light trap collection and identification.
- * Visit to a local sericulture center and submission of report.

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Semester II
17UCE240802

Hours/Week: 2
Credit: 2

COMPUTER LITERACY

Course Outcomes

1. Understand the basics of Computer Systems
2. Familiar with the applications of MS-Office / HTML & CSS
3. Know the statistical data analysis using R
4. Aware the latest trends and technologies such as Mobile Computing, Big Data and Analytics, Cloud Computing.
5. Understand the concepts of social networking sites.
6. Knowledge in Cyber Crime and Cyber Ethics.

Unit-I: Computer System

Computer - An Introduction - Hardware Components - Input and Output Technologies - Computer Hierarchy- Software Fundamentals - Systems Software and Os- Application Software- Software Licensing - Open Systems- Open Source Software- Programming Languages- Information Systems- General It Trends.

Unit-II: (For Non-CS)

Microsoft Word: Introduction - Word Environment - Opening and Creating a New Document - Saving Documents - Proofing Features - Printing a Document - Formatting Text - Working with Shapes and Lists - Line and Paragraph Spacing- Working with Tables - Columns and Ordering- Working with Pictures- Working with Headers and Footers - Using Indents and Tabs - Using Mail Merge.

Microsoft Excel: Introduction - Document Creation - Renaming a worksheet - Office user interface - Open a New Workbook - Columns, Rows, and Cells - Selecting a cell - Basic data entry, fill handle - Insert columns - Arithmetic Calculations & Formulas - Excel Formulas- Calculate with Functions - Function Library - Graphs and Charts - Printing the Document.

Microsoft PowerPoint: Starting PowerPoint - Working with Slides - Applying Theme - Animation- Transitions – Views.

Unit-II: (For CS)

HTML: Introduction - HTML generations – HTML Tags – Headings – Paragraphs – Comments – Line Breaks – Formatting Tags – Hyperlinks – Images – Lists – Tables – Frames – Forms.

CSS: Introduction – Use of External Style Sheet – Defining Styles – Use Relative Sizing – Use Numbered Value for Color.

Unit-III: Statistical Data Analysis

Introduction - R Programming Language - Basic R Commands - Univariate and Bivariate Statistical Measures - Graphic Representation of Statistical Data - Lab Exercise.

Unit-IV: SMAC

Introduction - Understanding the Enterprise of Tomorrow - Social Networking - Mobile Computing - Big Data and Analytics - Cloud Computing

Unit-V: Cyber Crime

Definition - List of Cyber Crimes - Cyber Ethics- Unethical Behaviour - Securing information privacy and confidentiality - Internet Ethics - Indian Information Technology Act - Advantages of Cyber Laws - National e-Governance Plan (NeGP) - eCommerce - Electronic Fund Transfer (EFT)

Book for Study

1. Department of Foundation Course, “Computer Literacy”, St. Joseph’s College, 2017.

Books for Reference

1. Alexis Leon, “Introduction to computers”, Vikas Publishing House Pvt. Ltd., New Delhi, 2008.
2. Alexis Leon and Mathew Leon, “Introduction to computers with Ms Office 2000”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2005.

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

Semester II	Course Outcomes (COs)	Course Code 17UCE240802A		Title of the Paper COMPUTER LITERACY												Hours 2	Credits 2
		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)										
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	Mean Score of COs		
	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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**Semester II
17UFC241002**

**Hours/Week: 2
Credits: 2**

FUNDAMENTALS OF HUMAN RIGHTS

Course Outcome

1. To ensure acquiring the knowledge about the historical background of human rights.
2. To ensure sensitizing the young the values of human rights.
3. To ensure the importance of human rights in the Indian context.
4. To ensure learning the fundamental duties in the constitution of India.
5. To ensure educating the youth in respecting and protecting the rights of every other human being.
6. To ensure teaching the youth on the vulnerabilities of women and children.

Unit-I

Introduction, Classification of Human Rights, Scope of Human Rights, Characteristics of Human Rights, and Challenges for Human Rights in the 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 Outcomes (COs)	Course Code 17UFC241002	Title of the Paper FUNDAMENTALS OF HUMAN RIGHTS													Hours 2	Credits 2
			Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)									
			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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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பருவம்: 3
17UGT310003

மணி நேரம்: 4
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 தொன்மையும் 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 செய்துதமிழ் - 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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**Semestre: III
17UGH310003**

**Hours/Week: 4
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 keeye, Vighra 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.

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)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	Mean Score of COs
	CO1	4	4	4	3	4	3	3	3	4	4	3.6
	CO2	3	3	2	3	2	3	3	3	5	3	3.0
	CO3	3	3	3	3	4	3	3	4	3	3	3.2
	CO4	3	2	2	3	3	3	3	3	3	4	2.9
	CO5	3	3	3	3	3	3	4	3	3	4	3.2
	CO6	4	4	4	4	3	3	3	3	3	3	3.3
	Mean Overall Score											

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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**Semestre: III
17UGF310003**

**Heures /Semaine: 4
Points : 3**

FRANÇAIS-III

Les résultats d'apprentissage: L' étudiant peut ...

- * 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_ronique 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 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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation Quality	1	2	3	4	5
	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: III
17UGS310001

Hours/Week: 4
Credits : 3

SANSKRIT-III

Course Outcomes

At the end of the course, a student should be able to demonstrate...

- * Knowledge and understanding of essential Sanskrit vocabulary in a given topic
- * Knowledge and understanding of the appropriateness of basic Sanskrit structures in Slokas
- * Knowledge of the basic Sanskrit poetry.
- * An idea on Epics and Puranas.
- * The usage of – Upasargas.
- * The familiarization the history of Sanskrit 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.

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)						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	4		3.1
	CO2	4	3	4	4	4	4	3	3	4	4		3.1
	CO3	4	3	3	4	4	4	4	3	3	4		3.1
	CO4	4	3	3	4	3	4	4	3	4	4		3.1
	CO5	4	4	4	3	4	3	3	4	3	4		3.1
	CO6	5	4	4	4	4	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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation Quality	1 0.0-1.0 Very poor	2 1.1-2.0 Poor	3 2.1-3.0 Moderate	4 3.1-4.0 High	5 4.1-5.0 Very High

Values Scaling:

Mean Score of COs =	Total of Values Total No. of POs & PSOs	Mean Overall Score for COs =	Total of Mean Scores Total No. of COs
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Semester: III
17UGE320103

Hours/Week: 5
Credits: 3

GENERAL ENGLISH-III

Course Outcome

- * Comprehend the local and global issues through the lessons
- * Do the tasks centering on skill development and enhance their Grammar Using and Writing Skills
- * Use interactive skills
- * Train and develop the Listening and Reading Skills of the learners through teacher-led reading practice
- * Enhance their Listening, Reading, Speaking, and Writing Skills
- * Develop their Creative and Critical Thinking and Speaking Skills

Unit-I: *Suggestions to Develop Your Reading Habit

- 1.0 Introduction
- 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

- 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:

- Dickens, Charles. *Hard Times*. Wordsworth: Printing Press, 1854. Print.

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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
17UBO330207

Hours/Week: 5
Credit: 3

TAXONOMY OF ANGIOSPERMS

Course Outcome

1. To observe the variations among in angiosperms
2. To understand the basic principles guiding the plant classification
3. To acquire knowledge on morphology and nomenclature
4. To describe and identify plants in technical terms
5. To study the salient features of various families mentioned in the syllabus
6. To understand the economic and medicinal importance of plants.

Unit I

History of plant taxonomy. Plant collection and specimen preparation. Examination of plant specimen: technical terms of plant description- plant types (habit and habitat), vegetative (root, stem and leaf) and reproductive (inflorescence, flower and fruit) parts, preparation of floral diagram and floral formula.

Unit II

Plant nomenclature: binomial nomenclature, elementary knowledge of ICBN: principles, rank of taxa, type method, principle of priority, effective and valid publication and author citation. Types and some important systems of classification: artificial (Carolus Linnaeus), natural (Bentham & Hooker) and phylogenetic (Engler & Prantle's). Brief account of cytotaxonomy, chemotaxonomy, molecular taxonomy and numerical taxonomy.

Unit III

Detailed study and economic importance of the following families: *Dicotyledons*: Annonaceae, Tiliaceae, Rutaceae, Anacardiaceae, Rosaceae, Fabaceae, Myrtaceae, Lythraceae.

Unit IV

Detailed study and economic importance of the following families: Cucurbitaceae, Apiaceae, Rubiaceae, Compositae, Sapotaceae, Apocynaceae, Asclepiadaceae, Solanaceae.

Unit V

Detailed study and economic importance of the following families: Labiatae, Amaranthaceae, Euphorbiaceae, Moraceae. *Monocotyledons*: Orchidaceae, Liliaceae, Pontederiaceae, Typhaceae, Gramineae.

Text Book

1. Sharma, OP. 2011. Plant Taxonomy, Tata McGraw-Hill Education New Delhi.

References

1. Clive AS. 1989. Plant Taxonomy and Biosystematics, Chapman and Hall Inc. New York.
2. Lawrence, GH. 1967. Taxonomy of Vascular Plants, MacMillan Co., USA.
3. Samuel, BJ & Arlene, EL. 1987. Plant Systematics, McGrawHill Inc., New York.
4. Jeffrey, C. 1982. An Introduction to Plant Taxonomy, Cambridge University Press, UK.
5. Pandey, BP. 2013. Taxonomy of Angiosperms, S. Chand & Co. Ltd., New Delhi.

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

Semester III	Course Code 17UBO330207	Title of the Paper TAXONOMY OF ANGIOSPERM												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	4	4	5	3	5	3	4	5	4	5	4	4.1	
CO2	5	2	5	4	4	5	4	4	5	4	5	3	4	4.2	
CO3	4	5	3	5	5	4	5	2	5	4	4	2	5	4.1	
CO4	5	3	5	4	4	3	4	4	4	5	4	5	3	4.1	
CO5	5	3	4	5	2	5	4	4	4	5	4	4	5	4.2	
CO6	4	3	5	4	4	5	5	5	4	3	4	5	4	4.2	
Mean Overall Score														4.1	

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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 =	Total of Values	Mean Overall Score for COs =	Total of Mean Scores
	Total No. of POs & PSOs		Total No. of COs

**Semester III
17UBO330208**

**Hours/Week: 3
Credit: 2**

PLANT BREEDING AND EVOLUTION

Course Outcome

1. To understand the aim and objectives of plant breeding
2. To acquire knowledge on various techniques of plant breeding
3. To acquire knowledge on methods of breeding economically important crops
4. To learn hybridization and its applications
5. To understand the process of evolution
6. To learn the various theories pertaining to biological evolution.

Unit I

Plant Breeding: Historical aspect of plant breeding and genetic basis – objectives of plant breeding – modes of reproduction in relation to breeding methods, asexual, sexual and apomictic reproduction – Floral biology in relation to selfing and crossing techniques. Breeding Methods: plant Introduction – types and procedures. Centres of diversity and origin of cultivated plants.

Unit II

Selection: Mass selection - pure line selection and clonal selection, merits and demerits of selection. Hybridization: objectives, choice of parents, problems and causes of failure in hybridization. Incompatibility and sterility, methods to overcome. Methods of handling segregation material for isolation of superior strains – bulk method and pedigree method of selection – role of interspecific and intergeneric hybridization in plant improvement.

Unit III

Inbreeding depression and heterosis: genetic basis and application in plant breeding. Steps in the production of single cross, double cross, three-way cross. Polyploids: induced polyploidy in plant breeding; role of auto and allopolyploids. Mutation and crop improvement.

Unit IV

Back crossing: theory and procedure for transferring various types of character. Breeding for disease resistance and drought tolerance. Preservation and utilization of germplasm. Breeding techniques for rice, sugarcane, groundnut and maize.

81

Unit V

Evolution: origin of life, theories of evolution of life forms: Lamarckism and Darwinism. Variations – definition causes and types, mutation (principles of Hugo De’Vries). Role of mutation in speciation. Evolution through ages: human evolution. Evidences for evolution.

