

**A.V.V.M. Sri Pushpam College(Autonomous), Nationally Reaccredited
with “A” Grade by NAAC (4th Cycle)
DST-FIST& DBT-Star Colleg Scheme Funded
(Affiliated to Bharathidasan University) Poondi – 613 503
PG & Research Department of Botany
B.Sc. Programme in Botany
OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM
SCHEME OF PROGRAMME AND SYLLABUS
(For the candidates admitted from 2023-2024 onwards)**

Vision and Mission of the college

Vision

To provide quality academic programmes and value oriented higher education to the rural community, equip them to encounter current regional, national and global demands upholding moral standards and intellectual competency.

Mission

- To provide conducive environment for quality teaching-learning process and innovative research.
- To bestow substantial educational experience that is intellectually, socially, and personally transformative.
- To strive to bring out the latent potentiality and core competency of the learners
- To foster the culture of research-based learning, independent academic inquiry by encouraging the students
- To involve in research activities ranging from hands on training, student projects, publications etc.,
- To nurture essential skills, competent minds and compassionate hearts.
- To impart a practical, demanding and overall development of the personality generated by love, consideration and care for the society.
- To serve the society by extending needful outreach programmes to the rural populace.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Make the learners realise the transformative power of education.
- Acquire profound disciplinary, applied, integrative knowledge and intellectual competency and domain specific and generic skills.
- Pursue lifelong learning and generate innovative solutions for the problems at individual and social level.
- Create a collaborative and inclusive environment, and serve the betterment of the society with moral integrity.
- Motivate to become a committed professional with necessary ethics as a leader as well as a team player.

PROGRAMME OUTCOMES for B.Sc., Botany Programmes

| The B.Sc. Botany program is designed to achieve the following objectives | |
|--|---|
| PO1 | Apply the knowledge of science and technology fundamentals for findings solution for complex problems. |
| PO2 | To provide up to date theoretical knowledge on various forms of plants, their interactions with biotic and abiotic entities in the ecosystem and relevant practical skills. |
| PO3 | To comprehend and interpret various facets of Botany including the importance and judicious utilization of plant sources. |
| PO4 | Exploration of diverse plant life-forms and to nature the conservation of biodiversity. |
| PO5 | To understand the principles and applications of various traditional and modern techniques used in Botany. |
| PO6 | To disseminate knowledge on the design and execution of experiments in Botany with emphasis on the operation of relevant sophisticated instruments. |
| PO7 | To impart knowledge on the economic importance of plant/microbial resources and their products and to promote entrepreneurship skill. |
| PO8 | To promote proficiency in designing the research problems, review of literature, laboratory experiments, data analyses and preparation of reports with professional ethics. |
| PO9 | To motivate the students to take up innovative and cutting-edge research in frontier areas of Botany and related biology subjects. |
| PO10 | To enable the students to take up various qualifying examinations concerning Botany and to face the challenges in career opportunities. |

PROGRAMME SPECIFIC OUTCOMES for B.Sc.,Botany Programme

| | |
|--|---|
| On successful completion of the B.Sc. Botany program, the students are expected to | |
| PSO1 | Implement the concept of science and technology to foster the traditional and modern techniques for solving the complex problems in Plant Biology. |
| PSO2 | Ensure the use of contemporary tools and techniques in understanding the scope and significance of Botany |
| PSO3 | Develop the scientific problem solving skills during experimentation, research projects, analysis and interpretation of data |
| PSO4 | Design scientific experiments independently and to generate useful information to address various issues in Botany. |
| PSO5 | Enhanced capacity to think critically; ability to design and execute experiments independently and/or team under multidisciplinary settings |
| PSO6 | Design and standardize protocols for public health and safety, and cultural, societal, and environmental considerations |
| PSO7 | Apply appropriate techniques, resources, and modern ICT tools for understanding plant resources. |
| PSO8 | Demonstrate the contextual knowledge in sustainable exploitation of medicinal, economically important and endangered plants as per the National Biodiversity Act. |
| PSO9 | Follow the concept of professional ethics and bioethics norms for practicing the value of plant kingdom. |
| PSO10 | Communicate proficiently with various stakeholders and society, to comprehend and to write and present reports effectively |

Curriculum structure for UG Programmes (OBE-CBCS) – 2023

| | Nature of Course | Total No. of Courses | Total marks | Total credits | Total credits for the Programme |
|--|---|----------------------|-------------|---------------|---------------------------------|
| Part – I | Language (Tamil / Hindi) | 04 | 400 | 12 | 123 (CGPA) |
| Part – II | English | 04 | 400 | 12 | |
| Part – III | Core Courses | 14 | 1400 | 62 | |
| | Core Industry Module (CIM) | 01 | 100 | 04 | |
| | Elective Courses (Generic) - Allied | 06 | 600 | 18 | |
| | Elective Courses (Discipline Centric) | 04 | 400 | 12 | |
| Part – IV | Skill Enhancement Course - Non Major Elective (NME) | 01 | 100 | 02 | 17 (Non CGPA) |
| | Skill Enhancement Course – Discipline Specific (SEC) | 02 | 200 | 04 | |
| | Professional Competency Skill Enhancement Course (PCSE) | 01 | 100 | 02 | |
| | Gender Studies (GS) | 01 | 100 | 02 | |
| | Environmental Studies (ES) | 01 | 100 | 02 | |
| | Value Education (VE) | 01 | 100 | 02 | |
| | Internship / Industrial Activity | -- | -- | 02 | |
| Part – V | Extension Activity (EA) | -- | -- | 01 | 140 |
| | Total | 40 | 4000 | 140 | |
| Value Added Course (VAC) | | 01 | 100 | -- | -- |
| Extra Credit Course – MOOC / Field visit / Hands on Training | | -- | -- | Max: 4 | -- |

***Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V has to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree**

Course Structure: B.Sc. Botany (2023)

| S. No | Seme ster | Category | Course Code | Title of theCourse | Maximum Marks | | | Minimum Marks | | | Hours/ Week | Credits |
|-------|-----------|--------------|--|---|---------------|-----|-------|---------------|----|-------|-------------|---------|
| | | | | | CIA | EE | Total | CIA | EE | Total | | |
| 1. | I | Language | 23U1BOT1/H1 | Tamil – I / Hindi – I | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 2. | | Language | 23U1BOE1 | English – I | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 3. | | Core | 23U1BOC1 | Plant Diversity I – Algae | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 4. | | Core | 23U1BOCP1 | Plant Diversity I Algae – Practical – I | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 5. | | Allied | 23U1BOZOA1 | Allied Zoology – I | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| | | Allied | 23U2BOZOAPL | Allied Zoology Practical (Non-Semester) | - | - | - | - | - | - | 3 | - |
| 6. | | EVS | 23U1BOES | Environmental Studies (Non-Semester) | - | 100 | 100 | - | - | 40 | SS | 2 |
| 7. | II | Language | 23U2BOT2/H2 | Tamil – II / Hindi – II | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 8. | | Language | 23U2BOE2 | English – II | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 9. | | Core | 23U2BOC2 | Plant Diversity II – Fungi, Bacteria, Viruses, Plant pathology and Lichens | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 4 |
| 10. | | Core | 23U2BOCP2 | Plant Diversity II - Fungi, Bacteria, Viruses, pathology and Lichens – Practical II | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 4 |
| 11. | | Allied | 23U2BOZOA2 | Allied Zoology – II | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| 12. | | Allied | 23U2BOZOAPL | Allied Zoology Practical (Non-Semester) | 25 | 75 | 100 | 10 | 30 | 40 | 3 | 3 |
| 13. | | VA | 23U2BOVE | Value Education | 25 | 75 | 100 | 10 | 30 | 40 | SS | 2 |
| | | Extra Credit | MOOC(Massive open online course) | | - | - | - | - | - | - | | |
| 14. | III | Language | 23U3BOT3/H3 | Tamil – III / Hindi – III | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 15. | | Language | 23U3BOE3 | English – III | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 16. | | Core | 23U3BOC3 | Plant Diversity III – Bryophytes, Pteridophytes & Gymnosperms | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 17. | | Core | 23U3BOCP3 | Plant Diversity III Bryophytes, Pteridophytes & Gymnosperms Practical – III | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 4 |
| 18. | | Allied | 23U3BOCHA1 | Allied Chemistry– I | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| | | Allied | 23U4BOCHAPL | Allied Chemistry Practical (Non-Semester) | - | - | - | - | - | - | 3 | - |
| | | Extra Credit | MOOC / Field visit / Hands on Training | | - | - | - | - | - | - | | |

| S. No. | Semester | Category | Course Code | Title of the Course | Maximum Marks | | | Minimum Marks | | | Hours/ Week | Credits |
|--------|----------|--|---------------------------------|---|---------------|-----|-------------|---------------|----|-------|-------------|------------|
| | | | | | CIA | EE | Total | CIA | EE | Total | | |
| 19 | IV | Language | 23U4BOT4/H4 | Tamil – IV / Hindi – IV | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 20 | | Language | 23U4BOE4 | English – IV | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 3 |
| 21 | | Core | 23U4BOCIM | Indfustry Module -Plant Anatomy and Embryology | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 22 | | Core | 23U4BOCP4 | Plant Anatomy and Embryology – Practical-IV | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 23 | | Allied | 23U4BOCHA2 | Allied Chemistry– II | 25 | 75 | 100 | 10 | 30 | 40 | 3 | 3 |
| 24 | | Allied | 23U4BOCHAPL | Allied Chemistry Practical (Non-Semester) | 25 | 75 | 100 | 10 | 30 | 40 | 3 | 3 |
| 25 | | SEC | 23U4BOSEC1 | Digital Literacy in Botany | 25 | 75 | 100 | 10 | 30 | 40 | 2 | 2 |
| 26 | | GS | 23U4BOGS | Gender Studies | - | 100 | 100 | - | - | 40 | SS | 2 |
| | | Extra Credit | Field visit / Hands on Training | | - | - | - | - | - | - | - | - |
| 27 | V | Core | 23U5BOC4 | Plant Morphology, Taxonomy & Economic Botany | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 28 | | Core | 23U5BOC5 | Cell biology, Genetics and Molecular Biology | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 29 | | Core | 23U5BOCP5 | Practical covering - Core V, VI - Practical V | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| 30 | | Elective | 23U5BOEL1A/ 23U5BOEL1B | Bio-Analytical Techniques/ Aquatic Botany | 25 | 75 | 100 | 10 | 30 | 40 | 4 | 3 |
| 31 | | Elective | 23U5BOEL2A/ 23U5BOEL2B | Applied Microbiology / Bioinformatics | 25 | 75 | 100 | 10 | 30 | 40 | 4 | 3 |
| 32 | | NME | 23U5BONME | Non-Major Elective: Herbal Medicine | 25 | 75 | 100 | 10 | 30 | 40 | 2 | 2 |
| 33 | | Core | 23U5BOC6PR | Project with Viva Voce | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 4 |
| | | Internship / Industrial Training (Carried out in II Year summer vacation – 30 hours) | | | | | | | | | - | 2 |
| 34 | VI | Core | 23U6BOC7 | Plant Ecology Evolution and Phytogeography | 25 | 75 | 100 | 10 | 30 | 40 | 6 | 5 |
| 35 | | Core | 23U6BOC8 | Plant Physiology and Plant Biochemistry | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 5 |
| 36 | | Core | 23U6BOCP6 | Practical covering - Core VII, VIII -Practical VI | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| 37 | | Elective | 23U6BOEL3A/ 23U6BOEL3B | Plant Biotechnology / Seed Biology | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| 38 | | Elective | 23U6BOEL4A/ 23U6BOEL4B | Forestry / Bionanotechnology | 25 | 75 | 100 | 10 | 30 | 40 | 5 | 3 |
| 39 | | SEC | 23U4BOSEC2 | Training for Competitive examinations | 25 | 75 | 100 | 10 | 30 | 40 | 2 | 2 |
| 40 | | PCSE | 23U6BOPCSE | Comprehensive Knowledge | - | 100 | 100 | - | 40 | 40 | 2 | 2 |
| | | Extension Activities | | Extension Activities (Outside College hours) | - | - | - | - | - | - | - | 1 |
| | | | | Total | | | 4000 | | | | | 140 |
| | | Value Added Course | | Botanical garden and landscaping | - | - | 100 | - | - | 40 | SS | - |

Internship/ Industrial Activity:

Students must complete in-plant training in any industry or organization where a programme-related procedure is being used, and this training must be done during the summer vacation at the end of II Year. A minimum of 30 hours should be spent on training. Students must submit a report on their training together with a certificate from the relevant industry or organization authority.

MOOC: Massive Open Online Course (MOOC) is offered in the II and III Semester as an Extra Credit Course. Students can avail any one or more of the courses available in MOOC to equip their skill and knowledge themselves. To receive the extra credit, students must provide their MOOC course completion certificate at the end of the second year.

Field visit / Hands on Training:

In order to achieve experiential learning, these programmes with a minimum of 15 hours of contact time are offered as Extra Credit Courses in the III & IV Semester.

Evaluation of field visit report will be held at the end of IV Semester. Components of Evaluation:

| | |
|----------------|-----|
| Internal Marks | 25 |
| External Marks | 75 |
| Total | 100 |

Skill Enhancement course (SEC) offered by the Botany Department**1. Digital Literacy in Botany****2. Training for Competitive examinations Botany for Competitive examinations**

General Studies for Competitive examinations

Non – Major Elective (NME) Course offered by the Botany Department

Herbal Medicine

Value Added Course offered by Botany Department

“Botanical garden and landscaping” will be conducted for III UG students as a certificate Course.