Text Book

1. Chaudhari, H.K., (1995) Revised Ed., Elementary Principles of Plant Breeding, Oxford & IBH, New Delhi.

References

1. Chopra, V. L., 1994. Plant breeding- Theory and Practice. Oxford & IBH.
2. Sharma J. R. (1996). Principles and Practice of Plant Breeding, Tata McGraw Hill
3. Sinha, U. and Sinha, S., (1992). Cytogenetics, Plant Breeding and Evolution, Vikas Publishing House Pvt. Ltd, India

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

Semester III	Course Code 17UB0330208	Title of the Paper PLANT BREEDING AND EVOLUTION																Hours 3	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	5	3	5	3	4	5	4	5	3	4	4	5	4.2					
CO2	3	5	4	4	5	3	4	5	4	5	3	5	3	4.1					
CO3	5	3	5	4	4	3	5	3	5	4	4	5	4	4.2					
CO4	4	5	5	4	3	5	4	4	3	4	4	3	5	4.1					
CO5	4	4	5	5	4	3	4	5	2	5	3	5	2	3.9					
CO6	5	3	4	5	4	4	5	4	4	5	5	4	4	4.3					
Mean Overall Score														4.1					

Result: The Score for this Course is 4.1 (Very High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
17UBO330209

Hours/Week: 3
Credit: 2

LABORATORY COURSE-III
(Taxonomy of Angiosperms and Plant Breeding)

Course Outcomes

1. To study the vegetative and floral characteristics of various families mentioned in the theory.
2. To learn plant breeding techniques.

Detailed Study:

- * Description of plant in technical terms.
- * A detailed study of the range of vegetative and floral characters of plants belonging to the families mentioned in the theory part except Orchidaceae.
- * Field trip to any place within or outside the state to study the plants in their natural habitats.
- * Spot identification (Binomial, Family) of plants included in the theory.
- * Field note-book and 5 herbarium sheets of common angiosperms are to be prepared and submitted at the time of Practical Examination.
- * Breeding techniques: Emasculation, Layering and Grafting.

Semester III
17UBO330405A

Hours/Week: 4
Credit: 3

Allied:
CHEMISTRY FOR BIOLOGISTS - I

Course outcome

1. To understand various chemical reactions involved in biological process
2. To acquire knowledge on the concepts of chemistry in biological system
3. To study the structure and properties of different types of bonds
4. To understand the classification and importance of biopolymers
5. To acquire knowledge on various techniques in organic chemistry
6. To apply the concept of chemistry in biological system.

Unit I: Inorganic Chemistry (12 Hours)

Covalent bond – properties of covalent molecules, structure of BCl_2 , BF_3 , NH_3 , H_2O , CH_4 , SiH_4 , ClF_3 , AF_4 and PCl_5 . Ionic bond – ionization energy, electro-negativity, electron affinity, lattice energy, properties of ionic molecules crystalline structure of ionic molecules. BCC, FCC, NaCl, CsCl. Coordinate bond – ligands, classification of ligands, nomenclature of complexes, oxalate, citrate tartrate, DMG, EDTA ligands and their importance. Structure of $[\text{Ag}(\text{NH}_3)_2]^+$ linear; $[\text{Cu}(\text{NH}_3)_4]^{2+}$ square planar; $[\text{Ni}(\text{Cl})_4]^{2-}$ Td; $[\text{Pt}(\text{CN})_4]^{2-}$ square planar; $[\text{Fe}(\text{CVN})_6]^{2-}$ octahedral. Hydrogen bond – Kinds- intra and inter consequences of H-bond mp, bp, dimer formation, importance of it in biopolymers (proteins and Nucleic acid).

Unit II: Organic Chemistry (12 Hours)

Hydrocarbons: Classification (Aliphatic Saturated / Unsaturated, cyclic / acyclic and Aromatic compounds) nomenclature. Substitution reactions: Free radical substitution reaction of alkane, Aromatic electrophilic substitution mechanisms (Halogenation and nitration only); Elimination reactions: 1. Dehydrohalogenation of alkyl halides to alkenes; 2. dehydration of alcohols to alkenes. Addition reaction: Electrophilic addition of HX to alkenes only; Markovnikov's and Anti- Markovnikov's additions.

Unit III: Quantitative Analysis (12 Hours)

Error Analysis: accuracy, precision, errors, determinate and indeterminate errors, eliminating and minimizing error, relative error, absolute error. Concentration units: mole, molarity, molality, formality, normality, ppm, mole fraction. Primary standard and secondary standard solutions, $V_1N_1 = V_2N_2$, acid-base titration, redox titration, complexometric titration, precipitation titration and example of each with indicators used.

Unit IV: Agricultural Chemistry (12 Hours)

Soil types-red soil, black soil, alluvial soil, desert soil, red soil; role of humus: Manures and their importance. Chemical fertilizers: Natural and synthetic fertilizers: NPK fertilizers: manufacture of NPK fertilizers, mixed fertilizers; role of macronutrients and micronutrients: Pesticides: classification-insecticides, herbicides and fungicides; Structure of important pesticides: DDT, BHC, 2,4-D, 2,4,5-T; biomass and its utilization; triple revolution India (Green, Blue and White).

Unit V: Bioinorganic and coordination Chemistry (12 Hours)

Chemistry of chlorophyll, phorphyrin unit and photosynthesis. Nitrogen fixation, carbon cycle. Chemistry of haem proteins: haemoglobin, myoglobin. Oxygen transport and respiration. Metallo enzymes, vitamins containing metals.

TEXT BOOKS

1. Puri B.R., Sharma L.R., Kalia K.K., (1993) Principles of Inorganic Chemistry (23rd edition), New Delhi, Shoban Lal Nagin, S. Chand New Delhi.
2. Jayashree Ghosh, *Text Book of Pharmaceutical Chemistry*, S. Chand, New Delhi, 1999.

REFERENCE

1. Puri B.R., Sharma L.R., Pathania M.S., (1993) Principles of Physical Chemistry (23rd edition), Shoban Lal Nagin, S. Chand, New Delhi.
2. Tiwari, Organic Chemistry, 2000 S. Chand & Company Pvt. Ltd., New Delhi.
3. R. Gopalan, 1999 Elements of Analytical Chemistry, S. Chand, New Delhi.

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

Semester III	Course Code 17UB0330405A	Title of the Paper CHEMISTRY FOR BIOLOGISTS-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	2	5	3	4	5	3	4	4	2	3	2	4	4	3.00			
CO2	3	4	4	3	5	3	4	4	3	4	3	3	4	3.13			
CO3	2	4	3	4	4	4	3	4	3	4	3	4	4	3.07			
CO4	3	5	4	3	5	3	4	5	3	3	3	4	4	3.27			
CO5	2	4	4	5	4	4	3	5	3	4	3	3	4	3.20			
CO6	3	4	3	2	5	3	4	4	2	3	3	3	4	3.30			
Mean Overall Score														3.13			

Result: The Score for this Course is 3.13 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
17UBO330405B

Hours/Week: 4
Credit: 3

Allied:

BIOMETRICS AND COMPUTER APPLICATIONS-I

Course outcome

1. To learn the basics of statistics in biological context
2. To acquire basic knowledge on statistical principles in designing biological experiments
3. To acquire knowledge on mathematical modeling
4. To learn mean, media and mode
5. To find out statistical tools and means to explore a population
6. To study the standard deviation.

Unit I

Types of measurements – (Interval, ratio, rank order, categorical) logarithm, permutation and combination.

Unit II

Solving a simple linear equation involving one variable and two variables. Matrices - operation on matrices – Determinants – Inverse – Solving a system of equations of order 3x3 using Cramer's rule, inverse method – Gauss Elimination method.

Unit III

Mathematical modeling: The simple function and their graphs revisited – principle of least squares (concepts only) – normal equations for curves, straight line, parabola – power curves, exponential curves, $y = a + bx$, $y = ax^2 + bx + c$, $y = abx$, $y = aex$ – Solving the above system of equation.

Unit IV

Statistics – meaning – population and samples – reasons for using samples – Types of sampling (SRS, Stratified, systematic) – Describing a sample – Frequency table – Frequency graphs – Diagrammatic representation of data.

Unit V

Measures of location: Mean Median and Mode. Measures of variability: Range, Mean deviation, Standard deviation and coefficient of variation. Skewness and Kurtosis.

Book

1. Nageswara Rao G.: Statistics for Agricultural Science, Oxford & IBH publishing Co.

Reference

1. Olive Jean Dunn: Basic Statistics: A primer for the Biomedical Sciences, John Wiley .

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

Semester III	Course Code 17UBO330405B	Title of the Paper BIOMETRICS AND COMPUTER APPLICATIONS - 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		2	5	3	4	5	3	4	4	2	3	2	4	4	3.00	
CO2		3	4	4	3	5	3	4	4	3	4	3	3	4	3.13	
CO3		2	4	3	4	4	4	3	4	3	4	3	4	4	3.07	
CO4		3	5	4	3	5	3	4	5	3	3	3	4	4	3.27	
CO5		2	4	4	5	4	4	3	5	3	4	3	3	4	3.20	
CO6		2	5	3	4	5	3	4	4	2	3	2	4	4	3.30	
Mean Overall Score															3.16	

Result: The Score for this Course is 3.16 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
17UBO330405B

Hours/Week: 2
Credit: 2

Allied:
COMPUTERLAB(EXCEL)

Course Outcomes:

1. To find out the mean and variance of samples.
2. To test the fitness of result by various statistical test.

Using the Excel packages the students are asked to solve the following exercises:

1. Solving a system of equations – Inverse Matrix, Cramer's rule.
 2. Curve fitting – Straight line, Regression line and second degree.
 3. Construction of frequency table – Univariate, Bivariate and Cross tabs.
 4. Drawing frequency graphs.
 5. Pictorial presentation – Bar diagrams, Pie diagrams etc.
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Semester III
17UFC340901

Hours/Week: 2
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 - Land 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	3	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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III
17UFC341003A

Hours/Week: 2
Credits: 2

FORMATION OF YOUTH-I

Course Outcome

1. To expose the students to the presence of unjust structures in society
2. To ensure that students to acquire social ethics and social responsibility.
3. To ensure the students learn to face the global challenges with determination.
4. To ensure living with integrity in personal life and the responsibilities in public life.
5. To ensure preparing the students to seek amicable solutions to common problems.
6. To ensure training the students to inculcate business ethics.

Unit-I:

Introduction to Social Ethics

Social ethics, Social ethics and Social responsibility, Social ethics play an important role of the areas, Religion influences social changes and vice versa, Social ethics and corporate dynamics, Forms of social ethics

Unit-II:

The Economic and Political Systems of Today

Planned Economy and Communism, Feudalism, Market Economy and Capitalism, Socialism, Mixed Economy, The Emerging Market Economy, Political System, Totalitarian System, Oligarchic System

Unit-III:

Characteristics of a New World

Global Challenges, The Future is with the Educated Youth, Cost of the Sacrifice, Crusaders against corruption, Responsibility of the Educated Youth, Positive Global Scenario, The right to education, Eradicating gender inequality, Sustainable human development, Social Integration, Elimination of crime, Integration with global markets

Unit-IV:

Integrity in Public Life and National Integration

What is integrity, Public Life, Integrity and Public Life, Integrity in a Democratic State, India as a Democratic State, Behaviour of an Elected Representative of India, Noticeable degradation acts of Elected Representatives, Suggestions to stem this rot, Types of integrity, Transparency can be a guarantee for integrity

Unit-V:**Business Ethics and Cyber Crime**

Business Ethics, Business ethics permeates the whole organisation, Measuring business ethics, The Vital factors highlighting the importance of business ethics, Cyber Crime, Strategies in Committing Cyber Crimes, Factors aiding Cyber Crime, Computer Hacking, Cyber-Bullying, Telecommunications Piracy, Countermeasures to Cyber Crime, Ethical Hacking

Text Book:

1. **Formation of Youth**, Department of Foundation course, St.Joseph's College, Tiruchirappalli-2, 2016.

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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester- III
17UFC341003B

Hours/Week: 2
Credits: 2

RELIGIOUS DOCTRINE-I

Course Outcome

1. To ensure the understanding of the salvation history and experience the God.
2. To ensure enrichment of the young minds with catholic teachings.
3. To ensure the understanding the spiritual truth that human hearts depend on God.
4. To ensure the knowledge of the person of Jesus and follow his footsteps.
5. To ensure the understanding the hand of God in establishing justice and love.
6. To ensure the edification of the youth in faith and love to transcend all human barriers.

Unit: I-Salvation History

Recognizing God - Human Beings: Their worth & Gifts - The Fall - Hope of Salvation - Prophets' Promises

Unit: II-The Gospel of Jesus Christ

Introduction - According to: St. Mathew - St. Mark - St. Luke - St. John - Symbols

Unit: III-The Holy Spirit

Introduction - Holy Spirit in the Old Testament- Holy Spirit in the New Testament- Holy Spirit in Tradition-Biblical Images of the Spirit—Gifts & Fruits of the Holy Spirit

Unit: IV- Social Justice in the Prophets

Introduction-Prophet and Prophecy-Role of Prophets

Unit: V-The Catholic Church

Mystical Body of Christ-Visible Church on Earth-The Marks or Identifying Characteristics of the Church - Hierarchical Constitution of the Church - The Magisterium or Teaching of the Church - The Church and Salvation

Text Book:

1. **Life in the Lord**, Department of Foundation course, St. Joseph's College, Tiruchirappalli-2, 2011.

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)		
	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
CO2	4	1	4	3	3	4	4	4	5	4	5	5	5
CO3	4	3	4	4	3	4	4	5	4	4	5	5	5
CO4	4	1	4	3	3	4	4	4	5	4	5	5	5
CO5	4	1	4	3	3	4	4	4	5	4	4	4	5
CO6	4	1	4	3	3	5	5	5	5	4	5	4	4
Mean Overall Score													3.9

Result: The Score for this Course is 3.9 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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பருவம்: 4
17UGT410004

மணி நேரம்: 4
புள்ளிகள்: 3

பொதுத்தமிழ்-IV

பாடத்தின் விளைவு

- நாடகத்தின் போக்குகள், உத்திகள், பாத்திரப்படைப்பு, உரையாடல் முறை, கற்பனைத்திறம் போன்றவற்றை அறிந்துகொள்ளுதல்.
- புதிய நாடகங்களைப் படைக்கும் திறனைப் பெறுதல்.
- நாடகங்களை நடிக்கும் திறன் பெறுதல்
- கிரேக்க, ஆங்கில நாடகங்களை அடியொற்றி தமிழ்நாடகம் தோன்றிய வரலாறு அறியச் செய்தல்.
- சங்ககாலம் தொட்டு இக்காலம் வரை காதல் பற்றிய உணர்வுகளை எடுத்துரைத்தல்.
- தமிழ் வரலாற்றின் மன்னர்களின் ஆட்சியின் சிறப்புகளையும் வீழ்ச்சிகளையும் எடுத்துக்காட்டுதல்.

அலகு-1 (12 மணி நேரம்)

மனோன்மனியம், பாயிரம், அங்கம் - 1, களம் 1 - 5 வரை.

அலகு-2 (12 மணி நேரம்)

மனோன்மனியம், அங்கம் - 2, களம் 1 - 3 வரை.

இலக்கிய வரலாறு நான்காம் பாகம் - தமிழும் பிற துறைகளும் பக்கம் (365-387).

அலகு-3 (12 மணி நேரம்)

மனோன்மனியம், அங்கம் - 3, களம் 1 - 4 வரை.

உரைநடை நாடகம் (கௌதம புத்தர்)

அலகு-4 (12 மணி நேரம்)

மனோன்மனியம், அங்கம் - 4, களம் 1 - 5 வரை.

இலக்கிய வரலாறு நான்காம் பாகம் - சமயத்தவரின் தமிழ்ப்பணி (பக்கம் 391-402)

அலகு-5 (12 மணி நேரம்)

மனோன்மனியம், அங்கம் - 5, களம் 1 - 3 வரை.

இலக்கிய வரலாறு நான்காம் பாகம் - வெளிநாடுகள் தந்த தமிழ் இலக்கியம் (பக்கம் 410-435)

பாடநூல்கள் :

1. சுந்தரனார், மனோன்மனியம், தமிழாய்வுத்துறை (பதிப்பு), தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2. (அங்கம் : 3 களம் : 4 நீங்கலாக)
2. பாலசுப்பிரமணியம். கு.வெ, கௌதம புத்தர், அப்பா நிலையம், தஞ்சாவூர்
3. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை வெளியீடு, 2014.

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	5	4	4	5	4	4	4	4	4.1
CO6	4	3	4	5	5	4	4	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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semestre: IV
17UGH410004

Hours/Week: 4
Credits: 3

HINDI-IV

Learning 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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semestre: IV
17UGF410004

Heures /Semaine: 4
Points : 3

FRANÇAIS-IV

Les résultats d'apprentissage: L'étudiant peut ...

- * 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 compte 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.

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: IV
17UGS410004

Hours/Week: 4
Credits : 3

SANSKRIT-IV

Course Outcomes

At the end of the course, a student should be able to demonstrate...

- * knowledge and understanding of the history of Sanskrit Drama.
- * knowledge and understanding of the Nataka vivaranam.
- * the introduction of Functional - Sanskrit conversation Letter writing.
- * the ability to apply relevant theoretical perspectives to topics within the field of study
- * the competence in academic writing and oral presentation skills.
- * the ability to work both independently and in groups on presentations and/or development of Projects.

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester: IV
17UGE420104

Hours/Week: 5
Credits: 3

GENERALENGGLISH-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.

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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation Quality	1	2	3	4	5
	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
17UBO430210

Hours/Week: 5
Credit: 4

CELL BIOLOGY AND GENETICS

Course outcome

1. To understand the organization of cells
2. To understand the structure and organization of various cell organelles
3. To understand cell cycle and methods of cell division
4. To study the structure of DNA and RNA
5. To understand the principles and applications of genetics
6. To acquire the basic knowledge on genomics and proteomics.

Unit I

Cell division (mitosis and meiosis)- Cell cycle. Structure, organization and functions of nucleus, mitochondria, chloroplasts, ER, ribosomes, golgi complex, lysosome and vacuole.

Unit II

Cytoplasmic membrane structure and functions. Organisation of cytoskeleton. cellular mechanisms in development and differentiation. Chemical structure of DNA and RNA. Primary, secondary and tertiary structures of DNA. Chromatin nucleosomes and chromosomal proteins, protamines and histones. Special types of chromosome – polytene & lampbrush.

Unit III

Mendel's laws of heredity, Modified Mendelian ratios. Multiple alleles. Linkage and crossing over. Sex linked inheritance. Sex determination mechanism. Cytoplasmic inheritance (plastid inheritance).

Unit IV

DNA is the genetic material: proof: Griffith's, Avery *et al.*, and Hershey and Chase. RNA as genetic material. Population genetics: gene frequency, gene pool, Hardy-Weinberg equilibrium. Gene frequencies – conservation and changes.

Unit V

Basic knowledge and applications of genomics and proteomics. Genomics: structural and functional genomics. Plant genome (*Arabidopsis* and *Oryza*), animal (Homo sapiens). Human Genome Project - objectives and the controversies.

Book

1. Verma, P.S. & V.K. Agarwal, 2003, Genetics. S. Chand & Co.Ltd., New Delhi.

References

1. Freifelder, D. 1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.
2. Gardner, E.J., Simmons, M.J. & Snustad, D. 1991. Principles of Genetics, John Wiley & Sons Inc., 8th Edn., New York.
3. Sinnott, E.W., Dunn, L.L. & Dobzhansky, T. 1997. Principles of Genetics, Tata Mac Graw Hill Publishing Co., New Delhi.

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

Semester IV	Course Code 17UBO430210	Title of the Paper CELL BIOLOGY AND GENETICS												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	4	5	5	4	3	5	2	5	3	4	3	3	3.8	
CO2	5	3	4	5	4	5	3	4	4	5	3	5	3	4.0	
CO3	4	5	2	5	4	3	4	3	5	2	5	5	4	3.9	
CO4	5	3	5	2	5	4	5	3	4	5	5	5	3	4.2	
CO5	5	5	4	4	3	5	3	5	3	5	4	2	5	4.1	
CO6	3	4	4	5	2	4	5	3	5	5	4	3	5	4.0	
Mean Overall Score														4.0	

Result: The Score for this Course is 4.0 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
17UBO430211

Hours/Week: 5
Credit: 4

MOLECULAR BIOLOGY

Course Outcome

1. To understand the basic structure of biomolecules and their mode of action
2. To understand the types of DNA molecules and their mechanism of replication
3. To study the process of transcription and translation
4. To study the regulation of gene expression in prokaryotes and eukaryotes
5. To comprehend the molecular mechanism of gene regulation
6. To differentiate the regulation of gene expression between the prokaryote and eukaryote.

Unit I

Organisation of genome – prokaryotic and eukaryotic. Linear and circular DNA molecules. Mutation – types, causes and detection, mutant types – lethal, conditional, biochemical, germinal vs somatic mutants, insertional mutagenesis. Basic idea about mobile genetic elements - IS elements and transposons.

Unit II

DNA replication: semiconservative model, DNA polymerase, chemistry of synthesis, mechanism of replication in *E. coli*. Replication of RNA genome – replicase and reverse transcriptase. DNA repair mechanisms - mismatch and proof reading, photoreactivation, excision, recombination and SOS mechanisms in *E. coli*.

Unit III

Gene expression and the Central Dogma, transcription: RNA polymerase, signals, chemistry of RNA synthesis, mechanism of initiation, elongation and termination in *E. coli*. Differences in eukaryotes, post-transcriptional processing.

Unit IV

Translation – organization of mRNA, genetic code and its characterization, ribosome and rRNA, amino acyl synthetase, tRNA and amino acid activation. Mechanism of initiation elongation and termination. Translation factors, post-translation processing.

Unit V

Regulation of gene expression: The principles, cooperative and on-off regulations. Molecular mechanism: Negative and positive, repressors and inducers. Mechanism of *lac* operon and *trp* operon in *E. coli*. Differences in gene regulation in eukaryotes.

Books

1. Freifelder, D.1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.
2. Gupta PK 2005. Molecular Biology and Genetic Engineering, Rastogi Publications, Meerut.

References

1. De Robertis & De Robertis. 1990. Cell and Molecular Biology, Saunders College, Philadelphia, USA.
2. Elliott WH & Elliott DC. 2005. Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford.

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

Semester IV	Course Code 17UBO430211	Title of the Paper MOLECULAR BIOLOGY												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	4	3	3	4	3	3	4	3	5	5	3	4	3.7	
CO2	5	5	4	4	3	4	5	3	2	3	4	3	5	3.9	
CO3	4	5	4	4	5	3	3	4	3	4	5	3	4	3.9	
CO4	5	4	2	5	4	5	3	3	4	2	5	3	4	3.8	
CO5	5	3	5	2	5	3	4	4	4	3	3	5	4	3.8	
CO6	5	4	2	5	3	4	3	5	3	4	2	4	4	3.7	
Mean Overall Score														3.8	

Result: The Score for this Course is 3.8 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs =	Total of Values Total No. of POs & PSOs	Mean Overall Score for COs =	Total of Mean Scores Total No. of COs
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Semester IV
17UBO430212

Hours/Week: 3
Credit: 2

LABORATORY COURSE-IV
(Cell Biology, Genetics and Molecular Biology)

Course outcome

1. To understand the chemistry of plant components and products so as to exploit chemistry in the improvement and production of phytochemicals.
2. To import knowledge in some basic techniques necessary to handle the above objective.

Detailed Study::

1. Ultra structure of cell organelles.
 2. Study of mitosis in root tips
 3. Study of meiosis in anthers
 4. Inheritance Patterns – Mendelian and modified Mendelian ratios
 5. Linkage Mapping.
 6. Estimation of allele frequency in natural (random matting) populations.
 7. Isolation and display of polytene chromosomes.
 8. Extraction of human genomic DNA from saliva.
 9. Estimation of DNA (Colorimetric).
- _____

Semester IV
17UBO430407A

Hours/Week: 4
Credit: 3

Allied:
CHEMISTRY FOR BIOLOGISTS - II

Course outcome

1. To understand the chemistry of plant components.
2. To study the functional role of phytochemicals
3. To understand the plant based drugs and their curative roles
4. To elucidate various phytochemicals by natural methods
5. To experiment qualitative analysis of organic substances
6. To learn various chromatography techniques

Unit I: Physical Chemistry (12 Hours)

Chemical Kinetics - rate, order, molecularity of reactions. Zero order and first order reaction, rate constant derivation, examples, Importance of kinetic study, activation energy, activated complex, Arrhenius equation, factors affecting rate of the reactions. Thermodynamics of a chemical reaction - Terms DE, DH, DS, DG, endothermic, exothermic reactions, conditions for spontaneity of reactions. Laws of thermodynamics (I, II, III definition only).