**A. VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE (AUTONOMOUS),
POONDI, THANJAVUR DIST.
(NAAC Re-Accredited with A grade in 4th cycle)
Question Pattern for UG and PG Programmes (For
the students admitted from 2023 – 2024 onwards)**

Bloom's Taxonomy based Assessment pattern

| Bloom's category | Section | Choice | Marks | Total |
|------------------|---------|-------------|-------------|-------|
| K1 to K6 | A | Compulsory | 10 x 2 = 20 | 75 |
| | B | Either / Or | 5 x 5 = 25 | |
| | C | 3 out of 5 | 3 x 10 = 30 | |

SECTION – A (10 x 2 = 20)

Answer All the questions (Two Questions from each units)

| CO | K Level | Q. No. | Questions |
|----|---------|--------|-----------|
| | | 1. | |
| | | 2. | |
| | | 3. | |
| | | 4. | |
| | | 5. | |
| | | 6. | |
| | | 7. | |
| | | 8. | |
| | | 9. | |
| | | 10. | |

SECTION – B (5 x 5 = 25)

Answer All the questions (One Question from each unit)

| | | | |
|------|--|--------|--|
| | | 11(a). | |
| (OR) | | | |
| | | 11(b). | |
| | | 12(a). | |
| (OR) | | | |
| | | 12(b). | |
| | | 13(a). | |
| (OR) | | | |
| | | 13(b). | |
| | | 14(a). | |
| (OR) | | | |
| | | 14(b). | |
| | | 15(a). | |
| (OR) | | | |
| | | 15(b). | |

SECTION – C (3 x 10 = 30)

Answer ANY THREE questions (One Question from each unit)

| | | | |
|--|--|-----|--|
| | | 16. | |
| | | 17. | |
| | | 18. | |
| | | 19. | |
| | | 20. | |

OBE QUESTION PATTERN

Bloom's Taxonomy Action Verbs

| K1 Remember | K2 Understand | K3 Apply | K4 Analyze | K5 Evaluate | K6 Create |
|---|---|---|--|---|---|
| <ul style="list-style-type: none"> • Choose • Copy • Define • Describe • Discover • Duplicate • Enumerate • Examine • Find • How • Identify • Label • List • Locate • Match • Memorize • Name • Omit • Recall • Recognize • Relate • Select • Show • Spell • State • Tabulate • Tell • What • When • Where • Which • Who • Why | <ul style="list-style-type: none"> • Associate • Classify • Compare • Contrast • Convert • Demonstrate • Describe • Differentiate • Discuss • Distinguish • Estimate • Explain • Express • Extend • Identify • Illustrate • Indicate • Infer • Interpret • Outline • Paraphrase • Predict • Relate • Rephrase • Show • Summarize • Translate | <ul style="list-style-type: none"> • Apply • Build • Calculate • Change • Choose • Complete • Construct • Demonstrate • Develop • Discover • Dramatize • Experiment • Identify • Interview • Interpret • Illustrate • Make use of • Manipulate • Model • Modify • Organize • Paint • Plan • Prepare • Produce • Relate • Select • Show • Sketch • Solve • Use • Utilize | <ul style="list-style-type: none"> • Advertise • Appraise • Analyze • Assume • Break down • Categorize • Classify • Compare • Conclusion • Connect • Contrast • Differentiate • Discover • Dissect • Distinguish • Discriminate • Divide • Examine • Explain • Function • Inference • Inspect • List • Motive • Order • Point out • Prioritize • Relationships • Select • Separate • Simplify • Subdivide • Survey • Take part in • Test for • Theme | <ul style="list-style-type: none"> • Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Convince • Criteria • Criticize • Decide • Deduct • Defend • Determine • Discriminate • Estimate • Evaluate • Explain • Find errors • Grade • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Order • Predict • Prioritize • Prove • Rank • Rate • Recommend • Reframe • Select • Summarize • Support • Value | <ul style="list-style-type: none"> • Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Generalize • Hypothesize • Imagine • Improve • Integrate • Invent • Make up • Maximize • Minimize • Modify • Originate • Organize • Plan • Predict • Prepare • Produce • Propose • Rearrange • Rewrite • Role-play • Solution • Solve • Substitute • Write |

B.Sc. Botany

| Semester | Subject Code | Title Of The Paper | Hours Of Teaching/ Week | No. of Credits |
|----------|-----------------|--------------------------|-------------------------|----------------|
| I | 23U1BOT1 | வயாதுத் தமிழ் - 1 | 6 | 3 |

Nature of the Course

| | | | |
|---|---|---|---|
| 1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது | ✓ | 7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல் | |
| 2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது | | 8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது | ✓ |
| 3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது | ✓ | 9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது | |
| 4. Addresses Gender Sensitization பாலின உணர்விறன் பூர்த்தி செய்தல் | | 10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது | |
| 5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல் | | 11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது | |
| 6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல் | ✓ | | |

Course Objectives

- முதலாமாண்டுப் பட்ட வகுப்பு மாணவர்களுக்குத் தமிழ் மொழி இலக்கியங்களை அறிமுகம் செய்தல்
- தற்கால இலக்கியப் போக்குகளையும் இலக்கணங்களையும் மாணவர் அறியுமாறு செய்தல்.
- மாணவர்களுக்குத் தமிழ் படைப்பாற்றலைத் தூண்டுதல்.
- தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.

| Unit | Details | Hours |
|---------------|--|--------|
| Unit-I | மரபுக் கவிதை 1. பெ. சுந்தரனார் - தமிழ்த் தெய்வ வணக்கம் 2. பாரதிதாசன் - சிறுத்தையே வெளியில் வா 3. கவிமணி - புத்தரும் சிறுவனும் 4. முடியரசன் - மொழி உணர்ச்சி 5. கண்ணதாசன் - ஆட்டனத்தி ஆதிமந்தி — ஆதிமந்தி புலம்பல் 6. சுரதா - துறைமுகம் தொகுப்பிலிருந்து ஏதேனும் ஒரு கவிதை 7. தமிழ் ஒளி - கடல் | 18 Hrs |

| | | |
|-----------------|---|--------|
| Unit-II | புதுக்கவிதை 1. அப்துல் ரகுமான் - வீட்டுக்கொரு மரம் வளர்ப்போம் 2. ஈரோடு தமிழன்பன் - சென்றியூ கவிதைகள் (ஏதேனும் ஐந்து கவிதைகள்) 3. வைரமுத்து - பிற்சேர்க்கை 4. மு.மேத்தா- வாழைமரம் 5. அறிவுமதி -வள்ளுவம் பத்து 6. நா முத்துக்குமார் - ஆனந்த யாழை மீட்டுகிறாய் 7. சுகிர்தராணி - சபிக்கப்பட்ட முத்தம் 8. இளம்பிறை -நீ எழுத மறுக்கும் எனது அழகு | 18 Hrs |
| Unit-III | சிறுகதைகள் 1. வாய்ச் சொற்கள் - ஜெயகாந்தன் (மாலை மயக்கம் தொகுப்பு) 2. கடிதம் - புதுமைப்பித்தன் 3. முள்முடி - தி ஜானகிராமன் 4. சிதறல்கள் - விழி.பா.இதயவேந்தன் 5. காகித உறவு - சு.சமுத்திரம் 6. வீட்டின் மூலையில் சமையல் அறை - அம்பை 7. (மொழிபெயர்ப்புக் கதை) ஆண்டன் செக்காவ் - நாயக்காரச் சீமாட்டி, சந்தியா | 18 Hrs |
| Unit-IV | 1. பாடம் சார்ந்த இலக்கிய வரலாறு 2. இராகபாவம் — கேட்டிவி | 18 Hrs |
| Unit-V | மொழித்திறன் போட்டி தேர்வு 1.பொருள் பொதிந்த சொற்றொடர் அமைத்தல் 2. ஓர் எழுத்து ஒரு மொழி 3. வேற்றுமை உருபுகள் 4. திணை, பால், எண், இடம் 5. கலைச்சொல்லாக்கம், மொழிபெயர்ப்பு. (குறிப்பு: அலகு 4, 5 ஆகியன போட்டித் தேர்வு நோக்கில் நடத்தப்பட வேண்டும்). | 18 Hrs |

| CO Number | CO Statement | Cognitive Level |
|------------|--|-----------------|
| CO1 | பாரதியார் காலந்தொட்டு தற்காலப் புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல். | K2 |
| CO2 | புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர். | K3 |
| CO3 | இக்கால இலக்கிய வகையினைக் கற்பதன் மூலம் படைப்பாக்கத் திறனைப் பெறுவர். | K4 |
| CO4 | மொழியறிவோடு சிந்தனைத்திறன் அதிகரித்தல். | K3 |
| CO5 | தமிழ்மொழியைப் பிழையின்றி எழுதவும், புதிய கலைச் சொற்களை உருவாக்கவும் அறிந்து கொள்ளுதல். | K5 |

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ் பார்வை நூல்கள்.

1. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்
2. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல்
3. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resource

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. [www.tamilvu.org/ library](http://www.tamilvu.org/library)
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <<http://www.chennailibrary.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- [tamale books downloads. blogspot.com](http://tamalebooksdownloads.blogspot.com)
7. Tamil Books on line- [books. tamil cube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

| பொதுத்தமிழ் —1 | | | | | | | | | | | | |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 |
| CLO1 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 |
| CLO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 |
| CLO4 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 |
| CLO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-----------------|--------------------------------------|---------------------------|----------------|
| I | 23U1BOE1 | PART - II GENERAL ENGLISH | 6 | 3 |

| Learning Objectives | | |
|----------------------------|--|-----------------------------------|
| LO1 | To enable earners to acquire self awareness and positive thinking required in Various life situations. | |
| LO2 | To help the macquire the attribute of empathy | |
| LO3 | To assist them in acquiring creative and critical thinking abilities | |
| LO4 | To enable them to learn the basic grammar | |
| LO5 | To assist the min developing LSRW skills | |
| Unit No. | Unit Title &Text | No.of Periods for the Unit |
| I | SELF-AWARENESS(WHO) & POSITIVE THINKING (UNICEF) Life Story Chapter 1 from Malala Yousafzai, I am Malala An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3) M.K.Gandhi Poem Where the Mind is Without Fear–Gitanjali 35– Rabindranath Tagore Love Cycle– Chinua Achebe | 20 |
| II | EMPATHY Poem Nine Gold Medals– David Roth Alice Fellor poverty–William Words worth Short Story The School for Sympathy– E.V. Lucas Barn Burning – William Faulkner | 20 |
| III | CRITICAL & CREATIVE THINKING Poem The Things That Haven't Been Done Before– Edgar Guest Stopping by the Woods on a Snowy Evening– Robert Frost Readers Theatre The Magic Brocade – A Tale of China Stories on Stage–Aaron Shepard (Three Sideway Stories from Wayside School” by Louis Sachar) | 20 |
| IV | Reflective Thinking The Running Rivulets of man The Lady in the Silver Coat Mr.Applebaum at Play The Feigning Brawl of an Imposter Thy Life is my Lesson | 15 |
| V | Communication Skill Part of Speech Articles Noun Pronoun Verb Adverb Adjective Preposition | 15 |

| Course Outcomes | | |
|-----------------|---|--------------|
| Course Outcomes | On completion of this course, students will: | |
| CO1 | Acquire self awareness and positive thinking required in various life situations | PO1,PO7 |
| CO2 | Acquire the attribute of empathy. | PO1,PO2,PO10 |
| CO3 | Acquire creative and critical thinking abilities. | PO4,PO6,PO9 |
| CO4 | Learn basic grammar | PO4,PO5,PO6 |
| CO5 | Development and integrate the use of four language skills i.e., listening, speaking, reading and writing. | PO3,PO8 |

| | Textbooks (Latest Editions) |
|----|--|
| 1. | Malala Yousafzai. Iam Malala, Little, Brown and Company, 2013. |
| 2. | M.K.Gandhi. An Autobiography or The Story of My Experiments with Truth (Chapter – I), Rupa Publications, 2011. |
| 3. | Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings): A Collection of Prose Translations Made by the Author from the Original Bengali. MacMillan, 1913. |
| 4. | N.Krishnasamy. Modern English: A Book of Grammar, Usage and Composition Macmillan, 1975. |
| 5. | Aaron Shepard. Stories on Stage, Shepard Publications, 2017. |
| 6. | J.C.Nesfield. English Grammar Composition and Usage, Macmillan, 2019. |
| 7. | Sri.KTV. Melodious Harmony, New Century Book House. 2022 |

| Web Resources | |
|---------------|---|
| 1 | Malala Yousafzai. Iam Malala (Chapter 1) https://archive.org/details/i-am-malala |
| 2 | M.K.Gandhi. An Auto biography or The Story of My Experiments with Truth (Chapter-1)- Rupa Publication, 2011 https://www.indiastudychannel.com/resources/146521-Book-Review-An-Autobiography-or-The-story-of-my-experiments-with-Truth.aspx |
| 3 | Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings) https://www.poetryfoundation.org/poems/45668/gitanjali-35 |
| 4 | Aaron Shepard. Stories on Stage, Shepard Publications, 2017 https://amzn.eu/d/9rVzINv |
| 5 | JCNesfield. Manual of English Grammar and Composition. https://archive.org/details/in.ernet.dli.2015.44179 |

Mapping with Programme Outcomes:-

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

Mapping with Programme Specific Outcomes:-

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 |
|--|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |
| Weight age | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to POS | 3.0 | 3.0 | 3.0 | 3.0 |

3– Strong, 2 –Medium, 1-Low

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|----------------------------|---------------------------|----------------|
| 1 | 23U1BOC1 | PLANT DIVERSITY-I ALGAE | 5 | 5 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To provide a comprehensive knowledge on the biology of algae.
2. To provide a basis for better understanding of the evolution higher of plants.
3. To understand reproductive biology, ecology of plants by studying the simpler systems in algae.
4. To understand the role of algae in ecosystems as primary producers of nutrition.
5. To understand importance of algae to animals and humans.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | ALGAL CLASSIFICATION Classification (Fritsch-1935-1945), General characters of algae – Chlorophyceae, Phaeophyceae, Rhodophyceae and Cyanophyceae. Algal distribution, Economic importance of algae | 15 |
| II | ALGAL STRUCTURE Thallus organization - unicellular – <i>Chlorella</i> ; Diatoms, colonial - <i>Volvox</i> , filamentous - <i>Anabaena</i> , <i>Oedogonium</i> , siphonous – <i>Caulerpa</i> ; parenchymatous - <i>Sargassum</i> , <i>Gracilaria</i> . | 15 |
| III | ALGAL REPRODUCTION Reproduction - Vegetative, asexual, sexual reproduction and life histories (haplontic - <i>Oedogonium</i> and <i>Chara</i> , diplontic - Diatoms and <i>Sargassum</i> , Diplohaplontic - <i>Ulva</i> and diplobiontic - <i>Gracilaria</i>) | 15 |
| IV | ALGAL CULTIVATION Algal cultivation methods, Algal production systems; indoor cultivation methods and large - scale cultivation of algae, harvesting of algae. | 15 |
| V | ECONOMICAL IMPORTANCE Algae as food and feed: Agar - agar, Alginic acid and Carrageenan; Diatomite. Resource potential of algae: Application of algae as fuel, agriculture and pharmaceutical. Role of algae in CO ₂ sequestration, Algae as indicator of water pollution, algal bioinoculants, Bioluminescence. | 15 |

Textbook:

1. Gangulee Das and Kar (1989). College Botany, Vol. II, New Central Book Agency, Calcutta.
2. Vashishta, P.C. 2014. S.Chand & Company Ltd, New Delhi.
3. Dehradun. Edwardlee, R. 2018. Phycology, 5th Ed., Cambridge University Press,
4. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.

References Books:

1. Achintya Das, Ananya Roy Chowdhury, (2023) Chapter 16 - Algal cultivation in the pursuit of emerging technology for sustainable development, Editor(s): Suhaib A. Bandh, Fayaz A. Malla, Valorization of Microalgal Biomass and Waste water Treatment, Elsevier, <https://doi.org/10.1016/B978-0-323-91869-5.00014-4>
2. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN: 978-9922-20-391-1.
3. Mihir Kumar, D. 2010. Algal Biotechnology. Daya Publishing House, New Delhi.
4. Chapman V.J. and Chapman D.J., 2013. The Algae. Alpha Numera.
5. Fritsch, F.E. 1945. Structure and reproduction of Algae. Cambridge University press.
6. Bold, H.C and Wynne, M.J. 1978. Introduction to the Algae: Structure and Function. Prantice Hall of India New Delhi.

Web resources:

1. <https://www.crcpress.com/Therapeutic-and-Nutritional-Uses-of-Algae/Pereira/p/book/9781498755382>
2. <https://www.crcpress.com/Algae-Anatomy-Biochemistry-and-Biotechnology-Second-Edition/Barsanti-Gualtieri/p/book/9781439867327>
3. <https://www.crcpress.com/Marine-Algae-Biodiversity-Taxonomy-Environmental-Assessment-and-Biotechnology/Pereira-Neto/p/book/9781466581678>
4. <https://www.kopykitab.com/Botany-For-Degree-Students-ALGAE-by-B-R-Vashishta-Dr-A-K-Sinha-Dr-V-P-Singh>
5. <https://www.wileyindia.com/a-textbook-of-algae.html>
6. <https://www.kobo.com/in/en/ebook/algae-biotechnology>
7. <https://www.ikbooks.com/books/book/life-sciences/botany/a-textbook-algae/9788188237449/>

Pedagogy:

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | Relate to the structural organization, reproduction and significance of algae. | K1 |
| CO2 | Demonstrate knowledge in understanding the various life cycle patterns and the fundamental concepts in algal growth | K2 |
| CO3 | Explain the benefits of various algal technologies on the ecosystem. | K3 |
| CO4 | Compare and contrast the thallus organization and modes of reproduction in algae. | K4 |
| CO5 | Determine the emerging areas of Algal Biotechnology for identifying commercial potentials of algal products and their uses. | K5 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | O5 | SO6 | PSO7 | PSO8 | PSO9 | PSO10 |
|------------|------------|------------|------------|------------|-----------|------------|-------------|-------------|-------------|--------------|
| C01 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 1 |
| C02 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 3 | 3 |
| C03 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 2 |
| C04 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| C05 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching/ Cycle | No. of Credits |
|----------|-------------|---|-----------------------------|----------------|
| 1 | 23U1BOCP1 | PLANT DIVERSITY - I ALGAE -PRACTICAL-I | 5 | 5 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|--|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To develop skills to identify algae based on habitat, thallus structure and the internal organization.
2. To identify microalgae in a mixture.
3. To develop skills to prepare the microslides of algae.
4. To study the economic importance of few species.
5. To understand importance of algae to animals and humans

SYLLABUS

ALGAE

1. Micro-preparation of the unicellular-*Chlorella*, Diatoms, colonial-*Volvox*, filamentous - *Anabaena*, *Oedogonium*, siphonous-*Caulerpa*, parenchymatous- *Sargassum*, *Gracilaria*).
2. Identifying the micro slides relevant to Chlorophyceae, Phaeophyceae, Rhodophyceae and Cyanophyceae.
3. Identifying types of algal mixture.
4. Economic importance of Algae as: (i) Food (ii) Feed (iii) Biofertilizers (iv) Seaweed liquid fertilizer (v) Hydrogen production by algae (vi) SCP (vii) Agar Agar (viii) Alginate (ix) Diatomaceous earth.
5. Field visit to study fresh water/marine water algal habitats.
6. Visit to nearby industry actively engaged in algal technology

Textbook:

1. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi.
2. Bendre, M. Ashok and Ashok Kumar, A. 2020. Text Book of Practical Botany-1 (10th ed). Rastogi Publications, Meerut.
3. Round, FE. 1984. The Ecology of Algae. Cambridge University Press.
4. Aziz, F and Rasheed, R. 2019. A Course Book of Algae. Publisher: University of Sulaimani. ISBN:978-9922-20-391-1.
5. Singh, Pandey and Jain. 2020. A text book of Botany, 5th Edition, Rastogi Publication, Meerut.

References Books:

1. Nancy Sereadiak and M. Huynh. 2011. Algae identification lab Guide. Accompanying
2. Manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher.
3. Chapman, V.J and Chapman, D.J. 1960. The Algae, ELBS & MacMillan, London.

B.Sc. Botany

4. Lee, R.D. 2008. Phycology 4th Edition, Cambridge University Press, New York.
5. Dehradun. Edwardlee, R. 2018. Phycology, 5th Ed., Cambridge University Press, London.

Webresources:

1. <https://www.amazon.in/Practical-Manual-Algae-Sundara-Rajan/dp/8126106492>
2. https://books.google.co.in/books/about/Practical_Manual_of_Algae.html?id=8d5DAAACA AJ&redir_esc=
3. [https://freebookcentre.net/biology-books-download/Concepts-of-Botany-Algae-\(PDF21P\).html](https://freebookcentre.net/biology-books-download/Concepts-of-Botany-Algae-(PDF21P).html).
4. <https://www.ebooks.com/en-in/book/210152662/algae/sachin-kumar-mandotra/>
5. https://books.google.co.in/books/about/Algae.html?id=s1P855ZWc0kC&redir_esc=y

Pedagogy:

Lecture, Assignment, PPT presentation, Quiz, Group Discussion, Demonstration, e-content and Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | Recall and identify algae using key identification characters. | K1 |
| CO2 | Demonstrate practical skills in preparation of fresh mount and identification of algal forms from algal mixture. | K2 |
| CO3 | Describe the internal structure of algae prescribed in the syllabus | K3 |
| CO4 | Decipher the algal diversity in fresh/marine water and their economic significance. | K4 |
| CO5 | Evaluate the various techniques used to culture algae for commercial purposes | K5 |

Cognitive Level:

K1 - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| CO 5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3) M-Medium (2) L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| I | 23U1BOZOA1 | ALLIED ZOOLOGY – I (Diversity of Invertebrates and Chordates) | 5 | 3 |

Nature of the Course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | | Employability Oriented | √ | Addresses Professional Ethics | √ |
| Relevant to national need | √ | Entrepreneurship Oriented | √ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | √ | Addresses Environment and Sustainability | √ |
| Relevant to Global need | √ | | | Addresses Human Values | |

Course Objectives:

The main objectives of this course are to:

| | |
|---|---|
| 1 | To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida |
| 2 | To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata |
| 3 | To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia |
| 4 | To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia |
| 5 | To acquire detailed knowledge of select invertebrate and chordate forms |

SYLLABUS

| Unit | Content | No. of Hours |
|------|---|--------------|
| I | Diversity of Invertebrates–I Principles of taxonomy. Criteria for classification–Binomial nomenclature. General characters and Classification of Protozoa, Coelenterata, Helminthes and Annelida up to classes with two examples. | 15 Hrs |
| II | Diversity of Invertebrates–II General characters and Classification of Arthropoda, Mollusca and Echinodermata up to class level with two examples. | 15 Hrs |
| III | Diversity of Chordates–I General characters and Classification of Prochordata, Pisces and Amphibia up to orders with two examples. | 15 Hrs |
| IV | Diversity of Chordates–II General characters and Classification of Reptilia, Aves and Mammalia up to orders with two examples. | 15 Hrs |
| V | Animal organization: Detailed study: Structure and organization of (i) Earthworm (ii) Fish (iii) Rabbit | 15 Hrs |

Text Books

1. Ekambaranatha Ayyar and T.N. Ananthakrishnan, (1992), Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai.
2. Kotpal, R.L. (2019-2020). A Modern Text Book of Zoology; Invertebrates, Rastogi publications XI Edition.
3. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Invertebrates. Saras Publication, Nagercoil.
4. Kingsley, J. S. (2015). Text Book of Vertebrate Zoology. United States: FB&C Limited.
5. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Chordate. Saras Publication, Nagercoil Vol II

References Books

1. E.L.Jordan & DR. P.S. Verma, (2019) Chordate Zoology, S Chand Publishers, New Delhi.
2. Kotpal, R.L. (2009-2010). A Modern Text Book of Zoology; vertebrates, Rastogi publications XI Edition
3. Jordon, E. L. and Verma, P. S. (1995). Invertebrate Zoology. S. Chand and Co, Zoology Delhi.
4. Barnes (2006) Invertebrate Zoology. Toppan International Co.
5. Yapp, W.B., 1965. Vertebrates, Their structure and life, Oxford University Press, New York, U.S.A.

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com

Pedagogy: Lecture, Assignment, PPT presentation

Course Outcomes

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

| CO No. | CO Statement | CO Cognitive level |
|------------|--|--------------------|
| CO1 | Recall the characteristic features invertebrates and chordates. | K1 |
| CO2 | Classify invertebrates up to class level and chordates up to order level | K4 |
| CO3 | Explain and discuss the structural and functional organisation of some invertebrates and chordates | K2 |
| CO4 | Relate the adaptations and habits of animals to their habitat | K2 |
| CO5 | Analyse the taxonomic position of animals. | K4 |

Cognitive Level:

K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

| Mapping of Course Outcomes with Programme Outcomes: | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO 9 | PO10 |
| CO1 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|-------------------------------|---------------------------|----------------|
| I & II | 23U2BOZOAPL | ALLIED ZOOLOGY PRACTICAL (NS) | 3 | -- |

Nature of the Course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | √ | Employability Oriented | √ | Addresses Professional Ethics | √ |
| Relevant to national need | | Entrepreneurship Oriented | √ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | √ | Addresses Environment and Sustainability | √ |
| Relevant to Global need | √ | | | Addresses Human Values | |

Course Objectives:

The main objectives of this course are to:

| | |
|---|--|
| 1 | To acquire a basic knowledge of laboratory techniques in related to Zoology |
| 2 | To acquire a basic knowledge of taxonomic position, body organization and evolutionary relationship of species |
| 3 | To inculcate the significance of various invertebrates and chordates in their ecosystem |
| 4 | To comprehend the basic concepts of human genetics and patterns of inheritance |
| 5 | students to learn basic concepts of embryological studies, immunity and the working of immune organs |

DISSECTION OF INVERTEBRATES:

1. Earth worm-Digestive system and Nervous system.
2. Cockroach – Digestive System, Nervous system and Reproductive system.
3. Freshwater mussel – Digestive system.

DISSECTION OF CHORDATA (virtual dissection)

Video clipping of Arterial and Venous system of Frog.

Dissection – Digestive system of fish

MOUNTING:

1. Earthworm - body setae and penial setae.
2. Mouth parts – honeybee, cockroach and mosquito
3. Fish - Placoid scales of shark and Brain of fish

Physiology: Sphygmomanometer, Stethoscope, Hemacytometer

Embryological slides: 24 Hour Chick Embryo, 48 Hour Chick Embryo, 72 Hour Chick Embryo, 96 Hour Chick Embryo.

Genetics:

1. Identification of ABO blood group.
2. Identification of male and Female *Drosophila*,

Immunology:

Lymphoid organs of Rat.

SPOTTERS:

Invertebrata: Paramecium, Trypanosoma, Plasmodium, Leucosolenia, Sycon sponge, Aurelia, Obelia, Planaria, Liver fluke, Tapeworm, Ascaris, Leech, Earthworm, Nereis, Cockroach, Prawn Fresh water mussel, Star fish. **Protochordata and Vertebrata:** Amphioxus, Balanoglossus, Shark, Frog, Salamander, Calotes, Chamaeleon, Cobra, Pigeon, Rabbit.

Text Book:

1. Kotpal, R.L. (2019-2020). A Modern Text Book of Zoology; Invertebrates, Rastogi

publications XI Edition

2. Ekambaranatha Ayyar and T.N. Ananthakrishnan, (1992), Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai.
3. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Chordate. Saras Publication, Nagercoil Vol II
4. Ahsan, J. and Sinha, S.P. (2010). A hand book on Economic Zoology. S. Chand & Co.,

Reference:

1. Verma, P. S. (2013). A Manual of Practical Zoology of Invertebrates. S. Chand of company Ltd, New Delhi.
2. Ekambaranatha AYYAR and Ananthakrishnan, T. N. (2009). Manual of Zoology Vol – II. S. Viswanathan Pvt. Ltd. Chennai.
3. De Iuliis, G. and Pulera, D. (2006). The Dissection of Vertebrates: A Laboratory Manual. Netherlands: Elsevier Science.
4. S. N. Prasad, M. Sc., D. Phil. Lecturer 1n Zoology, University of Allahabad. And P. V. Rajamannar, M. Sc. Zoology Department, qniversi~y of Delhi., Laboratory Manual of Vertebrate Zoology . (For B. Sc. Students), Allahabad. Universal book company 20, mahatma gandhi marg.
5. Verma P.S. & Agarwal Developmental Biology, Chordata embryology S. Chand & Co.
6. Gupta G. K., 2013. Genetics Classical to Modern, Rastogi publishers, Meerut.
7. Singh, H.R and Kumar, N. 2017. Animal physiology and biochemistry, Vishal publishing company, Jalandhar, 864 pp.
8. Coleman, R.M., 2014. Fundamental Immunology, 2nd Edition, Published by Mc Graw Hill Education India, 357 pp.