Unit II: Pharmaceutical Chemistry (12 Hours)

Classification of drugs: Definitions of: Drug, pharmacophore, pharmacognory, pharmacy, pharmacokinetics, pharmacodynamics, pharmacopoeia (IP, BP, USP). Antibiotics: Penicillin; Anaesthetics-general and local anaesthetics: Inhalation anaesthetics (N_2O , $CHCl_3$, haloethane, ethylchloride). Intravenous anaesthetics (thiopental sodium); & sulphonamide drugs.

Unit III: Chemistry of Natural Products (12 Hours)

Vitamins-types of vitamins A_1 retinol, vitamin B complex (thiamine- B_1 , riboflavin- B_2 , cyanocobalamin- B_{12}), vitamin C, vitamin D and Vitamin E (Sources and deficiency disorders of vitamins only) (structures and structural elucidation not required) Alkaloids: Occurrence, Classification, physical properties and uses of coniine, piperine, nicotine, morphine and quinine alkaloids (structures of alkaloids not required) Terpenoids: Classification, properties and uses of camphor, citral and α -pinene (structures of terpenoids not required).

Unit IV: Organic qualitative Analysis(12 Hours)

Qualitative analysis of organic substances: solubility test in $NaHCO_3$, $NaOH$, HCl , test for saturation and unsaturation; aliphatic & aromatic; acidic, basic

and neutral nature; elements test for N, S and halogens: functional groups like acid, phenol, aldehyde, ketone, carbohydrate, amine, amide and diamide.

Unit V Chromatography and electrophoresis (12 Hours)

Introduction, types of Chromatographic Techniques: Principles, instrumentation, sampling and applications of Paper, thin layer, column chromatography and electrophoresis

TEXT BOOKS:

1. Puri B.R., Sharma L.R., Pathania M.S., 1993. Principles of Physical Chemistry (23rd edition), New Delhi, ShobanLalNagin Chand & Co.
2. Jayashree Ghosh, 1999. Text Book of Pharmaceutical Chemistry, S. Chand & Company Pvt. Ltd., New Delhi

REFERENCES:

1. Tiwari, 2000 Organic Chemistry, S. Chand & Company Pvt. Ltd., New Delhi.
2. N. S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Lab Manual, S. Viswanathan & Co. Pvt.Ltd., 1998
3. R. Gopalan, 2000 Elements of Analytical Chemistry, S. Chand, New Delhi.
4. Puri B.R., Sharma L.R., Kalia K.K., 1993. Principles of Inorganic Chemistry (23rd edition), New Delhi, ShobanLalNagin Chand & Co.
5. Puri B.R., Sharma L.R., Pathania M.S., 1993. Principles of Physical Chemistry (23rd edition), New Delhi, ShobanLalNagin Chand & Co.

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

Semester IV	Course Code 17UBO430407A	Title of the Paper CHEMISTRY FOR BIOLOGISTS-II												Hours 4	Credits 3
		Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)						Mean Score of COs	
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1		2	4	3	4	4	4	3	4	3	4	3	4	3	4
CO2		2	5	3	4	4	4	2	4	5	3	3	4	3	4
CO3		3	4	4	5	4	4	2	3	4	4	3	4	4	4
CO4		2	4	3	5	4	4	3	3	4	4	3	3	4	3
CO5		2	3	4	4	5	4	3	4	3	5	2	4	4	3
CO6		2	4	3	4	4	4	3	4	3	4	3	4	3	4
Mean Overall Score														3.00	

Result: The Score for this Course is 3.0 (Moderate Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester III & IV
17UBO430406A

Hours/Week: 2
Credit: 2

Allied:
CHEMISTRY PRACTICAL FOR BIOLOGISTS

Course Outcome

1. To estimate various minerals by volumetric analysis.
2. To identify various biomolecules by standard biochemical methods.

Students learn the techniques of volumetric and organic qualitative analysis

I. 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.

II. Volumetric Analysis

Estimation of acid by titration using standard base – estimation of base titration using standard acid – estimation of iron by titration with potassium permanganate – estimation of oxalic acid by titration using potassium permanganate – estimation of potassium dichromate by titration of copper by titration using KI and standard thiosulphate – estimation of iron using potassium thiocyanate by spectrophotometry (demonstration only).

REFERENCES:

1. Experimental Chemistry, J. N. Gurtu and Kapoor, S. Chand and Co. 1987.
2. N. S. Gnanaprasagam and G. Ramamurthy, Organic Chemistry – Lab Manual, S. Viswanathan & Co. Pvt.Ltd., 1998.

Semester IV
17UBO430407B

Hours/Week: 4
Credit: 3

Allied:
BIOMETRICS AND COMPUTER APPLICATIONS- II

Course Outcome

1. To understand the various applications of statistics
2. To acquaint latest developments in field of information technology
3. To study the communicative tools in the field of information technology
4. To enable the students to analyze and handle biological data
5. To understand the testing of hypothesis using null hypothesis
6. To understand co-relation and regression, and their applications.

Unit I

Probability: normal distribution – definition – properties – areas under normal curve – interpreting areas as probabilities – importance of normal distributions. Confidence interval: confidence interval for means – between two means, variance and proportion.

Unit II

Testing of hypothesis: null hypothesis – two kinds of errors – testing of hypothesis based simple mean – difference between mean – population proportion – difference between the population proportion – the Chi-square test – goodness of fit – test for independence – f test: equality of variances.

Unit III

Correlation and regression: correlation: types of correlation – scatter diagram – Pearson's coefficient of correlation – rank correlation. Simple regression: meaning of regression lines – regression equations y on x and x on y only – regression coefficient – simple problems.

Unit IV

Theory of attribute: introduction – notations – dichotomy – classes and class frequencies – consistency of data – criteria of independence – Yule's coefficient of association – coefficient of colligation.

Unit V

Comparison between Parametric and Non-parametric tests. Non-parametric tests – Single test, Run test for randomness, Wald-Wolfowitz run test, Median test, Wilcoxon single rank test, Mann Whitney U test – (no derivations – conceptual and applications understanding are to be tested).

Book

1. Nageswara Rao G.: Statistics for Agricultural Science OXFORD & IBH publishing Co.

Reference

1. Olive Jean Dunn: Basic Statistics: A primer for the Biomedical Sciences – John Wiley and Sons.

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

Semester IV	Course Code 17UBO330407B	Title of the Paper BIOMETRICS AND COMPUTER APPLICATIONS - 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	2	4	3	4	4	3	4	3	4	3	4	3	4	3.00	
CO2	2	5	3	4	4	2	4	5	3	3	4	3	4	3.07	
CO3	3	4	4	5	4	2	3	4	4	3	4	4	4	3.20	
CO4	2	4	3	5	4	3	3	4	4	3	3	4	3	3.00	
CO5	2	3	4	4	5	3	4	3	5	2	4	4	3	3.07	
CO6	2	4	3	4	4	3	4	3	3	3	4	3	4	3.03	
Mean Overall Score														3.03	

Result: The Score for this Course is 3.0 (Moderate Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
17UBO430408B

Hours/Week: 2
Credit: 2

Allied:
COMPUTERLAB - II
(Statistical Software Package)

Course Outcome

1. To find out the mean and variance of samples.
2. To test the fitness of result by various statistical test.

Detailed study:

1. Finding Mean and Variance.
 2. Finding correlation coefficient, Rank Correlation.
 3. T- test
 4. F-test
 5. Chi-square test
 6. Non-parametric tests.
-

Semester IV
17UFC441004A

Hours/Week: 2
Credits: 2

FORMATION OF YOUTH-II

Course Outcome

1. To ensure preparing the students to live in harmony with nature.
2. To ensure the youth the significance of public health and the related issues.
3. To ensure sensitizing the youth about addictions and their consequences.
4. To ensure educating the youth on disaster management and First-Aid.
5. To ensure enlightening on the developmental issues and challenges of youth today.
6. To ensure the value of counselling for attaining positive mental health.

Unit-I: Harmony with Nature

What is environment, Why should we think of harmony, Longing for human well-being, Principles to conserve environmental resources, Causes of disharmony, The fruits of harmony with nature, Forest resources, Water resources, Mineral resources, Food resources, Fruits of disharmony, 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 Scale	1-20% 1	21-40% 2	41-60% 3	61-80% 4	81-100% 5
Relation Quality	0.0-1.0 Very poor	1.1-2.0 Poor	2.1-3.0 Moderate	3.1-4.0 High	4.1-5.0 Very High

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester IV
17UFC441004B

Hours/Week: 2
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 Outcomes (COs)	Course Code 17UFC441004B		Title of the Paper RELIGIOUS DOCTRINE-II										Hours 2	Credits 2
		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 Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation Quality	1	2	3	4	5
	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester V
17UBO530213

Hours/Week: 6
Credits: 3

BIOPHYSICS AND BIOSTATISTICS

Course Outcome

1. To understand the physical principles applicable to biological systems
2. To learn the emerging field of biophysics with reference to bioenergetics
3. To understand photobiology and its biological significance
4. To learn the principles of statistics and their applications in biology
5. To understand measures of central value and standard deviation
6. To learn various probability tests of significance.

Unit I

Biophysics: bioenergetics - energy and work. Laws of thermodynamics – concept of entropy and enthalpy – Gibb's free energy – energy transduction in biological systems – high energy compounds – ATP bioenergetics and energy coupled reactions. Radioactivity - structure of an atom - isotopes – types of radiations – detection of radiation - autoradiography – application of radioactive isotopes in biological studies.

Unit II

Photobiology - electromagnetic spectrum – visible range of spectrum – dual nature of light (wave & particle nature) – solar energy and photosynthesis – energy states of atom – spin property – absorption spectra of molecules – energy states – excitation – singlet and triplet states – de excitation – heat emission – light emission. Bioluminescence.

Unit III

Biostatistics: Data: primary & secondary; variable: discrete & continuous – population & sample. Sampling techniques – classification of data - frequency distribution: discrete, continuous and cumulative – parts of a statistical table – advantages of classification of data. Presentation of data - histogram, frequency polygon, frequency curve, Ogive curve, bar charts: simple, multiple, subdivided, pie diagram.

Unit IV

Measures of central values: mean, median, mode. Measures of dispersion: range, mean deviation, standard deviation, coefficient of variation – Skewness. Correlation - definition – types – methods of studying correlation: scatter diagram method and Karl Pearson's coefficient of correlation for simple and linear data. Regression: definition – regression lines.

Unit V

Probability - definition, binomial, poisson and normal distributions. Tests of significance. General procedure – large sample testing & small sample testing: t-Test, Chi-square test and F test.

Books

1. Bose, 1981. Elementary Biophysics, Vijaya Printers, Chennai.
2. Nageswara Rao, G. 1983. Statistics for Agricultural Science Oxford & IBH.

References

1. S.P. Gupta, 2008. Elementary Statistical Methods, Sultan Chand & Sons, New Delhi
2. Casey, E.J., 1969. Biophysics Concepts and Mechanisms, East & West Press, New Delhi.

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

Semester V	Course Code 17UBO530213	Title of the Paper BIOPHYSICS AND BIOSTATISTICS												Hours 6	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	3	3	4	5	3	4	4	3	4	4	5	4	3.9	
CO2	4	5	3	5	3	4	3	4	5	4	3	4	5	4.0	
CO3	5	4	4	3	4	4	3	5	2	3	2	5	5	3.8	
CO4	4	5	4	2	4	4	4	3	5	3	5	3	4	4.3	
CO5	5	5	3	5	3	4	5	4	5	4	4	4	5	3.2	
CO6	4	3	2	4	2	3	5	3	3	3	4	2	4	3.3	
Mean Overall Score														3.7	

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

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester V
17UBO530214

Hours/Week: 5
Credits: 3

ECOLOGY AND CLIMATE CHANGE

Course Outcome

1. To understand the fundamentals of ecology
2. To learn various ecosystems and their components
3. To learn various biogeochemical cycles and their significance
4. To understand techniques of community studies
5. To learn the center of origin of cultivated plants
6. To understand various factors and concepts of climate change

UNIT I

Introduction to ecology and ecosystem, biosphere and biomes. Autecology: definition and its various aspects. Synecology: definition, classification units of vegetation, community composition, classification of community, study of plant community structure. Basic idea of biodiversity – species, genetic, ecosystem and habitat diversity.