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com

**Pedagogy: Dissection, Mounting Videoclipping,
Course Outcomes**

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

| CO No. | CO Statement | CO Cognitive level |
|--------|--|--------------------|
| CO1 | Recall the characteristic features invertebrates and chordates. | K1 |
| CO2 | Classify invertebrates up to class level and chordates up to order level | K3 |
| CO3 | Analyse the different developmental stages | K4 |
| CO4 | Analyse the working of body and immune systems | K4 |
| CO5 | Analyse the identification of blood grouping and Genetical studies | K4 |

Cognitive Level:

K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

| Mapping of Course Outcomes with Programme Outcomes: | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

B.Sc. Botany

| Semester | Subject Code | Title Of The Paper | Hours Of Teaching/ Week | No. of Credits |
|-----------|-----------------|-------------------------|-------------------------|----------------|
| II | 23U2BOT2 | வொதுத் தமிழ் – 2 | 6 | 3 |

Nature of the Course

| | | | |
|---|---|---|---|
| 1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது | ✓ | 7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல் | |
| 2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது | | 8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது | ✓ |
| 3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது | ✓ | 9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது | |
| 4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல் | | 10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது | |
| 5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல் | | 11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது | |
| 6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல் | ✓ | | |

Course Objectives

| |
|---|
| 1. சமய இலக்கியங்களையும் சிற்றிலக்கியங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல். |
| 2. மாணவர்களுக்கு மொழித்திறனை வளர்க்கப் பயிற்சி அளித்தல். |
| 3. மாணவர்களுக்குச் சிறுகதை இலக்கிய வடிவத்தை உணர்த்துதல். |

| Unit | Details | Hours |
|-----------------|--|--------|
| Unit-I | 1. திருநாவுக்கரசர் தேவாரம் - நாமார்க்கும் குடியல்லோம் எனத் தொடங்கும் பதிகம் (10 பாடல்கள்) 2. ஆண்டாள் - திருப்பாவை (முதல் 10 பாசரம்) | 18 Hrs |
| Unit-II | 1. வள்ளலார் - அருள் விளக்க மாலை (முதல் 10 பாடல்) 2. எச். ஏ. கிருட்டிணப்பிள்ளை - இரட்சணிய மனோகரம் - பால்ய பிரார்த்தனை 3. குணங்குடி மஸ்தான் சாகிபு - பராபரக்கண்ணி (முதல் 10 கண்ணி) | 18 Hrs |
| Unit-III | சிற்றிலக்கியங்கள் 1. தமிழ்விடு தூது (முதல் 20 கண்ணி) 2. திருக்குற்றாலக் குறவஞ்சி - குறத்தி மலைவளம் கூறுதல் 3. முக்கூடல் பள்ளு - நாட்டு வளம் | 18 Hrs |
| Unit-IV | 1. பாடம் தழுவிய இலக்கிய வரலாறு 2. மனோரஞ்சிதம் - கேட்டிவி | 18 Hrs |
| Unit-V | மொழித்திறன்/போட்டித் தேர்வுத் திறன் 1. தொடர் வகைகள் 2. மரபுத்தொடர், பழமொழிகள் 3. பிறமொழிச் சொற்களைக் களைதல் 4. வழுச்சொற்கள் நீக்குதல் 5. இலக்கணக் குறிப்பு அறிதல் | 18 Hrs |

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | பக்தி இலக்கியங்களைக் கற்பதன் மூலம் பக்தி நெறியினையும், சமய நல்லிணக்கத்தையும் தெரிந்து பின்பற்றுவர். | K1, K2 |
| CO2 | சிற்றிலக்கியங்களின்வழி இலக்கியச் சுவையினையும் பண்பாட்டு அறிவினையும் பெறுவர். | K2 |
| CO3 | பட்டப் படிப்பினைப் படிக்கும் போதே பெரும்பான்மையான தமிழ் இலக்கியங்கள் குறித்த அறிவினைப் பெறுவர். | K4 |
| CO4 | தமிழ்ச் சமூகப் பண்பாட்டு வரலாற்றினை இலக்கியங்கள் வாயிலாக அறிவர். | K3 |
| CO5 | போட்டித் தேர்வுகளில் வெற்றி பெறுவதற்குத் தமிழ்ப் பாடத்தினைப் பயன்கொள்ளும் வகையில் ஏற்ற பயிற்சி பெறுவர். | K4 |

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ்

பார்வை நூல்கள்

1. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்
2. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல்
3. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resource:-

Related Online Contents (MOOC,SWAYAM,NPTEL,Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. [www.tamilvu.org/ library](http://www.tamilvu.org/library)
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <<http://www.chennailibrary.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- [tamilebooksdownloads. blogspot.com](http://tamilebooksdownloads.blogspot.com)
7. Tamil Books on line- [books.tamil cube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

| பொதுத்தமிழ் —2 | | | | | | | | | | | | |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 |
| CLO1 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 |
| CLO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 |
| CLO4 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 |
| CLO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|-----------|-----------------|--------------------------------------|---------------------------|----------------|
| II | 23U2BOE2 | PART - II GENERAL ENGLISH | 6 | 3 |

| Learning Objectives | | |
|----------------------------|---|------------------------------------|
| LO1 | To make students realize the importance of resilience | |
| LO2 | To enable them to become good decision makers | |
| LO3 | To enable them to imbibe problem-solving skills | |
| LO4 | To enable them to use tenses appropriately | |
| LO5 | To help the student use English effectively at the work place. | |
| Unit No. | Unit Title & Text | No. of Periods for the Unit |
| I | RESILIENCE Poem Don't Quit – Edgar A. Guest Still Here – Langston Hughes Short Story Engine Trouble – R.K. Narayan Rip Van Winkle – Washington Irving | 20 |
| II | DECISION MAKING Short Story The Scribe – Kristin Hunter The Lady or the Tiger – Frank Stockton Poem The Road not Taken – Robert Frost Snake – D. H. Lawrence | 20 |
| III | PROBLEM SOLVING Prose life Story How I taught My Grandmother to Read – Sudha Murthy Autobiography How frog Went to Heaven – A Tale of Angolo Wings of Fire (Chapters 1, 2, 3) by A.P.J. Abdul Kalam | 20 |
| IV | Moral Values The Stoic Penalty Nobility in Reasoning Malu, the Frivolous Freak Honesty is the Cream of Chastity A Boy in Boy's Town | 15 |
| V | Tenses Present Past Future Concord | 15 |

| Course Outcomes | | |
|------------------------|--|----------------|
| Course Outcomes | On completion of this course, students will; | |
| CO1 | Realize the importance of resilience | PO1, PO7 |
| CO2 | Become good decision-makers | PO1, PO2, PO10 |
| CO3 | Imbibe problem-solving skills | PO4, PO6, PO9 |

| | | |
|------------|--|---------------|
| CO4 | Use tenses appropriately | PO4, PO5, PO6 |
| CO5 | Use English effectively at the work place. | PO3, PO8 |

Text Books (Latest Editions)

| References Books | |
|-------------------------|--|
| 1 | Martin Hewings. Advanced English Grammar. Cambridge University Press, 2000 |
| 2 | SP Bakshi, Richa Sharma. Descriptive English. Arihant Publications (India) Ltd., 2019. |
| 3. | Sheena Cameron, Louise Dempsey. The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing, 2019. |
| 4 | Barbara Sherman. Skimming and Scanning Techniques, Liberty University Press, 2014. |
| 5. | Phil Chambers. Brilliant Speed Reading: What every ouneed to read, however. Pearson, 2013. |
| 6. | Communication Skills: Practical Approach Ed. Shaikh Moula Ramendra Kumar. Stories of Resilience, Blue Rose Publications, 2020. |
| 7. | Sri.KTV.Melodious Harmony, New Century Book House. 2022 |

Web Sources

| | |
|---|---|
| 1 | Langston Hughes. Still Here https://poetryace.com/im-still-here |
| 2 | R.K. Narayan. Engine Trouble http://www.sbioaschooltrichy.org/work/Work/images/new/8e.pdf |
| 3 | Washington Irving. Rip Van Winkle https://www.gutenberg.org/files/60976/60976-h/60976-h.htm |
| 4 | Frank Stockton. The Lady or the Tiger https://www.gutenberg.org/ebooks/396 |

Mapping with Programme Outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3–Strong, 2–Medium, 1–Low Mapping with Programme Specific Outcomes:

| CO / PO | PSO1 | PSO2 | PSO3 | PSO4 |
|--|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |
| Weight age | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 |

3– Strong, 2 –Medium, 1–Low

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--|---------------------------|----------------|
| II | 23U2BOC2 | PLANT DIVERSITY II: FUNGI, BACTERIA, VIRUSES, PLANT PATHOLOGY AND LICHENS | 5 | 4 |

Nature of the course

| | | | |
|--|---|-------------------------------------|---|
| Employability Oriented | √ | Relevant to Local need | √ |
| Entrepreneurship Oriented | √ | Relevant to regional need | |
| Skill development Oriented | √ | Relevant to national need | √ |
| Addresses Gender Sensitization | | Relevant to Global development need | |
| Addresses Environment and Sustainability | | Addresses Professional Ethics | |
| Addresses Human Values | | | |

Course Objectives

The main objectives of this course are to:-

1. Describe the common characteristics of fungi as being heterotrophic, unicellular/multicellular.
2. Understand the biology of fungi and to discuss the importance of fungi in various ecological roles
3. Understand lichen structure, function, identification, and ecology; comprehend the events of symbiosis and lichenization and to demonstrate the use of lichens as bio-indicator species.
4. Identify the main groups of plant pathogens their symptoms.
5. Understand the various types of plant diseases.

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | FUNGI Classification of fungi - (Alexopoulos and Mims, 1979), criteria for classification, Characteristic features, thallus organization, mode of nutrition, structure, reproduction and life-history of classes, each with one suitable example: Zygomycotina (<i>Mucor</i> , <i>Rhizopus</i>), Ascomycotina (<i>Aspergillus</i> , <i>Saccharomyces</i>), Basidiomycotina (<i>Agaricus</i> , <i>Pleurotus</i> ,) and Deuteromycotina (<i>Cercospora</i> , <i>Alternaria</i>). Importance of mycorrhizal association. | 15 |
| II | ECONOMIC IMPORTANCE OF FUNGI: Cultivation of mushroom – <i>Pleurotus</i> (food). Fungi in agriculture application (biofertilizers); Biopesticides, Production of industrially important products from fungi- alcohol (ethanol), organic acids (citric acid), enzymes (protease). Vitamins (Vitamin B-complex and Vitamin B-12), applications of fungi in pharmaceutical products (Penicillin). Importance of VAM fungi. Harmful effects of Fungi. | 15 |
| III | BACTERIA, VIRUS: Classification (Bergey's, 1994), structure and reproduction of bacteria, Mycoplasma, Virology -Viruses general characters, structure and reproduction. | 15 |
| IV | PLANT PATHOLOGY: General symptoms of plant diseases, Geographical distribution of diseases, Etiology; Host-Pathogen relationships, Disease cycle and environmental relation; prevention and control of the following plant diseases. General characters of Bacteria and Viruses. Bacterial diseases – Citrus canker. Viral diseases – Tobacco Mosaic Fungal diseases Tikka disease of ground nut. | 15 |

| | | |
|---|---|----|
| V | LICHEN: Classification (Hale, 1969). Habitat, nature of association, Structure, Nature of Mycobionts and Phycobionts, Study of growth forms of lichens (crustose, foliose and fruticose), types, distribution, thallus organization, reproduction and ecological significance of lichens with special reference to <i>Usnea</i> . Economic importance of Lichens: food, fodder and nutrition, flavor, tanning and dyeing, cosmetics and perfumes, air pollution and biomonitoring, poison from lichens, | 15 |
|---|---|----|

Recommended Textbook:

1. Pandey, B.P. 1997. College Botany. Vol. I Fungi & Pathology.
2. Mehrotra, R.S and Aneja, K.R. 2003. An introduction to mycology. New age International (P) Ltd, Publishers, New Delhi.
3. Poonam Singh and Ashok Pandey. 2009. Biotechnology for agro-Industrial residues utilization. Springer.
4. Satyanarayana T and Johri B.N. 2005. Microbial diversity, Current Perspectives and Potential Applications, IK International.
5. Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata.
6. Sharma, P.D. 2011. Plant Pathology, Rastogi Publication, Meerut, India
7. Mahendra Rai. 2009. Advances in Fungal Biotechnology. I.K. International Publishing House, New Delhi.

Reference Books

1. Alexopoulos, C.J., Mims, C.W., Blackwell, M. 1996. Introductory Mycology. 4th edition. John Wiley & Sons (Asia) Singapore.
2. Webster, J and Weber, R. 2007. Introduction to Fungi. 3rd edition. Cambridge University Press, Cambridge.
3. Sharma, O.P. 2011. Fungi and allied microbes The McGraw –Hill companies, New Delhi.
4. Burnett, J.H. 1971. The fundamentals of Mycology. ELBS Publication, London.
5. Bessey, E.A. 1979. Morphology and Taxonomy of fungi, Vikas publishing House Pvt. Ltd, New Delhi.
6. Dharani Dhar Awasthi. 2000. A Handbook of Lichens Vedams eBooks (P) Ltd. New Delhi.
7. Pelzer, M.J., Chan, E.C.S and Krieg, N.R. 1983. Microbiology, Tata MaGraw Hill Publishing House, New Delhi.
8. Pandey, P.B. 2014. College Botany- 1: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. Chand Publishing, New Delhi.
9. Mishra, A. and Agarwal, R.P. 1978. Lichens – A Preliminary Text. Oxford and IBH.
10. Pandey, B.P. 2005. College Botany I: Including Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S Chand & Company

Web resources:

1. <https://www.amazon.in/Fungi-Sarah-C-Watkinson-ebook/dp/B0199YFDDE>
2. <http://www.freebookcentre.net/biology-books-download/A-text-book-of-mycology-and-plant-pathology.html>
3. <http://www.freebookcentre.net/Biology/Mycology-Books.html>
4. <https://www.kobo.com/us/en/ebook/introduction-to-fungi>
5. <http://www.freebookcentre.net/biology-books-download/Introductory-Mycology.html>

Pedagogy: Teaching / Learning methods

Lecture, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar

Course Outcome

| CO number | On completion of this course, the students will be able to: | Programme outcomes |
|------------------|---|---------------------------|
| CO1 | Recognize the general characteristics of microbes, fungi and lichens and disease symptoms. | K1 |
| CO2 | Develop an understanding of microbes, fungi and lichens and appreciate their adaptive strategies based on structural organization.. | K2 |
| CO3 | Identify the common plant diseases, according to geographical locations and devise control measures. | K3 |
| CO4 | Analyze the emerging trends in fungal biotechnology with special reference to agricultural and pharmaceutical applications. | K4 |
| CO5 | Discuss and develop skills for statistical analysis of biological problems. | K5 |

Mapping with Programme Outcomes:

| COs | COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 |
|-------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 2 | 1 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |

S-Strong (3)

M-Medium (2)

L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| II | 23U2BOCP2 | PLANT DIVERSITY –II: FUNGI,BACTERIA,VIRUSES, PLANT PATHOLOGY AND LICHENS –PRACTICAL II | 5 | 4 |

Nature of the course

| | | | |
|--|---|-------------------------------------|---|
| Employability Oriented | √ | Relevant to Local need | |
| Entrepreneurship Oriented | √ | Relevant to regional need | |
| Skill development Oriented | | Relevant to national need | √ |
| Addresses Gender Sensitization | | Relevant to Global development need | |
| Addresses Environment and Sustainability | | Addresses Professional Ethics | |
| Addresses Human Values | | | |

Course Objectives

The main objectives of this course are to:

- To enable students to identify microscopic and macroscopic fungi.
- To prepare microslides of fungi and lichens.
- To know the presence of pathogen inside the plant tissues through microscopic sections.
- To identify the bryophytes based on the morphology, and microslides.
- To know the economic importance of the microbes studied.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| | <p style="text-align: center;">EXPERIMENTS</p> <ol style="list-style-type: none"> 1. Microscopic observation of vegetative and reproductive structures through temporary preparations and permanent slides. 2. Identifying the micro slides 3. Herbarium specimens of bacterial diseases/photograph. 3. Protocol for mushroom cultivation. 4. Inoculation techniques for fungal culture (Demonstration only). 5. Study of economically important products obtained from fungi: Fungal biofertilizers, biopesticides, biofungicide (<i>Trichoderma</i>), edible mushroom/Yeast, organicacids (citric acid) enzymes (protease), antibiotics and vitamins. 6. Mycorrhiza: ecto-mycorrhiza and endo-mycorrhiza (Photographs) 7. Visit to fungal biotechnology laboratories. 8. Ultra structure of bacteria. 9. Structure of bacteriophage. 10. Micro-preparation of <i>Usnea</i> to study vegetative and reproductive structures. 11. Identifying the micro slides 12. Study of thallus and reproductive structures (apothecium) through permanent slides. 12. Economic importance of Lichens - Dye and perfume. | |

Textbook:

1. Chmielewski, J.G and Kraysky, D. 2013. General Botany laboratory Manual. Author House, Bloomington, USA.
2. Das, S and Saha, R. 2020. Microbiology Practical Manual. CBS Publishers and Distributors (P) Ltd., New Delhi, India.
3. Webster, J and Weber, R. 2007. Introduction to Fungi, 3rd Ed. Cambridge University Press,

Cambridge.

4. Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata.
5. Nair, L.N. 2007. Topics in Mycology and Pathology, New Central Book agency, Kolkata.

References:

1. Alexopoulos, J and Mims, W. 1985. Introductory Mycology, Wiley Eastern Limited New Delhi.
2. Bendre, M. Ashok and Ashok Kumar, A. 2020. Text Book of Practical Botany 1 (10th ed). Rastogi Publications, Meerut.
3. Singh, R and U.C. Singh 2020. Modern mushroom cultivation, 3d Edition Agrobios (India), Jodhpur.
4. Poonam Singh and Ashok Pandey. 2009. Biotechnology for agro-Industrial residues utilization. Springer.
5. Satyanarayana T and Johri B.N. 2005. Microbial diversity, Current Perspectives and Potential Applications, IK International.

Web resources:

1. <https://www.amazon.in/Practical-Manual-Fungi-Fungicides/dp/B0025AEFP4>
2. https://books.google.co.in/books/about/Practical_Mycology.html?id=5ycJAQAAMAAJ&redir_esc=y
3. <https://www.flipkart.com/colour-handbook-practical-plant-pathology/p/itmefsn6dyhfs9b>
4. https://books.google.co.in/books/about/Practical_Botany.html?id=T5narQEACAAJ&redir_esc=y
5. <https://www.kobo.com/us/en/ebook/introduction-to-fungi>

Pedagogy: Teaching / Learning methods

Lecture, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar

Course Outcome

| CO number | On completion of this course, the students will be able to: | Programme outcomes |
|-----------|--|--------------------|
| CO1 | Identify microbes, fungi and lichens using key identifying characters | K1 |
| CO2 | Develop practical skills for culturing and cultivation of fungi. | K2 |
| CO3 | Identify and select suitable control measures for the common plant diseases. | K3 |
| CO4 | Analyze the characteristics of microbes, fungi and plant pathogens | K4 |
| CO5 | Access the useful role of fungi in agriculture and pharmaceutical industry.. | K5 |

Mapping with Programme Outcomes:

| COs | COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 |
|------|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 1 |
| CO 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3)

M-Medium (2)

L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|-----------|-------------------|---|---------------------------|----------------|
| II | 20U2BOZOA2 | ALLIED ZOOLOGY –II (Physiology, Embryology, Immunology, Human Genetics and Animal Behaviour) | 5 | 3 |

Nature of the Course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | | Employability Oriented | √ | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | √ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | | Addresses Environment and Sustainability | √ |
| Relevant to Global need | √ | | | Addresses Human Values | |

Course Objectives :

The main objectives of this course are to

| | |
|---|--|
| 1 | To enable students to learn basic concepts relating to aspects of respiratory, circulatory, excretory nervous and sensory physiology. |
| 2 | To enable students to comprehend the processes involved during development |
| 3 | To enable students to learn basic concepts of immunity and the working of immune organs and familiarize them with the recommended vaccination schedule |
| 4 | To enable students to comprehend the basic concepts of human genetics and patterns of inheritance |
| 5 | To enable students to learn about aspects of animal behaviour such as foraging, courtship, nest construction, parental care and learning |

SYLLABUS

| Unit | Content | No. of Hours |
|------------|--|--------------|
| I | Physiology: Respiration - Respiratory pigments and transport of gases. Mechanism of blood clotting. Types of excretory products – Ornithine cycle. Structure of neuron – Conduction of nerve impulse -Physiology of vision and hearing. | 15 Hrs |
| II | Embryology: Fertilization, Cleavage, Pattern of Cleavage, Gastrulation of frog and Organogenesis of Frog eye – Extra embryonic membrane in Chick - Placentation in mammals. | 15 Hrs |
| III | Immunology: Innate and Acquired - Active and Passive; Antigens and Antibodies; Types of Immunoglobulins -Immunological organs – Vaccination schedule. | 15 Hrs |
| IV | Human Genetics: Human Chromosomes – Sex Determination in Humans - Patterns of Inheritance - Autosomal Dominant, Autosomal Recessive, X-linked, Y-linked, Mitochondrial, Multiple Alleles- Genetic Counselling | 15 Hrs |
| V | Animal Behaviour: Foraging, Courtship Behaviour, Shelter and Nest Construction, Parental Care in Fish and Amphibia, Learning Behaviour. | 15 Hrs |

Text Book:

1. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.
2. Gupta G. K., 2013. Genetics Classical to Modern, Rastogi publishers, Meerut.
3. Singh, H.R and Kumar, N. 2017. Animal physiology and biochemistry, Vishal publishing company, Jalandhar, 864 pp.
4. Coleman, R.M., 2014. Fundamental Immunology, 2nd Edition, Published by Mc Graw Hill Education India, 357 pp.

References:

1. Owen, J. A., Punt, J. & Stranford, S. A. - Kuby Immunology. New York: W.H. Freeman & Company
- Klug, W. S., Cummings, M. R. & Spencer, C - Concepts of Genetics. (12th ed.). New Jersey: Pearson Education.
2. Mathur, R.- Animal Behaviour. Meerut: Rastogi.
3. Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.
4. Cooper, Geoffrey M., 2018. The cell: A Molecular Approach, Eighth Edition, Oxford University Press.

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com
3. <https://www.ncbi.nlm.nih.gov/books/NBK10052/>
4. <https://www.genome.gov/genetics-glossary/Sex-Linked>

Pedagogy: Lecture, Assignment, PPT presentation,

Course Outcomes

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

| CO No. | CO Statement | CO Cognitive level |
|--------|---|--------------------|
| CO1 | Recall the parts and working of body organs and developmental stages, name the patterns of inheritance and list different types of animal behaviour | K1 |
| CO2 | Analyse the different developmental stages | K4 |
| CO3 | Analyse the working of body and immune systems | K4 |
| CO4 | Analyse the different patterns of inheritance | K4 |
| CO5 | Relate the behaviour of animals to physiology. Analyse the different types of behaviour | K2 |

Cognitive Level:

K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

| Mapping of Course Outcomes with Programme Outcomes: | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 |
| CO4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 1 | 3 | 2 | 3 | 2 |

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|-------------------------------|---------------------------|----------------|
| I & II | 23U2BOZOAPL | ALLIED ZOOLOGY PRACTICAL (NS) | 3 | 2 |

Nature of the Course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | | Employability Oriented | | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | | Addresses Environment and Sustainability | √ |
| Relevant to Global need | √ | | √ | Addresses Human Values | |

Course Objectives:

The main objectives of this course are to:

| | |
|---|--|
| 1 | To acquire a basic knowledge of laboratory techniques in related to Zoology |
| 2 | To acquire a basic knowledge of taxonomic position, body organization and evolutionary relationship of species |
| 3 | To inculcate the significance of various invertebrates and chordates in their ecosystem |
| 4 | To comprehend the basic concepts of human genetics and patterns of inheritance |
| 5 | students to learn basic concepts of embryological studies, immunity and the working of immune organs |

DISSECTION OF INVERTEBRATES:

1. Earth worm-Digestive system and Nervous system.
2. Cockroach – Digestive System, Nervous system and Reproductive system.
3. Freshwater mussel – Digestive system.

DISSECTION OF CHORDATA (virtual dissection)

Video clipping of Arterial and Venous system of Frog.

Dissection – Digestive system of fish

MOUNTING:

1. Earthworm - body setae and penial setae.
2. Mouth parts – honeybee, cockroach and mosquito
3. Fish - Placoid scales of shark and Brain of fish

Physiology: Sphygmomanometer, Stethoscope, Hemocytometer

Embryological slides: 24 Hour Chick Embryo, 48 Hour Chick Embryo, 72 Hour Chick Embryo, 96 Hour Chick Embryo.

Genetics:

1. Identification of ABO blood group.
2. Identification of male and Female *Drosophila*,

Immunology:

Lymphoid organs of Rat.

SPOTTERS:

Invertebrata: Paramecium, Trypanosoma, Plasmodium, Leucosolenia, Sycon sponge, Aurelia, Obelia, Planaria, Liver fluke, Tapeworm, Ascaris, Leech, Earthworm, Nereis, Cockroach, Prawn Fresh water mussel, Star fish. **Protochordata and Vertebrata:** Amphioxus, Balanoglossus, Shark, Frog, Salamander, Calotes, Chamaeleon, Cobra, Pigeon, Rabbit.

Text Book:

1. Kotpal, R.L. (2019-2020). A Modern Text Book of Zoology; Invertebrates, Rastogi publications XI Edition

| |
|---|
| <p>2. Ekambaranatha Ayyar and T.N. Ananthakrishnan, (1992), Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai.</p> <p>3. Nair, NC., Leelavathy, S., Soundara Pandian, N., Murugan, T., and Arumugam, N. (2021). Text book of Chordate. Saras Publication, Nagercoil Vol II</p> <p>4. Ahsan, J. and Sinha, S.P. (2010). A hand book on Economic Zoology. S. Chand & Co.,</p> <p>Reference:</p> <p>9. Verma, P. S. (2013). A Manual of Practical Zoology of Invertebrates. S. Chand of company Ltd, New Delhi.</p> <p>10. Ekambaranatha AYYAR and Ananthakrishnan, T. N. (2009). Manual of Zoology Vol – II. S. Viswanathan Pvt. Ltd. Chennai.</p> <p>11. De Iuliis, G. and Pulera, D. (2006). The Dissection of Vertebrates: A Laboratory Manual. Netherlands: Elsevier Science.</p> <p>12. S. N. Prasad, M. Sc., D. Phil. Lecturer 1n Zoology, University of Allahabad. And P. V. Rajamannar, M. Sc. Zoology Department, qniversi~y of Delhi., Laboratory Manual of Vertebrate Zoology . (For B. Sc. Students), Allahabad. Universal book company 20, mahatma gandhi marg.</p> <p>13. Verma P.S.&Agarwal Developmental Biology, Chordata embryology S.Chand&Co.</p> <p>14. Gupta G. K., 2013. Genetics Classical to Modern, Rastogi publishers, Meerut.</p> <p>15. Singh, H.R and Kumar, N. 2017. Animal physiology and biochemistry, Vishal publishing company, Jalandhar, 864 pp.</p> <p>16. Coleman, R.M., 2014. Fundamental Immunology, 2nd Edition, Published by Mc Graw Hill Education India, 357 pp.</p> |
|---|

Web-Resources:

1. www.sanctuaryasia.com
2. www.iaszoology.com

Pedagogy: Dissection, Mounting Videoclipping,

Course Outcomes

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

| CO No. | CO Statement | CO Cognitive level |
|--------|--|--------------------|
| CO1 | Recall the characteristic features invertebrates and chordates. | K1 |
| CO2 | Classify invertebrates up to class level and chordates up to order level | K3 |
| CO3 | Analyse the different developmental stages | K4 |
| CO4 | Analyse the working of body and immune systems | K4 |
| CO5 | Analyse the identification of blood grouping and Genetical studies | K4 |