UNIT II

Biogeochemical cycles - C, N & P. Plant succession: definition, primary and secondary succession, autogenic and allogenic succession, pioneers and climax communities. Mechanism of plant succession - xerosere and hydrosere. *Population interactions*: symbiosis, mutualism, parasitism.

UNIT III

Sampling techniques in plant community studies – quadrat and transect methods – species area curve – density, frequency, abundance, dominance of populations – importance value index – construction of phytographs. Phytogeographical zones of India.

UNIT IV

Centres of origin and distribution of species. Patterns of plant distribution - continuous and discontinuous. Continental drift - evidences and impact; endemic distribution, theories on endemism, age and area hypothesis.

UNIT V

Carbon emissions, global warming, climate change, carbon credit, carbon sequestration, blue carbon, alternative energy sources and green energy. Climate change conferences and the role of IPCC and UNFCCC.

Text Book

1. Sharma, P.D. (1995) Ecology and Environment

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References

1. Melchias G. 2001. Biodiversity and Conservation. Science Publishers Inc, NH USA.
2. Odum, E.P. 1983. Basic Ecology, Saunders, Philadelphia.
3. Smith, R.L. 1996. Ecology and Field Biology, Harper Collins, New York.
4. Dash M C (1993). *Fundamentals of Ecology*. Tata McGraw Hill.
5. Varma P S, Agarwal V K. *Principles of Ecology*. S Chand and Co.
6. Begon, M. Harper, J.L. and Townsend, C.R. 1996. Ecology, Blackwell Science, U.S.A.
7. N.S. Subrahmanyam and A.V. S.S. Sambamurty. 2000. Ecology. Narosa Publishing, Delhi

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

Semester V	Course Code 17UBD530214	Title of the Paper ECOLOGY AND CLIMATE CHANGE													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	4	4	4	5	3	5	4	3	4	3	2	3	5	3.8		
CO2	4	4	5	3	3	2	3	4	3	5	2	5	3	3.5		
CO3	3	4	3	3	3	3	3	3	2	2	5	3	4	3.2		
CO4	4	4	4	2	4	3	5	3	4	2	4	2	4	3.5		
CO5	5	3	3	5	2	3	5	3	3	5	2	3	4	3.5		
CO6	3	4	4	3	5	3	5	3	5	4	4	2	5	3.8		
Mean Overall Score														3.5		

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester V
17UBO530215

Hours/Week: 3
Credits: 2

LABORATORY COURSE-V

(Biophysics, Biostatistics, Ecology and Climate Change)

Course Outcome

1. To separate cell and tissue components by various techniques.
2. To analyze the physico-chemical characteristics of water and soil.
3. To study the vegetation by various methods.

Biophysics and Biostatistics

1. Separation of cell and tissue components by centrifugation
2. Separation of pigments by Paper chromatography
3. Absorption spectrum of macromolecules and pigments – UV, FTIR
4. Sampling by Random Number Table
5. Data Collection
6. Classification of Data: Discrete, continuous and cumulative.
7. Statistical diagrams: Histogram, Frequency curve, Bar chart and Ogive curve
8. Measures of Central Values: Mean, Median and Mode
9. Measures of Dispersion: Range, Mean Deviation and Standard Deviation.

Ecology and Climate Change

1. Chemical analysis of water and Soil –Total hardness, Carbonates and Bicarbonates and Dissolved oxygen.
 2. Vegetation Analysis: Quadrat, Line transects, Species Density, abundance and richness. Basal area and relative dominance
 3. Green auditing
 4. Field trip
-

Semester V
17UBO530216

Hours/Week: 5
Credits: 3

MICROBIOLOGY AND IMMUNOLOGY

Course Outcome

1. To study micro organism and their activities
2. To exploit the potentiality of microbes in industry, agriculture and environmental issues
3. To learn culture techniques of microbes
4. To study various human diseases caused by microbes and their control
5. To understand various types of food spoilage and their methods of food preservation
6. To understand human immune system and learn the origin, structure and function of immunoglobulins.

Unit I

History and scope of microbiology, characterization and classification of microorganisms. Whittaker's five kingdom concept – Bergey's Manual of Systematic Bacteriology (outline only). Morphology, cell structure, cell wall chemistry, growth, nutrition and reproduction of bacteria. Viruses – structure, classification and reproduction - lytic and lysogenic cycle. A general account on Rickettsias, Chlamydias, Mycoplasmas, Viroids and Prions.

Unit II

Culture of microorganisms: Pure cultures, batch and continuous cultures. Preservation of microorganisms. Microorganisms and Human diseases: Food borne (botulism), water borne (typhoid), air borne (tuberculosis), vector borne (malaria) and contact diseases (AIDS), avian flu, swine flu and SARS. Control of microorganisms – physical, chemical and biological methods.

Unit III

Microbial ecology: Soil microbiology – role of microbes in biogeochemical cycles (carbon, nitrogen and sulphur). Aquatic microbiology – fresh water, marine and estuarine. Air microbiology. Food microbiology (types of food spoilage and methods of food preservation). Dairy microbiology – fermented dairy products. Industrial microbiology (fermentation and industrial production of alcohol and antibiotics).

Unit IV

Immune system - adaptive, innate, humoral and cellular immunity. Origin, structure and immunological role of primary lymphoid organs (bone marrow

and thymus) and Secondary lymphoid organs (Spleen, lymph nodes, Payer's patches, tonsils and appendix).

Unit V

Origin, structure and immunological role of immune cells (Leucocytes and lymphocytes). Lymph- composition and functions. Antibody types - study of IgG, its structure and immunological role.

Books

1. Pelczar J Chan ECS & Krieg R 1999. Microbiology, Tata McGraw Hill, New Delhi.
2. Sullia SB & Shantharam S 2005. General microbiology. Oxford & IBH
3. Chakravarty AK 2000. Immunology, Tata McGraw Hill Publication, New Delhi.

Reference

1. Casida LE 1989. Industrial microbiology, Wiley Eastern, New Delhi.
2. Dubey RC & Maheshwari DK. 2004. A text book of microbiology. S. Chand New Delhi.
3. Frazier, NC.1974. Food Microbiology, II Edn., Tata McGraw Hill, New Delhi.
4. Martin Alexander. 1978. Introduction to Soil Microbiol, Wiley Eastern, New Delhi.
5. Janeway CA & Travers P. Immunobiology, Garland Publishing Inc., New York.
6. Daniel P. Stites & Abba I. Jerr. 1998. Medical Immunology, 9th Ed., Prentice-Hall International Inc.

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

Semester V	Course Code 17UBO530216	Title of the Paper MICROBIOLOGY AND IMMUNOLOGY												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	4	5	3	4	4	3	3	4	2	5	2	3	4	3.5	
CO2	5	2	3	3	3	2	4	2	3	4	2	4	4	3.2	
CO3	4	5	3	5	3	4	3	4	3	5	4	2	5	3.8	
CO4	5	3	5	3	4	5	3	5	4	4	3	2	4	3.8	
CO5	3	3	2	3	2	3	3	3	2	2	3	2	2	3.5	
CO6	3	4	3	5	2	5	3	4	2	5	3	4	2	3.5	
Mean Overall Score														3.5	

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester V
17UBO530217

Hours/Week: 3
Credits: 2

**LABORATORY COURSE-VI
(MICROBIOLOGY & IMMUNOLOGY)**

Course Outcome

1. To learn various techniques of isolation and enumeration of microorganisms from various sources.
2. To learn the various immunological tests.

Microbiology

1. Preparation of common media (Nutrient agar & Potato dextrose agar).
2. Staining of Bacteria (Simple & Grams staining).
3. Isolation and enumeration of microbes in soil and water (serial dilution).
4. Study of motility by Hanging Drop.
5. Pure cultures of bacteria – Streak plate, Pour plate and Spread plate.
6. Microbiology of milk (Phosphatase and MBRT)
7. Antibiosis - Kirby Baur method

Immunology

1. Blood grouping
 2. WIDAL- test for typhoid
 3. RPR- test for syphilis
 4. RF- test for rheumatoid arthritis
 5. Immunoelectrophoresis – Demo
 6. ELISA – Demo
-

Semester V
17UBO530218

Hours/Week: -
Credits: 2

**Self-Paced Learning:
ECONOMIC BOTANY
(Partially Online-Course)**

Course Outcome

1. To understand the economically important crops
2. To study the morphology and uses of medicinal plants
3. To acquire the importance of medicinal plants for human welfare
4. To acquire scientific knowledge on preparation of valuable economic plant products
5. To produce beverages and narcotics from specific plants
6. To study plants used for the preparation of latex, dye, resin, gum and fibres.

Unit I

Study of binomial, family, morphology of useful parts and economic importance of the following: cereals: rice, wheat, maize, pearl millet and finger millet. pulses: red gram, black gram, bengal gram, rarden pea and cluster bean.

Unit II

Study of binomial, family, morphology of useful parts and economic importance of the following: fruits: apple, banana, mango, papaya grape and guava. Spices: nutmeg, cinnamon, fennel, fenugreek and pepper.

Unit III

Study of binomial, family, morphology of useful parts and economic importance of the following: fibres: cotton, jute, sisal hemp, coconut and flax. Essential oils: lemongrass oil, sandal wood oil, olive oil, jasmine oil and eucalyptus oil.

Unit IV

Study of binomial, family, morphology of useful parts and economic importance of the following: beverages & narcotics: coffee, tea, cocoa, tobacco and ganja. Tannins & resins: myrobalan, wattle bark, canada balsam, turpentine and gum arabic.

Unit V

Study of binomial, family, morphology of useful parts and economic importance of the following: latex & dyes: chicle, gutta percha, rubber, indigo

and haematoxylin. Drugs: digitalin, santonin, ephedrine, nux-vomica and serpentine.

Text Book

1. Pandey B.P.2005.Economic Botany.S.Chand &Company Pvt.Ltd., New Delhi.

References

1. Pandey B.P.2011.College Botany. Vol.III. S.Chand & Company Pvt. Ltd., New Delhi.
 2. Verma V. 2009. Text book of Economic botany. Ane Books Pvt. Ltd., New Delhi.
 3. Pandey BP. 2007. Botany for degree students, S.Chand &Company Pvt.. Ltd., New Delhi.
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Semester V
17UBO530301A

Hours/Week: 4
Credits: 4

Core Elective: BIOPESTICIDES

Course Outcome

1. To understand the types and mode of action of biopesticides
2. To understand plants as source of natural pesticides
3. To learn mass production techniques of microbial biopesticides
4. To learn insects as biopesticides
5. To learn virus as biopesticide
6. To understand the various types of biopesticide formulations.

Unit I

Biological control of insect pests: scope and principles, factors affecting biological control. Biopesticides: introduction, importance and classification – living creatures to control pests – weeds for controlling pest.

Unit II

Botanical pesticides: present status and future prospects; opportunities for botanical pesticides in crop rotation; multiple cropping for controlling pests. Plants as a source of natural pesticides: neem, chrysanthemum, aristolochia, garlic, turmeric and citronella.

Unit III

Biocontrol agents: Isolation, identification, mode of action and mass production of *Pseudomonas fluorescens* (bacterial agent), *Trichoderma viride* (fungal agent).

Unit IV

Biological pesticides: isolation, identification. Bacterium as biopesticide (*Bacillus thuringiensis*). Fungus as biopesticide (Entomophagous - *Beauveria bassiana*). Insect as biopesticide (*Reduviid predators* - *Rhynocoris kumarii*, *R. fuscipes*, *R. marginatus*). Trichogramma. Virus as biopesticide (Baculovirus - NPV).

Unit V

Production methods of biopesticides: liquid culture fermentation and solid state fermentation – Types of biopesticide formulations: dry inoculum, granules, pellets, capsules, wettable powder and liquid formulations.

Books

1. Ghosh G K, 2000, Biopesticide and Integrated pest Management, A P H Publishing Corporation, New Delhi.
2. Subba Rao N S, 1982, Advances in Agricultural Microbiology, Oxford & IBH Publishing Company, Chennai.