Cognitive Level:

K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

| Mapping of Course Outcomes with Programme Outcomes: | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
| CO1 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO4 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

| Semester | Subject Code | Title Of The Paper | Hours Of Teaching/ Week | No. of Credits |
|------------|-----------------|-------------------------|-------------------------|----------------|
| III | 23U3BOT3 | வொதுத் தமிழ் – 3 | 6 | 3 |

Nature of the Course

| | | | |
|---|---|---|---|
| 1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது | | 7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல் | ✓ |
| 2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது | | 8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது | ✓ |
| 3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது | ✓ | 9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது | |
| 4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல் | | 10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது | |
| 5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல் | | 11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது | |
| 6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல் | ✓ | | |

Course Objectives

| |
|---|
| <p>1. இலக்கியங்களின் சிறப்பினை உணர்த்துதல்.</p> <p>2. காலந்தோறும் எழுந்த காப்பியங்களின் போக்கையும், புதினத்தின் இலக்கிய வடிவத்தை மாணவர்கள் உணருமாறு செய்தல்.</p> <p>3. யாப்பு, அணி போன்ற இலக்கிய வகைகளையும் மொழி பெயர்ப்புத் திறனையும் மாணவர்கள் உணருமாறு செய்தல்.</p> <p>4. தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்பக் கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.</p> |
|---|

| Unit | Details | Hours |
|-----------------|---|---------------|
| Unit-I | பெருங்காப்பியங்கள் 1. சிலப்பதிகாரம் - வழக்குரைகாதை-இளங்கோவடிகள் 2. மணிமேகலை ஆதிரை பிச்சையிட்ட காதை சீத்தலைச்சாத்தனார் 3. சீவகசிந்தாமணி - பூமகன் இலம்பகம் திருத்தக்கதேவர் 4. வளையாபதி-நாதகுத்தனார் | 18 Hrs |
| Unit-II | சமயக் காப்பியங்கள் 1. பெரியபுராணம் - பூசலார் நாயனார்புராணம்-சேக்கிழார் 2. கம்பராமாயணம்- மந்தரை சூழ்ச்சிப் படலம்-கம்பர் 3. வில்லிபாரதம் - மற்றோர் சருக்கம்-வில்லிபுத்தூராழ்வார் 4. சீராப்புராணம் - புலி வசனித்த படலம்-உமறுப்புலவர் | 18 Hrs |
| Unit-III | புதினம் 1. வஞ்சிமாநகரம் (வரலாற்றுப் புதினம்) -நா. பார்த்தசாரதி | 18 Hrs |

| | | |
|----------------|--|---------------|
| Unit-IV | 1.பாடம் தழுவிய இலக்கிய வரலாறு 2.குரல் கொடுக்கும் வானம்பாடி - கேட்டிவி | 18 Hrs |
| Unit-V | மொழித்திறன்/போட்டித் தேர்வுத் திறன் 1. நூல் மதிப்புரை 2. திறனாய்வு செய்தல் 3. கடிதம் வரைதல் 4. விண்ணப்பம் எழுதுதல் | 18 Hrs |

| CO Number | CO Statement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | காப்பியங்கள் அறிமுகப்படுத்தப்படுவதால் தமிழ் மொழியின் உயர்வையும் சிறப்பையும் உணர்தல். | K1, K2 |
| CO2 | தமிழ்ப் புதினங்களின்வழி சமகாலப் படைப்புகளின் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர். | K2 |
| CO3 | நாவல் இலக்கியம் அறிமுகப்படுத்தப்படுவதால் சிந்தனை ஆற்றல், படைப்பாற்றல், கற்பனைத்திறன் வளர்தல். | K4 |
| CO4 | யாப்பு, அணி இலக்கணங்கள், மொழிபெயர்ப்புத்திறன் ஆகியவற்றைக் கற்பதன் மூலம் போட்டித் தேர்வுகளை எதிர் கொள்ளுதல். | K3 |
| CO5 | காப்பியங்கள் அறிமுகப்படுத்தப்படுவதால் தமிழ் மொழியின் உயர்வையும் சிறப்பையும் உணர்தல். | K4 |

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ்

பார்வை நூல்கள்

1. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்
2. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல்
3. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resources

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. [www.tamilvu.org/ library](http://www.tamilvu.org/library)
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennaiLibrary.com <<http://www.chennaiLibrary.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- [tamale books downloads. blogspot.com](http://tamalebooksdownloads.blogspot.com)
7. Tamil Books on line- [books. tamil cube.com](http://books.tamilcube.com)
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

| பொதுத்தமிழ் —3 | | | | | | | | | | | | |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 |
| CLO1 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 |
| CLO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |
| CLO3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 |
| CLO4 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CLO5 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|------------|-----------------|--------------------------------------|---------------------------|----------------|
| III | 23U3BOE3 | PART - II GENERAL ENGLISH | 6 | 3 |

| Learning Objectives | | |
|----------------------------|--|------------------------------------|
| LO1 | To make students realize the importance of resilience | |
| LO2 | To enable them to become good decision makers | |
| LO3 | To enable them to imbibe problem-solving skills | |
| LO4 | To enable them to use tenses appropriately | |
| LO5 | To help the student use English effectively at the work place. | |
| Unit No. | Unit Title & Text | No. of Periods for the Unit |
| I | ACTIVE LISTENING Short Story Ina Grove–Akutagawa Ryunosuke Translated from Japanese by Takashi Kojima The Gift of the Magi – O’ Henry Prose Listening – Robin Sharma Nobel Prize Acceptance Speech – Wangari Maathai | 20 |
| II | INTERPERSONAL RELATIONSHIPS Prose Telephone Conversation–Wole Soyinka Of Friendship – Francis Bacon Song (Motivational/ Narrative) Ulysses–Alfred Lord Tennyson And Still I Rise– Maya Angelou | 20 |
| III | COPING WITH STRESS Poem Leisure– W.H. Davies Anxiety Monster– Rhona McFerran Readers Theatre The Forty Fortunes: A Tale of Iran Where there is a Will–Mahesh Dattani | 20 |
| IV | Grammar Phrasal Verb & Idioms Modals and Auxiliaries Verb Phrases–Gerund, Participle, Infinitive | 15 |
| V | Composition/Writing Skills Official Correspondence–Leave Letter, Letter of Application, Permission Letter Drafting Invitations Brochures for Programmes and Events | 15 |

| Course Outcomes | | |
|------------------------|--|--------------|
| Course Outcomes | On completion of this course, students will; | |
| CO1 | Listen actively | PO1,PO7 |
| CO2 | Develop interpersonal relationship skills | PO1,PO2,PO10 |
| CO3 | Acquire self-confidence to cope with stress | PO4,PO6,PO9 |
| CO4 | Master grammar skills | PO4,PO5,PO6 |
| CO5 | Carryout business communication effectively | PO3,PO8 |

Text Books (Latest Editions)

| | |
|----------|---|
| 1 | Wangari Maathai–Nobel Lecture. Nobel Prize Outreach AB 2023.Jul 2023. |
| 2 | Mahesh Dattani,Where there is W ill. Penguin, 2013. |
| 3 | Martin Hewings, Advanced English Grammar, Cambridge University Press,2000 |
| 4 | EssentialEnglishGrammarbyRaymondMurphy |

WebResources

| | |
|----------|---|
| 1 | WangariMaathai–NobelLecture.NobelPrizeOutreachAB2023.Mon.17Jul 2023. https://www.nobelprize.org/prizes/peace/2004/maathai/lecture/ |
| 2 | TelephoneConversation-Wole Soyinka https://www.k-state.edu/english/westmank/spring_00/SOYINKA.html |
| 3 | AnxietyMonster- RhonaMcFerran- www.poetrysoup.com |

Mapping with Programme Outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3– Strong, 2– Medium, 1 -Low

Mapping with Programme Specific Outcomes:

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 |
|--|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |
| Weight age | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| III | 23U3BOC3 | PLANT DIVERSITY-III BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS | 5 | 5 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | √ | Relevant to national need | √ | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | √ |

Course Objectives

The main objectives of this course are to:

1. To enable the students to have an overview of Non-vascular and Vascular cryptogams
2. To understand the morphological diversity of Bryophytes and Pteridophytes
3. To know the evolution of Bryophytes and Pteridophytes
4. To understand the economic importance of the Bryophytes and Pteridophytes
5. To understand anatomy and reproduction of Bryophytes and Pteridophytes.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | BRYOPHYTES: General characters of Bryophytes, classification (Watson, 1971) (up to family). Economic importance of Bryophytes – Ecological importance (Pollution indicators and monitoring), Medicinal uses, horticulture, industrial uses and absorbent and ages | 15 |
| II | BRYOPHYTES: Structure, reproduction and life cycle of the following classes each with a suitable example: Hepaticopsida (<i>Riccia</i>); Anthocerotopsida (<i>Anthoceros</i>) and Bryopsida (<i>Funaria</i>). Evolution of Bryophytes. | 15 |
| III | PTERIDOPHYTES: General Characters of Pteridophytes-Classification (Reimer, 1954). Apogamy and apospory, homospory and heterospory. Origin and evolution of Pteridophytes. Stellar Evolution. Economic importance of Pteridophytes | 15 |
| IV | PTERIDOPHYTES: Morphology, anatomy and reproduction of the taxa belonging to each of the following classes: Psilotopsida (<i>Psilotum</i>), Lycopsidea (<i>Lycopodium</i>), Sphenopsida (<i>Equisetum</i>), Pteropsida (<i>Marsilea</i>). | 15 |
| V | GYMNOSPERMS: Classification of Gymnosperms (Sporne, 1954) (up to family). General characteristics, Economic importance of Gymnosperms with special reference to oil, resin, timber, etc. Morphology, anatomy and reproduction of the taxa belonging to each of the following orders: Cycadales (<i>Cycas</i>), Coniferales (<i>Pinus</i>), Gnetales (<i>Gnetum</i>). | 15 |

Textbook:

1. Sharma, O.P. 2017. Bryophyta, Mac Millan India Ltd. Delhi.
2. Alam, A.2020. Contemporary Research on Bryophytes Book Series: Recent Advances in Botanical Science. 10.2174/97898114337881200101.
3. Alain Vanderpoorten. 2009. Introduction to Bryophytes, 1st Edition, Cambridge University Press.
4. Chopra, R.N. 2005. Biology of bryophytes. New Age International (P) Ltd. New Delhi, India.
5. Prem Puri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram & Sons. Lucknow, India.
6. Gupta, M.N. 1972. The Gymnosperms (2nd Edition) Shiva Lal Agarwala & Co., Agra.
7. Vashista, P.C. 1976. Gymnosperms, S.Chand & Co. New Delhi.
8. Bhatnagar, S.P and Moitra, A. 1996. Gymnosperms. New Age International Publishers, New Delhi, India.
9. [Anil Kumar](#). 2006. Gymnosperms. S. Chand & Company Pvt. Ltd. New Delhi.
10. Bhatnagar S.P and Alok Moitra. 2013. Gymnosperms. Publisher: New Age International Pvt Ltd Publishers. New Delhi

References:

1. Eames, A. 1963. Morphology of lower vascular plant, Mc Graw Hill, Chennai.
2. Parihar. N.S. 1967. An introduction of Embryophyta, Vol.III– Pteridophyta, Central book depot, Allahabad.
3. Smith, G. M. 1955. Cryptogamic Botany, Volume-II– Mc Graw Hill, Chennai
4. Sporne, K.R. 1976. Morphology of Pteridophytes, 4th edition, B.I. Publication. Chennai.
5. Watson, E.V. 1963. The structure and Life of Bryophytes. Hutchinson & Co, UK.
6. Parihar, N.S. 1991. Bryophytes. Central Book Depot, Allahabad.
7. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad
8. Sporne, K.R. 1991. The Morphology of Gymnosperms. B.I. Publications, New Delhi.
9. Bhatnagar, S.P and Moitra, A. 1996. Gymnosperms, New Age Int. Pvt. Ltd., New Delhi.

Webresources:

1. <http://www.bryoecol.mtu.edu/>
2. <https://www.amazon.in/Introduction-Bryophytes-Alain-Vanderpoorten-ebook/dp/B007NFWQK>
3. <http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm>
4. http://www.bsienviis.nic.in/Database/Pteridophytes-in-India_23432.aspx
5. http://www.botany.ubc.ca/bryophyte/mossintro.html#TIUC&redir_esc=y
6. https://books.google.co.in/books?hl=en&lr=&id=Pn7CAAAQBAJ&oi=fnd&pg=PA1&dq=Introduction+to+Gymnosperms&ots=sfYSzCL02&sig=ysX1KRvetV0bAza4Sq6RWau4XU8&redir_esc=y#v=onepage&q=Introduction%20to%20Gymnosperms&f=false
7. https://books.google.co.in/books/about/Botany_for_Degree_Gymnosperm_Multicolor.html?id=HTdFYFNxnWQC&redir_esc=y
8. <https://books.google.co.in/books/about/Gymnosperms.html?id=4dvyNckni8wC>
9. <https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf>

Pedagogy: Lecture, Assignment, PPT Presentation, Quiz, Discussion, Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | Recognize morphological variations of Bryophytes and Pteridophytes | K1 |
| CO2 | Explain the anatomy and reproduction of Bryophytes and Pteridophytes | K2 |
| CO3 | Compare and contrast the variations in the internal cellular organization, gametophyte and sporophyte of Bryophytes and Pteridophytes. | K3 |
| CO4 | Decipher the stages of plant evolution and their transition to land habitat. | K4 |
| CO5 | Access the use ful role of Bryophytes and Pteridophytes | K5 |

CognitiveLevel: K1- Remember; **K2-**Understanding; **K3-**Apply; **K4-**Analyze; **K5–**Evaluate; **K6–**Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 2 | 1 | 2 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 |
| CO 5 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 1 | 3 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| III | 23U3BOCP3 | PLANT DIVERSITY – III BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS- PRACTICAL-III | 5 | 4 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | √ | Relevant to national need | √ | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | √ |

Course Objectives

The main objectives of this course students will be able to:

1. To enable students gain expertise in hand sectioning technique.
2. To study diversity of Bryophytes and Pteridophytes.
3. To understand the anatomical structure of the Bryophytes and Pteridophytes.
4. Develop comprehensive skills in sectioning and micro preparation.
5. Describe the structure of fossil forms prescribed in the syllabus.

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | BRYOPHYTES: Study of morphology, anatomy and structure of the vegetative and reproductive organs of Bryophytes genera included in the theory syllabus. Hepaticopsida (<i>Riccia</i>); Anthocerotopsida (<i>Anthoceros</i>) and Bryopsida (<i>Funaria</i>) (need not study developmental aspects). | 25 |
| II | PTERIDOPHYTES: Study of morphology, anatomy and structure of the vegetative and reproductive organs of Pteridophytes genera and fossils included in the theory syllabus. Psilotopsida (<i>Psilotum</i>), Lycopsidea (<i>Lycopodium</i>), Sphenopsida (<i>Equisetum</i>), Pteropsida (<i>Marsilea</i>). Identifying the micro slides Botanical excursion | 25 |
| III | GYMNOSPERMS: Study of morphology, anatomy and structure of the vegetative and reproductive organs of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i> . | 25 |

Textbook:

1. Sharma, O.P. 2017. Bryophyta, Mac Millan India Ltd, New Delhi.
2. Sharma, O.P. 2012. Pteridophyta, Tata Mc Graw- Hills Ltd, New Delhi.
3. Ashok, M. Bendre and Kumar. 2010. A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany. Revised edition. Published by Rakesh Kumar Rastogi publication.
4. Prem Puri. 2001. Bryophytes– morphology growth and differentiation. Atma Ram & Sons. Lucknow, India.

5. Tuba Z., Slack N.G. and Stark L.R.2011. Bryophyte Ecology and Climate Change. Cambridge University press, Cambridge.

References:

1. Ashok, M. Bendre and Kumar. 2010. A text book of Practical Botany, Algae, Fungi, Lichen, Bryophyta, Pteridophyta, Gymnosperms and Palaeobotany. Revised edition. Published by RakeshKumar Rastogi publication.
2. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing.
3. Puri, P. 1980. Bryophytes. Atma Ramand Sons, New Delhi.
4. Sporne, K.R. 1991. The Morphology of Pteridophytes .B.I. Publ. Pvt. Ltd. Chennai.
5. Vashista. P.C. 1971. Botany for Degree students: Pteridophyta. S.Chand & Co. New Delhi.

Webresources:

1. <https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4>
2. <https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883>
3. <http://www.eeb.uconn.edu/people/goffinet/Classificationmosses.html>
4. <https://www.vitalsource.com/products/introduction-to-bryophytes-alain-vanderpoorten-v9780511738951?duration=perpetual>
5. <https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/>

Pedagogy: Lecture, Observation, PPT, Records & Demonstration

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|--|-----------------|
| CO1 | Recognize the major groups of Non-vascular and Vascular cryptogams | K1 |
| CO2 | Describe the structure of Bryophytes and Pteridophytes forms Prescribed in the syllabus. | K2, |
| CO3 | Identify and illustrate the morphological and anatomical features Of bryophytes and Pteridophytes. | K3 |
| CO4 | Develop comprehensive skills in sectioning and micropreparation. | K4 |
| CO5 | Interpret the significance of reproductive structures in Bryophytes And Pteridophytes | K5 |

Cognitive Level: K1-Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 1 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|--------------------------------|-------------|---|---------------------------|----------------|
| III | 23U3BOCHA1 | Allied chemistry-I (For Biologists) | 5 | 3 |
| Objective of the course | | The course aims at giving an overall view of the <ol style="list-style-type: none"> 1. concepts of chemical bond and hybridization. 2. fuel gases, Plant nutrients and Fertilizers 3. Pesticides and polymers 4. applications of colloids and chromatographic technique. 5. study of drugs and its application | | |
| Course Outline | | UNIT I 15 Hrs Fundamental concepts Bonding – nature of bonds – ionic, covalent, coordinate and hydrogen bonds - Cleavage of covalent bonds – homolytic and heterolytic fission – electrophiles, nucleophiles and free radicals . Types of organic reactions – substitution, addition, elimination, rearrangement – definition and examples. Hybridisation – states of hybridization of carbon in methane, ethane, ethylene, acetylene. | | |
| | | UNIT II 15 Hrs Fuel gases, Plant nutrients and Fertilizers Fuel gases – natural gas, water gas, semi water gas, carburetted water gas, producer gas, LPG and oil gas – composition, manufacture (elementary idea) and uses. Plant nutrients – major nutrients – role of nitrogen, phosphorus and potassium in plant life, micro nutrients. Fertilizers – definition, urea, ammonium sulphate, superphosphate of lime, triple superphosphate and potassium nitrate – preparation and uses. | | |
| | | UNIT III 15 Hrs Industrial Organic Chemistry Pesticides – DDT, BHC – preparation and uses. Refrigerant – freon 12 – preparation, properties and uses. Polymers – definition, classification – natural and synthetic, homo and copolymers, natural polymers – cotton, silk and wool, preparation and applications of the synthetic polymers – polythene, PVC, teflon and nylon. Synthetic dyes – classification, preparation and uses of methyl orange and indigo, food colours. | | |
| | | UNIT IV 15 Hrs Colloidal State and Chromatography Colloidal system – definition, types -Emulsions– definition, types – o/w and w/o emulsions – tests for identification, properties and applications. Gels – definition, classification, preparation and properties – syneresis, imbibition and thixotropy. Electrophoresis – applications. Chromatography–column and paper chromatography – experimental procedures only. | | |

| | |
|--------------------------------------|---|
| | <p align="center">UNIT V 15 Hrs</p> <p align="center">Pharmaceutical chemistry</p> <p>Antiseptic & disinfectants – phenolic compounds – Dettol, phenyle& Lysol – Definition – differences – medicinal uses and side effects. Anaesthetics – general anaesthetics and local anaesthetics – Definition, examples, uses and side effects.</p> <p>Analgesics – narcotic– morphine&pethidine, non-norcotic – salicylic acid & its derivatives –ZGH medicinal uses and side effects. Organic pharmaceutical aids – Preservatives, antioxidants, colouring, flavouring and sweetening agents – Definition, examples and uses</p> |
| Recommended Text | <ol style="list-style-type: none"> 1. Text Book of Ancillary Chemistry, V.Veeraiyan et al, revised edition, 1997. 2. Allied Chemistry, R. Gopalan and S. Sundaram, S. Chand & Sons, 2nd edition, 1993. |
| Reference Books | <ol style="list-style-type: none"> 1. Text Book of Organic Chemistry, P.L. Soni and H.M. Chawla, S.Chand& Sons, , 29th edition, 2014 (Unit III). 2. Principles of Inorganic Chemsitry, B.R. Puri, L.R. Sharma and K.C. Kalia Vishal Publishing Co, Reprint 2016 (Unit I & II). 3. Principles of Physical Chemistry, B.R.Puri, L.R. Sharma, Vishal Publishing Company, Jalandhar, 44th edition 2009. (Unit IV) 5. A text book of pharmaceutical chemistry, Jayashree Ghosh, S.Chand and Company Ltd., New Delhi, 1st edition, 2004. (Unit V) 6. Pharmaceutical Chemistry, S. Lakshmi, S.Chand& Company Ltd., New Delhi, 3rd edition, 2004. (Unit V) |
| Website and e-learning source | <ol style="list-style-type: none"> 1. https://gascnagercoil.in/wp-content/uploads/2020/12/allied-chemistry-book.pdf 2. https://ngovernmentcollege.com/chemistry-notes/ 3 https://chemistrynotes.com |

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | Enable the students to understanding the concepts of bond and hybridization | K1 |
| CO2 | know the role of fuel gases, Plant nutrients and Fertilizers | K2 |
| CO3 | know the preparation of pesticides and polymers | K3 |
| CO4 | learn applications of colloids and chromatographic technique. | K5 |
| CO5 | Understanding the function of drugs and application | K4 |

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | S | M | S | S |
| CO2 | M | S | S | S | S | M | S |
| CO3 | S | S | M | S | S | S | S |
| CO4 | M | S | S | S | S | M | S |
| CO5 | M | S | M | S | S | M | S |

S– Strong

M– Medium

L – Low

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|-------|------|------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--|---------------------------|----------------|
| III & IV | 23U4BOCHAPL | Allied chemistry practical (Non – semester) | 3+3 | -- |

| | |
|--|--|
| Objectives of the course are to | <p>The course aims at giving an overall view of the</p> <ul style="list-style-type: none"> acquire a practical knowledge on volumetric analysis Students learn the techniques of organic qualitative analysis. |
| Course Outline | <p>A. Volumetric Analysis 45 Hrs</p> <ol style="list-style-type: none"> 1. Estimation of HCl (or H₂SO₄) by NaOH using a standard oxalic acid solution 2. Estimation of NaOH by H₂SO₄ (or HCl) using a standard Na₂CO₃ solution 3. Estimation of oxalic acid by KmnO₄ using a standard Mohr's salt solution 4. Estimation of Ferrous sulphate by KmnO₄ using a standard oxalic acid solution. 5. Estimation of Mohr's salt by KmnO₄ using a standard oxalic acid solution. 6. Estimation of KMnO₄ by thio using a standard K₂Cr₂O₇ solution. 7. Estimation of K₂Cr₂O₇ by thio using a standard CuSO₄ solution 8. Estimation of CuSO₄ by thio using a standard K₂Cr₂O₇ solution <p>B. Organic qualitative analysis</p> <p>Systematic analysis of an organic compound , Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.</p> <p>The following substance are prescribed:</p> <p>Benzoic Acid , Cinnamic acid, Phenol , Cresol, Aniline ,Toludine, Urea, Benzaldehyde, Glucose</p> |
| Reference Books | 1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997) |

Course Outcomes (for Mapping with POs and PSOs)

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

| CO Number | CO Statement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | acquire a practical knowledge on volumetric analysis | K1 |
| CO2 | gain knowledge on Dichrometry titration | K3 |
| CO3 | learn the techniques of organic qualitative analysis. | K2 |
| CO4 | Find out the functional group | K5 |
| CO5 | Detect the element present in a compounds | K6 |

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze;
K5 – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|------------|------------|------------|------------|------------|------------|------------|------------|
| CO1 | S | S | S | S | S | S | S |
| CO2 | M | S | S | S | M | S | S |
| CO3 | S | S | S | M | S | S | S |
| CO4 | S | S | S | S | S | S | S |

S– Strong **M**– Medium **L** – Low

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Semester | Subject Code | Title Of The Paper | Hours Of Teaching/ Week | No. of Credits |
|-----------|-----------------|--------------------------|-------------------------|----------------|
| IV | 23U4BOT4 | வயாதுத் தமிழ் - 4 | 6 | 3 |

Nature of the Course

| | | | |
|---|---|---|---|
| 1. Employability Oriented வேலை வாய்ப்புச் சார்ந்தது | | 7. Addresses Professional Ethics தொழில் நெறிமுறைகளை நிறைவு செய்தல் | |
| 2. Entrepreneurship Oriented தொழில் முனைவு சார்ந்தது | | 8. Relevant To Local Need உள்ளூர் தேவைகளோடு தொடர்புடையது | ✓ |
| 3. Skill Development Oriented திறன்மேம்பாடு சார்ந்தது | ✓ | 9. Relevant To Regional Need மண்டல அளவிலான தேவைகளோடு தொடர்புடையது | |
| 4. Addresses Gender Sensitization பாலின உணர்திறன் பூர்த்தி செய்தல் | | 10. Relevant To National Need தேசிய அளவிலான தேவைகளோடு தொடர்புடையது | |
| 5. Addresses Environment and Sustainability சுற்றுச் சூழல் மற்றும் நிலைத் தன்மை நிறைவு செய்தல் | ✓ | 11. Relevant To Global Development Need உலக அளவிலான தேவைகளோடு தொடர்புடையது | |
| 6. Addresses Human Values மனித மதிப்புகளை நிறைவு செய்தல் | ✓ | | |

Course Objectives

| |
|---|
| <p>1. சங்க இலக்கியத்தின் சிறப்பையும், நாடகம் என்னும் இலக்கிய வகையின் தன்மையையும் அகத்திணை, புறத்திணை இலக்கணங்களையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.</p> <p>2. தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்பக் கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்.</p> <p>3. சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வார்.</p> <p>4. தமிழின் தொன்மையையும், செம்மொழித் தகுதியையும் அறிந்து கொள்ளுதல்.</p> |
|---|

| Unit | Details | Hours |
|-----------------|---|---------------|
| Unit-I | எட்டுத்தொகை 1 நற்றிணை (10, 14, 16), குறுந்தொகை (16, 17, 19, 20, 25, 29, 38, 440) கலித்தொகை (38, 51), அகநானூறு (15, 33, 55), புறநானூறு (37, 86, 112), பரிபாடல் — 55 | 18 Hrs |
| Unit-II | எட்டுத்தொகை 2 நெடுநல்வாடை - நக்கீரர் | 18 Hrs |
| Unit-III | நாடகம் - சபாபதி-பம்மல் சம்பந்த முதலியார் | 18 Hrs |
| Unit-IV | 1. பாடம் தழுவிய இலக்கிய வரலாறு 2. பயணங்கள் தொடரும் - கேட்டிவி | 18 Hrs |
| Unit-V | 1. மொழிபெயர்ப்பு / கலைச்சொற்கள் 2. கொடுக்கப்பட்டுள்ள ஆங்கிலப்பகுதியைத் தமிழில் மொழிபெயர்த்தல் 3. அலுவலகத் கடிதம் - தமிழில் மொழிபெயர்த்தல் | 18 Hrs |

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | சங்க இலக்கியத்தில் காணப்பெறும் வாழ்வியல் சிந்தனைகளை அறிந்து கொள்வர். | K1, K2 |
| CO2 | தமிழின் தொன்மையையும், செம்மொழித் தகுதியையும் அறிந்து கொள்ளுதல். | K2 |
| CO3 | நாடக இலக்கியம் மூலம் நடிப்பாற்றலையும். கலைத்தன்மையையும், படைப்பாற்றலையும் வளர்த்தல். | K4 |
| CO4 | தமிழிலிருந்து அலுவலகக் கடிதங்களை மொழிபெயர்க்கும் அறிவைப் பெறுவர். | K3 |
| CO5 | மொழியறிவோடு வேலை வாய்ப்பினைப் பெறுதல். | K4 |