References

1. Krishna Chandra, Greep and Srivathsa, 2005, Bio Control Agents & Biopesticides,
2. Ministry of Agriculture, New Delhi and Regional Centre of Organic Farming, Bangalore.
3. Franklin R. Hell and Julius J. Menn, 1999, Biopesticides – Use and delivery, Humene Press, New Jersey.
4. D. Dent, 2000, Insect Pest Management 2nd Ed, ABI Publishers, UK

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

Semester V	Course Code 17UBO530301A	Title of the Paper BIOPESTICIDES														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	4	4	2	5	2	3	4	2	5	3	4	3.5			
CO2	3	5	3	2	5	3	5	3	4	3	4	3	4	3.6			
CO3	3	4	4	3	3	5	4	2	4	3	4	5	4	3.7			
CO4	5	3	5	2	4	2	3	5	3	3	4	3	2	3.4			
CO5	5	2	4	2	4	4	3	5	4	4	5	4	4	3.8			
CO6	4	3	3	4	3	4	3	5	2	4	2	4	3	3.4			
Mean Overall Score														3.5			

Result: The Score for this Course is 3.5 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
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Semester V
17UBO530301B

Hours/Week: 4
Credits: 4

Core Elective:
MEDICINAL BOTANY

Course Outcome

1. To understand the different Indian systems of medicine
2. To learn classifications of natural drugs
3. To study collection, cultivation and preparation of natural drugs
4. To understand drugs obtained from various parts of the plants
5. To study the process of drug adulteration
6. To learn various types of drug evaluation and quality control of drugs.

Unit I

History of medicinal plants. Traditional medicinal systems: ayurvedha, siddha, unani and naturopathy. Definition of drug classification of natural drugs - alphabetical, morphological, taxonomical, chemical and pharmacological.

Unit II

Ethnobotany – definition major tribes of South India and their ethno botanical and ethnobiological heritage. Ethnobotany and conservation of plants with special reference to India. Mythology and conservation of ecosystems (sacred groves).

Unit III

Cultivation, collection and preparation of natural drugs macroscopic (physical and organoleptic characters), therapeutic and pharmaceutical characterization of the following medicinal plants: *Adathoda vasica*, *Aloe vera*, *Centella asiatica*, *Piper nigrum*, *Allium sativum*, *Curcuma longa*, *Ocimum sanctum* and *Catharanthes roseus*.

Unit IV

Drugs from leaves (*Eucalyptus*), flower (*Eugenia*), fruits and seeds (*Coriander*), roots (*Withania*), underground stem (Ginger), bark (*Cinchona*) and wood (*Ephedra*). Cultivation and utilization of selected medicinal plants *Bacopa monnieri*, *Cassia senna*, *Gloriosa superba*, *Phyllanthus amarus* and *Rauvolfia serpentina*.

Unit V

Drug adulteration and types. Drug evaluation: physical, chemical and biological. Quality control of herbal drugs. Role of NMPB, AYUSH and CDRI.

Text Books

1. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2003). Pharmacognosy. Nirali Prakashan, Pune.

References

1. Bhattacharjee, S.K. 2004. Hand Book of Medicinal plants. Pointer Publishers, Jaipur.
2. Harbourne, J. B. (1998). Phytochemical methods: A Guide to Modern Techniques of Plant Analysis (3rd edition). Chapman and Hill Co., New York.
3. Jain, (2001). Medicinal plants. National Book Trust, New Delhi.
4. John Jothi Prakash, E. (2003). Medicinal Botany and Pharmacognosy. JPR Publication, Vallioor, Tirunelveli.
5. Joshi, S.G. (2001). Medicinal plants. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Prajapathi, Purohit, Sharma and Kumar. (2003). A Hand book of Medicinal plants. Agrobios Publications, Jodhpur.
7. Purohit and Vyas, (2004). Medicinal Plants Cultivation. Agrobios Publications, Jodhpur.

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

Semester V	Course Code 17UB0530301B	Title of the Paper MEDICINAL BOTANY													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	5	3	4	2	5	3	3	5	3	4	2	4	3.4		
CO2	4	3	4	3	2	4	3	5	2	4	3	4	3	3.5		
CO3	4	3	4	4	3	2	4	2	4	5	4	3	3	3.1		
CO4	3	4	3	3	3	2	4	4	2	4	3	2	3	3.2		
CO5	5	2	3	5	3	2	3	2	2	4	4	4	3	3.2		
CO6	3	2	3	2	3	5	3	2	4	3	4	3	4	3.1		
Mean Overall Score														3.2		

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Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester V
17UB0540601

Hours/Week: 2
Credits: 2

Skill Based Elective: MUSHROOM CULTURE

Course Outcome

1. To acquire knowledge on various types of mushrooms.
2. To understand cultivable species of mushrooms.
3. To learn the culture techniques of edible mushrooms.
4. To understand the various recipe prepared from mushrooms.
5. To learn the preservation and storage of mushrooms.
6. To study the economic importance of mushrooms.

Unit I

Introduction - Classification - Edible and Poisonous. Tests for identification - Nutritive value of mushrooms.

Unit II

Characteristics of common edible mushrooms Paddy straw, Oyster and milky mushrooms. Life cycle of a common mushroom (*Agaricus*).

Unit III

Culture Techniques – Preparation of spawn, preparation of compost – Spawn running – Harvesting and Marketing.

Unit IV

Preservation and storage of mushrooms – Diseases and pests of mushrooms.

Unit V

Delicious recipes of mushroom – Economic importance of mushrooms.

Book

1. Nita Bahl (1984). Handbook on Mushrooms, Oxford and IBH Publishing Company

Reference

1. Dubey, RC. (2001) A text book of Biotechnology, S.Chand & Co. Ltd.

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

Semester V	Course Code 17UBO540601	Title of the Paper MUSHROOM CULTURE												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	3	5	3	3	4	3	4	3	3	5	3	4	3.3	
CO2	4	5	4	3	3	3	3	3	3	3	3	3	3	3.1	
CO3	3	4	3	3	3	3	3	3	3	3	3	3	3	3.2	
CO4	3	2	3	3	3	3	3	5	3	3	4	3	3	3.2	
CO5	3	3	3	4	3	4	3	3	3	3	3	3	3	3.1	
CO6	3	3	3	3	3	3	3	3	3	3	3	3	4	3.5	
Mean Overall Score														3.2	

Result: The Score for this Course is 3.2 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester V
17USS540701AL P C
2 - 2Inter Departmental Courses (IDC):
SOFT SKILLS

Course Outcomes

1. To augment the level of confidence in articulation of 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; Questioners & 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. *Hiring 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
17USS540701B

Hours/Week: 2
Credits: 2

Inter Departmental Courses (IDC): NATIONAL CADET CORPS

Course Outcomes

1. NCC 'C' and 'B' certificates are very much useful and increase credit marks in UPSC and SSB examinations..
2. They learnt discipline punctual and leadership quality.
3. They got physical fitness for Army and Police selection.
4. They learnt general knowledge find political issue.
5. They got trained for social service and volunteers for disaster.
6. They will be the best citizens of India.

Unit-I: About NCC - Personality Development - 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.

Semester VI
17UBO630220

Hours/Week: 5
Credits: 3

PLANT PHYSIOLOGY

Course Outcome

1. To learn the underlying principles of various physiological process of plants
2. To study mineral nutrition in plants
3. To understand the mechanism of photosynthesis
4. To understand the mechanism of respiration
5. To learn the various plant growth substances and their physiological effects
6. To study seed dormancy and photoperiodism.

Unit I

Water, Mineral and Solute: Uptake and Transport. Molecular Structure and properties of water. Diffusion and osmosis – osmotic pressure, turgor pressure and significance of osmosis. Plasmolysis and its importance. Mechanism of absorption of water – passive and active absorption. Ascent of sap – theories on absorption. Absorption, mechanism and transport of mineral salts. Transpiration - types, mechanism, significance and factors affecting transpiration.

Unit II

Mineral nutrition: plant nutrients - essential and non-essential elements – micro and macro nutrients. Source, physiological role and deficiency symptoms of minerals. Hydroponics and aeroponics. Nitrogen metabolism: importance of nitrogen to plants. Sources of nitrogen – nitrogen cycle – nitrogen – ammonium assimilation and transamination.

Unit III

Photosynthesis: photosynthetic apparatus and pigment systems – Emerson enhancement effect and two pigment systems – photosynthetic electron transport system – Hill reaction – oxygen evolving complex. Mechanism of electron transport, cyclic, noncyclic and pseudocyclic phosphorylations. Synthesis of ATP by photophosphorylation. Mechanism of CO₂ fixation in C₃, C₄ and CAM plants.

Unit IV

Respiration: introduction, aerobic and anaerobic respiration - glycolysis – TCA cycle – mitochondrial electron transport system and its components – oxidative phosphorylation and ATP synthesis. Glyoxylate cycle – photorespiration – Pentose Phosphate Pathway. Respiratory Quotient.

Unit V

Plant growth substances: physiological effects of auxins, gibberellins, cytokinins, ethylene and abscisic acid. Dormancy: definition, causes of seed dormancy, breaking of seed dormancy, significance of seed dormancy. Physiology of seed germination. Photoperiodism, vernalization and flowering – Plant rhythm and Biological clock

Books

1. Verma V. 2007. Text book of Plant Physiology, Ane Books India, New Delhi
2. Jain V.K. 2006. Fundamentals of Plant Physiology, 18th ed. Chand & Co.
3. Pandey, SN & Sinha, BK. 2006. Plant Physiology, 4th Ed. Vikas Publishing House Ltd.

References

1. Noggle and Fritz, 1976. Introductory Plant Physiology, Prentice Hall, New Delhi.
2. Bajjal BD & Ravisharma, 1981. A Textbook of Plant Physiology, Shiva Lal Agarwal
3. Salisbury, F.B. & Ross, CN. 1995. Plant Physiology. CBS Publishers, New Delhi

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

Semester VI	Course Code 17UBO630220	Title of the Paper PLANT PHYSIOLOGY													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	3	5	3	4	4	5	4	3	4	4	4.1		
CO2	5	5	3	5	4	4	3	5	3	5	3	4	4	4.1		
CO3	4	4	5	4	3	5	3	4	5	5	3	5	3	4.4		
CO4	5	5	4	5	5	4	5	4	5	3	5	4	3	4.3		
CO5	4	4	5	5	3	5	5	4	5	4	4	5	3	4.1		
CO6	5	3	4	4	5	4	3	3	5	3	5	4	5	4.0		
Mean Overall Score														4.1		

Result: The Score for this Course is 4.1 (Very High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$	
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Semester VI
17UBO630221

Hours/Week: 3
Credits: 2

Laboratory Course-VII: Plant Physiology

Course Outcome

1. To study the effect of environmental factors on various physiological process.
2. To measure the enzyme activities on specific substrates.

Detailed Study:

1. Effect of temperature on membrane permeability.
2. Osmosis – Thistle funnel, potato osmoscope.
3. Determination of water potential and solute potential.
4. Determination of root pressure and sap exudation.
5. Effect of environmental factors on the rate of transpiration.
6. Extraction and separation of leaf pigments.
7. Effect of light and CO₂ on photosynthesis.
8. Aerobic respiration – Ganong's respiroscope.
9. Ascent of sap – Balsam plant experiment.
10. Measurement of lipase activity.
11. Demonstration experiments:
 - i. Phototropism,
 - ii. Geotropism,
 - iii. Arc Auxanometer,
 - iv. Dialatometer
 - v. Hydroponics

Semester VI
17UBO630222

Hours/Week: 5
Credits: 3

GENETIC ENGINEERING AND BIOTECHNOLOGY

Course Outcome

1. To understand the principles of genetic engineering
2. To study the mechanism of generating rDNA
3. To learn the types and application of cloning vectors
4. To study the different types of gene transfer methods
5. To acquire knowledge on the principles and applications of plant tissue culture
6. To learn the principles and application of Intellectual Property Rights.

Unit I

Crown gall disease and *Agrobacterium*. Steps in recombinant DNA Technology. Methods to generate desired foreign genes: isolation of prokaryotic gene by restriction enzymes and of eukaryotic gene by cDNA synthesis. Joining DNA molecules: ligases, linkers and homopolymers.

Unit II

Cloning vectors: natural vectors - *E. coli* plasmids; *in vitro* vectors – pBR; cosmids; single-stranded DNA vectors - M13; and shuttle vectors - *E. coli*; Yeast shuttle vector. Selectable markers. Gene cloning strategies: cDNA library and genomic library.

Unit III

Methods of gene transfer to bacteria, plants and animals: Ca-transfection, microinjection, electroporation, shotgun, lipofection, somatic cell nuclear transfer, and embryonic stem cells.

Unit IV

Protoplast fusion technology. Applications of plant tissue culture in agriculture and forestry. Transgenic plants against herbicide, insects, drought and salinity. Genetic Use Restriction Technology. Anti-sense RNA technology and the *Flavr Savr* tomato.

Unit V

Production technology of plantibodies and monoclonal antibodies by hybridoma technology. Gene therapy. Cloning animals (therapeutic and reproductive). Xenografting. Release of GMOs: Bt brinjal in India. Concerns of genetic engineering. IPRs – meaning, types (IP, Copy Rights & Patents). Arguments for & against patenting genes and life forms.

Books

1. Bernard R Glick & Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.
2. Old, RW & Primrose, SB. 2001. Principles of Gene Manipulation-an introduction to genetic engineering, Black Well Science Ltd., New York.

References

1. Gamborg, OL & Phillips, GC. 1995. Plant cell, Tissue and Organ culture, Narosa publishing House, New Delhi.
2. George, EF & Sherrington, PD. 1984. Plant propagation by Tissue culture, Exegetics Limited, London.
3. Old, RW & Primrose, SB. 2001. Principles of Gene Manipulation - an introduction to Genetic engineering, Black Well Science Ltd., New York.
4. James D Watson *et al.*, 1992. Recombinant DNA (2nd Edition), WH Freeman Co., New York.

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

Semester VI	Course Code 17UBO630222	Title of the Paper GENETIC ENGINEERING AND BIOTECHNOLOGY												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	3	3	3	3	2	3	3	2	2	5	4	3	4	3.2	
CO2	3	3	3	4	5	3	2	3	2	4	2	3	4	2.9	
CO3	3	3	4	3	3	3	2	3	3	3	2	2	4	3.1	
CO4	3	4	3	3	2	2	2	4	3	4	4	3	3	3.2	
CO5	4	2	4	2	3	2	5	2	5	2	4	2	5	3.4	
CO6	3	5	3	5	2	4	4	3	2	4	2	4	3	3.4	
Mean Overall Score														3.2	

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester VI
17UBO630223

Hours/Week: 4
Credits: 3

BIOCHEMISTRY

Course Outcomes

1. To understand the structure and properties of biomolecules
2. To study the classification, properties and functions of carbohydrates
3. To study the classification, properties and functions of lipids
4. To study the classification, properties and functions of proteins
5. To learn the characteristics, classifications and mode of action of enzymes
6. To study the classification, properties and significance of secondary metabolites.

Unit I

Carbohydrates: classification. Stereochemistry of simple sugars, α & β glycosidic linkages; structure and properties of mono- and disaccharides and oligosaccharides. Polysaccharides: chemical structure and function of starch. Structure of plant cell wall and bacterial cell wall.

Unit II

Lipids: classification, saturated and unsaturated fatty acids. Properties and synthesis of lipids; derived lipids and their biological role. Function and structure of biological membranes - the Singer-Nicolson's "fluid-mosaic" model.

Unit III

Amino acids & proteins: basic structure & properties. Globular and fibrous proteins. The peptide bond, amino acid sequence and primary structure; backbone folding and secondary structure; tertiary structure of collagen and the forces of protein stabilization.

Unit IV

Enzymes: biocatalysts – definition and characteristics, IUB classification; principles of catalysis, activation energy, transition state, active site and Michaelis-Menten equation. Mode of action - Lock & Key and Induced Fit models. Factors affecting enzyme action – pH, temperature, [S] & [E]. Enzyme regulation by inhibition – competitive, non-competitive, uncompetitive & feedback.

Unit V

Secondary metabolites and their functions in plants. Terpenoids: N-containing metabolites. Phenolics: classification, properties, structure and significance. Pathways of shikimic acid and mevalonic acid. Synthesis of alkaloids from amino acids.

Book

1. Jain JL 2009 Fundamentals of Biochemistry S. Chand, New Delhi

Reference

1. Elliott WH & Elliott DC. 2005. Biochemistry and Molecular Biology, 3rd Ed. Oxford University, Oxford
-

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

Semester VI	Course Code 17UBO630223	Title of the Paper BIOCHEMISTRY										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	3	4	4	2	5	3	3	4	3	2	5	2	4	3.1
CO2	4	3	2	3	2	3	3	2	2	3	5	4	4	3.1
CO3	3	3	3	5	2	3	4	2	3	5	3	2	2	3.3
CO4	3	2	4	2	5	3	3	5	2	2	5	3	4	3.2
CO5	3	5	2	2	3	4	4	3	3	5	3	2	2	3.2
CO6	5	3	2	2	4	3	2	4	3	2	4	4	4	3.6
Mean Overall Score														3.2

Result: The Score for this Course is 3.2 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs = $\frac{\text{Total of Values}}{\text{Total No. of POs \& PSOs}}$	Mean Overall Score for COs = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester VI
17UBO630224

Hours/Week: 3
Credits: 2

LABORATORY COURSE-VIII (Genetic Engineering, Biotechnology and Biochemistry)

Course Outcome

1. To learn the preparation and sterilization of culture media.
2. To learn the procedure for tissue culture.
3. To estimate biomolecules using qualitative and quantitative methods.

Detailed Study:

1. Culture media and sterilization techniques
2. Generation of *In vitro* plants
3. Embryo culture
4. Callus induction and differentiation
5. Somatic embryogenesis.
6. Micropropagation and Synthetic seeds
7. Qualitative estimation of sugars.
8. Estimation of total lipids.
9. Estimation of total free amino acids.
10. Determination of strength of amino acids.
11. Quantitative estimation of total protein.
12. Separation of plant pigments by Column chromatography
13. Assay of alkaline phosphatase and amylase

Semester VI
17UBO630225

Hours/Week: -
Credits: 2

COMPREHENSIVE EXAMINATION

Course Outcomes:

1. Analyze the basic concepts of OOP and apply it in problem solving.
3. Apply the fundamental principles of digital electronics and memories to problems.
4. Relate Java and its advance concepts in application programs.
5. Review the basic concept of Computer System and Operating System Structure with simple examples.
6. Review concepts of PHP with MySQL in simple problems.

UNIT I

C Programming, Object Oriented Programming with C++

UNIT II

Relational Database Management System, Digital Computer Fundamentals

UNIT III

Java Programming HTML5 and CSS3

UNIT IV

VB.NET, ASP.NET

UNIT V

Operating Systems, PHP with MYSQL

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

Semester VI	Course Code 17UBO630224	Title of the Paper COMPREHENSIVE EXAMINATION														Hours	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	4	2	4	3	3	4	2	3	4	4	3	3	3.2			
CO2	3	2	4	5	2	4	3	4	5	3	3	3	4	3.5			
CO3	4	4	3	3	3	4	5	2	1	3	3	4	3	3.2			
CO4	4	3	4	3	2	3	4	2	3	3	4	3	3	3.2			
CO5	5	2	3	3	2	3	4	2	3	3	3	5	4	3.2			
CO6	4	1	3	3	3	3	3	3	4	4	4	3	3	3.2			
Mean Overall Score														3.2			

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester VI
17UBO630226

Hours/Week: -
Credits: 2

GROUP PROJECT

Course Outcome

1. To acquire work skills in the field of biology.
2. To learn preliminary skills on research.

The chance to do research based project at the FINAL SEMESTER is offered to students as group work to be accomplished outside of the class hours.

Semester VI
17UBO630302A

Hours/Week: 4
Credits: 4

Core Elective: BIO-INSTRUMENTATION

Course Outcomes:

1. To understand the principle, procedure and application of various microscopes
2. To study the principle, types and operation of centrifuges
3. To study the principle, types and operation of chromatography
4. To study the principle, types and operation of colorimeter
5. To learn tracer techniques and their application in biology
6. To initiate students in the field of instrumentation and research

UNIT I

Microscopy: simple, compound, phase contrast, fluorescence, electron (SEM and TEM) microscopy. Micrometry. Buffers: characteristics and preparation; pH meter – principle, measurement of pH and pKa. Electrometric determination - glass and reference electrodes.

UNIT II

Centrifugation: principles, types and operation; rotors, bench top, low speed, high speed. cooling and ultracentrifuge. Clark oxygen electrode - basic principles and function.

UNIT III

Chromatography - principles and applications of paper, TLC, HPLC, ion exchange, and affinity chromatography. Electrophoresis – principles, types and applications - gel electrophoresis (AGE, SDS-PAGE), isoelectric focusing.

UNIT IV

Colorimeter - principles and instrumentation. Spectrophotometry - principles, instrumentation and types UV/Vis - general principles and instrumentation. Atomic absorption spectrophotometer, NMR and ESR.

UNIT V

Tracer techniques: nature of radioactivity, patterns of decay, half life - detection of radiation and measurements – GM Counter, Scintillation counter, autoradiography, X-ray crystallography and applications of isotopes.

Books

1. Kothari, C.R. 2000. Research Methodology – Methods & Techniques. Wishwa Prakashan.

- Misra, R.P, 2000 Research Methodology - a handbook, Concept Publishing Company, New Delhi.

References

- Hawkins, C and Sorgi, M. 2000 Research, Narosa Publishing House, New Delhi.
- Willard, H.D., *et al.*, 1965, Instrumental Methods of Analysis, D Van Nostrand Co., New York.
- Wilson, E. & Goulding, K.H. 2000 A Biologists' Guide to Principles and Techniques of Practical Biochemistry ELBS.

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

Semester VI	Course Code 17UBO630302A	Title of the Paper BIOINSTRUMENTATION												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	4	5	3	4	3	3	5	3	5	2	2	3.5	
CO2	4	3	5	4	5	3	3	3	4	2	3	2	4	3.1	
CO3	3	3	3	2	4	3	4	3	5	2	4	2	2	3.4	
CO4	3	2	4	2	5	4	3	5	4	2	3	3	4	3.5	
CO5	5	3	3	3	4	2	3	5	3	4	5	3	3	3.4	
CO6	4	4	4	3	5	2	4	2	4	2	4	2	4	3.4	
Mean Overall Score														3.3	

Result: The Score for this Course is 3.3 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
Relation	1	2	3	4	5
Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester VI
17UBO630302B

Hours/Week: 4
Credits: 4

Core Elective:
BIONANOTECHNOLOGY

Course Outcomes:

1. To learn the basic knowledge of nanoscience
2. To learn the properties and dimensions of nanoparticles
3. To synthesis green nanoparticles
4. To understand the mechanism of action of nanoparticles
5. To characterize nanoparticles using various techniques
6. To study the interaction between nanoparticles and living organism.

Unit I

Nanotechnology - origin, scope and importance. Nanoparticles – definition. Principles: quantization effects - inverse relationship between size and reactive surface area. Properties: surface effects, the effects of size, shape, surface and bulk composition, and solubility and persistence.

Unit II

Essentials of nanostructure generation: top-down vs. bottom-up. Chemical and physical self assembly. Physical, chemical and biogenic synthesis of nanomaterials – biomimetics, green plants, and microorganisms. Role of biomolecules - reducing and/or capping agents: proteins, viruses and carbohydrates.

Unit III

Detection and measurement of nanoparticles – physical characterization by UV, FTIR, SEM, FESEM, DLS, X-ray diffraction and Zeta potential.

Unit IV

Targeted nanoparticles: active & passive targeting. Application: medicine, manufacturing & materials, delivery vehicles, cancer therapy, tissue engineering, fluorescent biological labels, biological assays, imaging agents, biosensors, manipulation of cells and biomolecules.

Unit V

Interactions between nanoparticles and living systems, interaction with cells, exposure of living systems to nanomaterials - toxicity effects. Mediators of the toxicity of particles. Factors influencing the interaction of nanomaterials over mammalian cells: uptake, transport and biodistribution of nanoparticles

in living system, toxicity on cellular processes. Overview of EU regulatory aspects.

Text Book

1. Sharon, M. & Sharon, M 2012. Bio-Nanotechnology- Concepts and Applications, CRC Press.
2. Jain, K. K. 2012. Handbook of Nanomedicine, Springer.

References

1. Barbara Panessa-Warren, 2006 Understanding cell nanoparticle interactions making nanoparticles more biocompatible. Brookhaven National Laboratory
2. Bhushan Bharat (Ed.) 2012. Encyclopedia of Nanotechnology, Springer. Chand A, Mirkin, Christof Niemeyer 2007. Nanobiotechnology II: more concept and applications 1st edition Wiley-VCH Publisher.
3. European Commission, SCENIHR, 2006. Modified opinion on the appropriateness of existing methodologies to assess the potential risks associated with engineered and adventitious products of nanotechnologies, European Union
4. Gysell Mortimer, 2011. The interaction of synthetic nanoparticles with biological systems PhD Thesis, School of Biomedical Sciences, Univ. of Queensland.
5. Iseult Lynch, Anna Salvati & Kenneth A. Dawson, 2009 Protein-nanoparticle interactions: What does the cell see? *Nature Nanotechnology* 4, 546 - 547 doi:10.1038/nnano.2009.248
6. Jain K.K. Nanobiotechnology molecular diagnostics: Current techniques and application (Horizon Bioscience) 2006 Taylor & Francis 1st edition.
7. Johan Ach, Ludwig Siep 2007. Nano–Bio–Ethics: Ethical dimension of nanobiotechnology by 1st edition lit ver leg publication.
8. Kelsall Robert W, Ian Hamley, Mark Geoghegan, 2004 Nanoscale Science and Technology, Wiley Eastern.
9. Mark Ratner and Daniel Ratner 2002. Nanotechnology: A gentle introduction to the next big idea. Pearson Education Publishers.
10. Michael Kohler, Wolfgang, Fritzsche, 2004 Nanotechnology: Introduction to Nanostructuring Techniques.
11. Volker Mailander and Katharina Landfester 2009 Interaction of nanoparticles with cells biomacromolecules, 10 (9): 2379 – 2400 DOI: 10.1021/bm900266r. Yao N and Zhong Ling Wang, 2005, Hand book of microscopy for nanotechnology kluwer academic publishers.

Online Resources

- 1) <http://ieet.org/index.php/IEET/more/bionanotechnology20141007>
Institute of Ethics & Emerging Technologies
- 2) <https://phys.org/news/2014-10-endless-possibilities-bio-nano-technology.html>
- 3) <http://www.particle-works.com/applications/controlled-drug-release/Applications>
- 4) <https://jnanobiotechnology.biomedcentral.com/articles/10.1186/1477-3155-2-3> DOI: 10.1186/1477-3155-2-3
- 5) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3865110/>
- 6) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419715/>

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

Semester VI	Course Code 17UBO630302B	Title of the Paper BIONANOTECHNOLOGY														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	5	3	3	4	3	5	4	4	3	5	3.2			
CO2	5	3	4	2	2	4	2	4	3	2	4	3	4	3.2			
CO3	4	3	3	3	2	2	3	2	3	5	3	4	4	3.5			
CO4	4	4	3	4	3	2	5	2	4	4	3	3	5	3.2			
CO5	5	3	3	3	3	3	3	2	3	2	3	4	4	3.2			
CO6	5	4	3	5	3	2	3	3	3	5	2	2	2	3.2			
Mean Overall Score														3.2			

Result: The Score for this Course is 3.2 (High Relationship)

Note:

Mapping Scale	1-20%	21-40%	41-60%	61-80%	81-100%
	1	2	3	4	5
Relation Quality	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
	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 = $\frac{\text{Total of Mean Scores}}{\text{Total No. of COs}}$
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Semester VI
17UBO630303A

Hours/Week: 4
Credits: 4

Core Elective:
BIOLOGICAL TECHNIQUES

Course Outcomes:

1. To understand the various techniques in biology
2. To learn the principles and application of microscopy
3. To learn the technique of fixation, mounting and embedding of biological materials
4. To study the types of various staining
5. To prepare skeleton preparation, taxidermy and squash techniques
6. To learn vermiculture and animal rearing.

Unit I

Microtechniques - selection of material, fixation, fixation images- acid and basic. Preparation of permanent slide-Dehydration process, infiltration of wax, embedding, sectioning (microtome), mounting. Leaf clearing, smear and squash techniques.

Unit II

Stains: Classification- single, double, triple staining. Nuclear, cytoplasmic, cell wall stains and their rationale. Herbarium – collection, drying, pasting of plant specimen, protection of Herbarium- importance.

Unit III

Techniques of the preparation of vertebrate skeletons and transparency preparations (Alizarian red) cartilage staining, museum techniques: dry and wet preparation. Taxidermy Arthropod squash. Blood grouping ABO and Rh, blood smear preparation. Haemocytometer.

Unit IV

Earthworm and its types. Preparatory methods of vermiculture, culture techniques, Economic and ecological importance of vermicompost. Biofertilizers. Animal rearing : albino rats, rabbits and fruit fly.

Unit V

PCR - principles, technique and applications. Blotting techniques. DNA finger printing. SCP - Cultivation of *Spirulina* and *Scenedesmus*. Immunological test -WIDAL, RPR and RF.

Text Book

1. Ghatak KL. 2011. Techniques and methods in Biology, PHI Learning Private Limited.

References

1. Verma, P.S and Agarwal, Concept of Cell Biology, (New Delhi: S. Chand & Co., 1999)
2. Chamberlain, C.J., Methods in Plant Histology(Jaipur: Arihant Publishers, 1990)
3. Jayaraman , J., Techniques in biology, (Chennai: Higginbothoms Ltd., 1972)
4. Mahoney, R., Lab Techniques in Zoology,(UK: Butterworth, 1966)
5. Vasantaraj David, S. and Kumaraswamy. T., Elements of Economic Entomology, (Chennai: Popular Book Depo, 1998)

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

Semester VI	Course Outcomes (COs)	Course Code 17UBO630303A		Title of the Paper BIOLOGICAL TECHNIQUES												Hours 4	Credits 4
		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	3	4	3	2	5	2	2	4	3.2		
	CO2	4	3	5	2	2	3	2	2	5	2	4	3	4	3.3		
	CO3	3	2	3	5	3	5	2	4	3	3	4	2	4	3.1		
	CO4	3	3	3	2	2	5	3	2	2	3	3	4	5	3.3		
	CO5	3	5	3	4	2	3	3	3	5	2	2	5	3	3.0		
	CO6	3	2	3	2	4	3	4	2	2	5	2	2	5	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:

Mean Score of COs =	Total of Values	Mean Overall Score for COs =	Total of Mean Scores
	Total No. of POs & PSOs		Total No. of COs

Semester VI
17UBO630303B

Hours/Week: 4
Credits: 4

Core Elective: WOOD TECHNOLOGY

Course Outcomes:

1. To acquire knowledge on developmental anatomy of woody plants
2. To impart knowledge on properties of wood
3. To understand the techniques of wood seasoning and wood preservation
4. To study the agents responsible for wood deterioration
5. To understand the principles underlying paper and pulp preparation
6. To study the natural defects of wood.

UNIT I

Types of wood - soft wood and hard wood, compression wood and tension wood. General and physical features of wood: sapwood and heartwood, growth rings, rays, porous and non-porous woods. Features visible on longitudinal surface of wood - color, luster, odor, taste, weight, grain, texture and figure.

UNIT II

Chemical constituents of wood: occurrence of cellulose, hemicellulose and lignin in different morphological regions of cell wall. Wood deterioration: agents responsible for wood deterioration - fungi, bacteria, insects, marine borers. Micro-structural changes in wood due to fungal attack- brown rot, white rot, dry rot and soft rot of timber - decay of standing trees and stored logs.

UNIT III

Natural defects of wood - knots, reaction wood, other defects due to stress, silica content. Seasoning and preservation of wood: General principles of wood seasoning. Wood seasoning procedures - air seasoning, kiln seasoning. Moisture content of timber for different uses in different localities.

UNIT IV

Natural durability of timber. Wood preservation: basic principles, preservative chemicals. Different wood preservation techniques. Paper and Pulp technology: pulping- mechanical and chemical methods. Pulp cleaning and bleaching. Stock preparation and sheet formation. Paper machine - principles of forming paper, steam drying and its effects. Coating and finishing.

Synthetic woods - composite wood, man-made wood, or manufactured board, plywood, fibre board, particle board, oriented strand board, laminated timber, laminated veneer, cross laminated, parallel strand, laminated strand, finger joint, beams, trusses. The common commercial timbers of India.

1. Brown, H.P. 1985. Manual of Indian Wood Technology. Intl Books and Periodicals, New Delhi.

1. Christopher J. Bierman, 1993. Handbook of Pulping and Paper Making. Academic Press, 2nd E.
2. David N-S Hon and Nobuo Shiraishi. 2000. Wood and Cellulosic Chemistry 2nd ed.
3. Gary A. Smook. 2003. Handbook for Pulp & Paper Technologists (3rd Edition).
4. Panshim AJ Zeeauw CD 1980. Text Book Of Wood Technology, U S A, McGraw Hill
5. Wilson, K and White, D.J.B.1986. The Anatomy of Wood: Its Diversity and Variability. Stobart and son Ltd.
6. Zobel, B.J. and van Buijtenen, J.P. 1989. Wood Variation: Its Causes and Control. Springer-Verlag, New York.
7. Panshin, A. J. and de Zeeuw, C. 1980. Textbook of Wood Technology. McGraw-Hill Book Company, New York.

Result: The Score for this Course is 3.2 (High Relationship)

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

[illegible]

Semester VI
17UBO640602

Hours/Week: 2
Credits: 2

Skill-Based Elective:
HERBAL TECHNOLOGY

Course Outcomes:

1. To understand the importance of medicinal plant wealth in India
2. To understand the role of medicinal plants in human health care
3. To understand the techniques of herbal decoction preparation
4. To understand the techniques of herbal powder preparation
5. To understand the techniques of herbal oil preparation
6. To understand the techniques of herbal tea, soup and natural cosmetics preparation.

Unit I

Herbal decoction preparation: *Andrographis paniculata*, *Tinospora cordifolia*, *Alpinia officinarum*, *Hygrophila auriculata* and *Adhathoda vasica*.

Unit II

Herbal powder preparation: *Withania somnifera*, *Cyanodon dactylon*, *Nymphaea nouchali*, *Vernonia anthelmintica*.

Unit III

Herbal massage oil preparation: Pinda thylam, Herbal bath conditioner preparation: Nalankumavu, Panchakarbam.

Unit IV

Herbal hair oil preparation: Neelibirikathi. Herbal cream preparation: Mathan thylam.

Herbal health drinks preparation: Mathulai manabaku (*Punica granatum*).

Unit V

Preparation of herbal tea, herbal soup, herbal sweet and herbal cosmetics.

Books

1. Materia Medica Siddha Volume I&II, Murukasha Muthaliar
2. Kokate, C.K., Purokit A.P and Gokahale, 2002. Pharmacognosy, Nirali Prakashan, Pune.

References

1. S. Somasundaram 1997. Maruthuva Thavaraiyal, Ilangoan Padhippagam, Palayamkottai.
2. Peeter B. Kaufmann et al., 1999. Natural Products from Plants, C.R.C. Press.

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

Semester VI	Course Outcomes (COs)	Course Code 17UBO640602		Title of the Paper HERBAL TECHNOLOGY												Hours 2	Credits 2
		Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)								Mean Score of COs	
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8		
		5	3	4	4	4	4	3	5	3	4	2	4	4	5		
	CO1															3.4	
	CO2	3	3	3	4	2	4	5	3	4	3	2	5	3	4	3.1	
	CO3	4	3	3	5	3	5	2	2	2	2	3	3	5	3	3.2	
	CO4	5	2	2	3	3	3	3	3	3	3	3	4	3	4	3.7	
	CO5	4	2	5	3	4	4	2	4	5	3	5	5	2	4	3.3	
	CO6	4	5	3	2	5	5	4	2	3	4	2	4	3	2	3.2	
Mean Overall Score																3.3	

Result: The Score for this Course is 3.3 (High Relationship)

Note:

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

Values Scaling:

Mean Score of COs =	Total of Values Total No. of POs & PSOs	Mean Overall Score for COs =	Total of Mean Scores Total No. of COs

[illegible]