Text Books

1. தமிழ் இலக்கிய வரலாறு -செம்பதிப்பு- பெ.சுபாஷ் சந்திரபோஸ் பார்வை நூல்கள்.
2. தமிழ் இலக்கிய வரலாறு - சிற்பி.பாலசுப்பிரமணியன்.
3. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு - தமிழண்ணல்
4. வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு - எஃப்.பாக்கியமேரி

Web Resources

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

1. Tamil Heritage Foundation- www.tamilheritage.org <<http://www.tamilheritage.org>> Tamil virtual University Library-
2. www.tamilvu.org/library
3. <http://www.virtualvu.org/library> Project Madurai - www.projectmadurai.org.
4. Chennai Library- www.chennailibrary.com <<http://www.chennailibrary.com>>.
5. Tamil Universal Digital Library- www.ulib.prg <<http://www.ulib.prg>>.
6. Tamil E-Books Downloads- tamilebooks.downloads.blogspot.com
7. Tamil Books on line- books.tamilcube.com
8. Catalogue of the Tamil books in the Library of British Congress archive.org
9. Tamil novels on line - books.tamilcube.com

| பொதுத்தமிழ் —4 | | | | | | | | | | | | |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PSO1 | PSO2 |
| CLO1 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 |
| CLO2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CLO3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 |
| CLO4 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 |
| CLO5 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|-----------|-----------------|--------------------------------------|---------------------------|----------------|
| IV | 23U4BOE4 | PART - II GENERAL ENGLISH | 6 | 3 |

| Learning Objectives | | |
|----------------------------|--|------------------------------------|
| LO1 | To make students realize the importance of resilience | |
| LO2 | To enable them to become good decision makers | |
| LO3 | To enable them to imbibe problem-solving skills | |
| LO4 | To enable them to use tenses appropriately | |
| LO5 | To help the student use English effectively at the work place. | |
| Unit No. | Unit Title & Text | No. of Periods for the Unit |
| I | GOALSETTING(UNICEF) Life Story From Chinese Cinderella–Adeline Yen Mah Why I Write- George Orwell Short Essay On Personal Mastery–Robin Sharma On the Love of Life – William Hazlitt | 20 |
| II | INTEGRITY Short Story The Taxi Driver – K.S. Duggal Kabuliwala -Rabindranath Tagore A Retrieved Reformation –O Henry Extract from a play The Quality of Mercy (Trial Scene from the Merchant of Venice - Shakespeare) | 20 |
| III | COPING WITH EMOTIONS Poem Pride – Dahlia Ravikovitch Phenomenal Woman – Maya Angelou Reader's Theatre The Giant's Wife A Tall Tale of Ireland–William Carleton The Princess and the God :A Tale of Ancient India | 20 |
| IV | Language Competency Sentences Simple Sentences Compound Sentences Complex Sentences Direct and Indirect Speech | 15 |
| V | Report Writing Narrative Report Newspaper Report Drafting Speeches Welcome Address Vote of Thanks | 15 |

Course Outcomes

| Course Outcomes | On completion of this course, students will; | |
|------------------------|--|--------------|
| CO1 | Determine their goals | PO1,PO7 |
| CO2 | Identify the value of integrity. | PO1,PO2,PO10 |
| CO3 | Deal with emotions. | PO4,PO6,PO9 |
| CO4 | Frame grammatically correct sentences | PO4,PO5,PO6 |
| CO5 | Write cohesive reports. | PO3,PO8 |

Text Books (Latest Editions)

| | |
|-----------|--|
| 1 | Oxford Practice Grammar, John Eastwood, Oxford University Press |
| 2 | Cambridge Grammar of English, Ronald Carter and Michael McCarthy |
| 3. | George Orwell Essays, Penguin Classics |

Web Resources

| | |
|----------|---|
| 1 | http://www.gradesaver.com/George-orwell-essays/study/summary |
| 2 | O' Henry. A Retrieved Reformation. https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf |
| | Maya Angelou. Phenomenal Woman. https://www.poetryfoundation.org/poems/48985/phenomenal-woman |
| 3 | The Quality of Mercy, https://poemanalysis.com |
| 4 | https://www.oxfordscholarlyeditions.com/display/10.1093/actrade/9780199235742.book.1/actrade-9780199235742-div1-106-WilliamHazlitt |

Mapping with Programme Outcomes:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

3–Strong, 2–Medium, 1–Low

Mapping with Programme Specific Outcomes:

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 |
|--|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |
| Weight age | 15 | 15 | 15 | 15 |
| Weighted percentage of Course Contribution to Pos | 3.0 | 3.0 | 3.0 | 3.0 |

3– Strong, 2 –Medium, 1-Low

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--|---------------------------|----------------|
| IV | 23U4BOCIM | Industry Module – PLANT ANATOMY AND EMBRYOLOGY | 5 | 4 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|--|
| Employability Oriented | | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To know fundamental concepts of plant anatomy and embryology.
2. Understand the internal tissue organization of various plant organs.
3. Differentiate normal and abnormal secondary growth.
4. Comprehend the structural organization of flower with relevance to the process of pollination and fertilization.
5. Know embryology of plants.

| SYLLABUS | | |
|----------|---|-------------|
| Unit | Content | No of Hours |
| I | TISSUES: Cell wall - structure, and function. Tissues - Definition, types - Simple tissue system parenchyma, collenchyma and sclerenchyma (fibers and sclereids). Complex tissue system xylem and phloem. Meristem definition, structure, function and classification. Apical organization and theories: Apical organization theory, Root apex: Korper-Kappe theory. Histogen theory and Tunica-Corpus theory. | 15 |
| II | PRIMARY STRUCTURE: Primary structure of root and stem (Dicot and monocot). Leaf anatomy of dicot and monocot leaf. Vascular tissue systems: different types of vascular bundles and their arrangement in root and stem. Nodal anatomy: leaf trace, leaf gap, branch trace and branch gap-types. | 15 |
| III | SECONDARY STRUCTURE: Secondary thickening in monocots and dicot stem, Secondary thickening in monocot and dicot root. Anomalous secondary growth of stem- <i>Boerhaavia</i> , <i>Nyctanthes</i> and <i>Dracaena</i> .. Annual ring, Heartwood and Sapwood, Tyloses. Periderm structure and development: Phellem, Phellogen, Phelloderm, Rhytidome and lenticels. Stomatal types. | 15 |
| IV | EMBRYOLOGY: Structure and development of anther - development of male gametophyte. Ovule Structure of mature ovule, types of ovules; female gametophyte megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (<i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac. | 15 |

| | | |
|----------|--|----|
| V | FERTILIZATION: Double fertilization and triple fusion. Endosperm and its types- free nuclear, cellular, helobial, endosperm haustoria. Structure and development of dicot and monocot embryo. Polyembryony types, apomixis, parthenogenesis and parthenocarpy. Seed structure and its importance. | 15 |
|----------|--|----|

Textbook:

1. Bhojwani, S. S and Bhatnagar, S.P. 1994. Embryology of Angiosperms, Vikas.
2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
3. Burgess, J. 1985. An Introduction to Plant Cell Development. Cambridge University Press, Cambridge.
4. Raghavan, V. 1999. Developmental Biology of Flowering Plants. Springer-Verlag, New York.
5. Vimla Singh and Alok Abhishek. 2019. Plant Embryology and Experimental Biology. Educational Publishers and Distributors. New Delhi.
6. Pandey, B.P. 2015. Plant Anatomy S. Chand Publ. New Delhi.
7. Bhatnagar, S.P., Dantu, P.K, Bhojwani, S.S. 2014. The Embryology of Angiosperms 6th edition Vikas Publishing House. Delhi.
8. Waisel, Y., Eshel A and Kafkaki, U. (eds.). 1996. Plant Roots: The Hidden Hall (2nd edition). Marcel Dekker, New York.

References:

1. Esau, K. 1985. Anatomy of Seed Plants – John Willey.
2. Cutter, E.G. 1989. Plant Anatomy – Part I – Addison – Wesley Publishing Co..
3. Maheswari, P. 1991. An Introduction to Embryology of Angiosperms, Tata Mc Graw Hill Publishing Co. Ltd.,
4. Swamy, B.G.L and Krishnamoorthy. K.V. 1990. From Flower to Fruits, Tata Mc Graw Hill Publishing Co. Ltd.
5. Dickson, W.C. 2000. Integrative Plant Anatomy. Harcourt Academic Press, USA.
6. Fahn, A. 1974. Plant Anatomy. Pergamon Press, USA.
7. Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publisher, USA.
8. Evert, R.F. 2006. Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc. Any local/ state/ regional flora published by BSI or any other agency.
9. Swamy, B.G.L and Krishna murthy, K.V. 1980. From flower to fruit. Tata Mc Graw Hill Co. Pvt. Ltd, New Delhi

Webresources:

1. https://www.amazon.in/plant-anatomy-embryology-biotechnology-ebook/dp/B07H5JYFBJ/ref=asc_df_B07H5JYFBJ/?tag=googleshops-des-2
2. <https://www.kobo.com/us/en/ebook/a-textbook-of-plant-anatomy>
3. <https://archive.org/EXPERIMENTS/plantanatomy031773mbp>
4. <https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG>
5. <https://www.worldcat.org/title/embryology-of-angiosperms/oclc/742342811>
6. https://books.google.co.in/books/about/Embryology_of_angiosperms.html?id=uYfwAAAAMAAJ&redir_esc=y

Pedagogy: Teaching/Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar etc.)

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | Relate to the fundamental concepts of plant anatomy and embryology. | K1 & K2 |
| CO2 | Describe the internal tissue organization of various plant organs. | K1 & K4 |
| CO3 | Elucidate the stages of normal and abnormal secondary growth. | K3 & K6 |
| CO4 | Compare the structural organization of flower in relation to the process of pollination and fertilization. | K5 |
| CO5 | Access the various anatomical adaptations in plants. | K3 & K6 |

Cognitive Level: **K1** -Remember; **K2**-Understanding; **K3**-Apply; **K4** -Analyze;
K5–Evaluate; **K6**– Create

Mapping of Course Outcomes with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 1 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3)

M-Medium (2)

L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| IV | 23U4BOCP4 | PLANT ANATOMY AND EMBRYOLOGY PRACTICAL - IV | 5 | 5 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | √ | Relevant to national need | √ | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | √ |

Course Objectives

The main objectives of this course are to:

1. Enable students observe and record the morphological features of selected species of Gymnosperms.
2. Enable students observe and record the anatomical features of selected species of Gymnosperms.
3. Develop the skill of preparation of micro slides of the gymnosperm samples.
4. Enable students to gain insights into the basics of paleobotany and methods of fossilization.
5. Understand the anatomy of the fossil plants through microscopy.

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | ANATOMY: Study of simple and complex (Primary and Secondary) tissues by maceration. 1. Study the internal structure of primary (young) and secondary (old) stems. Internal structure of dicot and monocot stem. Internal structure of dicot and monocot root. 2. Anomalous secondary growth in the stems of <i>Boerhaavia</i> , <i>Nyctanthes</i> and <i>Dracaena</i> . 3. T.S of dicot and monocot leaves. 4. Study of stomatal types. | 40 |
| II | EMBRYOLOGY 1. T.S of (young and mature) anther (section from <i>Datura</i> or <i>Cassia</i> flower). 2. Observation of pollinia (slide only). 3. Types of ovule Anatropous, Orthotropous, Circinotropous, Amphitropous, Campylotropous (Permanent slides). 4. Types of Endosperm - Nuclear, cellular and helobial. Dissection and display of any two stages of embryo in <i>Tridax</i> | 35 |

Textbook:

1. Sundara, R. S. 2000. Practical manual of plant anatomy and embryology. Anmol Publ. PVT LTD, New Delhi.
2. Panshin, A.J and C. de Zeeuw. 1980. Textbook of wood technology. Structure, identification and uses of the commercial woods of the United States and Canada. Fourth Edition. New York: McGraw- Hill Book Company.
3. Sharma, H.P. 2009. Plant Embryology: Classical and Experimental, Bombay Popular Prakashan, ISBN-8173199698, 9788173199691.

References:

1. Sundara Rajan, S, 2003. Practical Manual of Plant Anatomy and Embryology 1st ed, Anmol Publications, ISBN-812610668.
2. Katherine Esau. 2006. Anatomy of Seed Plants. 2nd edition, John Wiley and Sons.
3. Allen, Sarah et al, 2016. Plant Anatomy Lab Manual, Fall.

Webresources:

1. <http://www.freebookcentre.net/Biology/Evolutionary-Biology-Books.html>
2. <https://www.amazon.in/Practical-Anatomy-Adrian-1901-1973-Foster/dp/1341784509>
3. https://books.google.co.in/books/about/Practical_Manual_Of_Plant_Anatomy_And_Em.html?id=Cq1KPwAACAAJ&redir_esc=y

Pedagogy: Lecture, observation, PPT, Record

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|--|-----------------|
| CO1 | Analyze and observe and record the morphological features of selected species of Gymnosperms | K1 |
| CO2 | Describe the structure of fossil forms prescribed in the syllabus | K2 |
| CO3 | Identify and Illustrate the morphological and anatomical features of gymnosperms | K3 |
| CO4 | Develop comprehensive skills in sectioning and micropreparation | K4 |
| CO5 | Interpret the significance of reproductive structures in gymnosperms | K5 |

Cognitive Level: K1- Remember; K2-Understanding; K3-Apply; K4-Analyze; K5-Evaluate; K6-Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|---|---|---|---------------------------|----------------|
| IV | 23U4BOCHA2 | Allied chemistry-II (For Biologists) | 5 | 3 |
| Objecti ve of the course | The course aims at giving an overall view of the 1. about the concepts of acids, bases and catalyst 2. know about the Carbohydrates and Vitamins 3. about Amino acids, Proteins and Nucleic acids 4. study about the biochemistry 5. detail study of food and adulteration | | | |
| Course Outline | UNIT I 15 Hrs Acids, Bases and Catalysis Acids and bases – Arrhenius and Lewis theories of acids and bases, pH scale, buffer solutions – definition – examples of acidic and basic buffer solutions, importance of pH and buffer in living systems. Hardness of water – types and determination of hardness by EDTA titration. Catalysis – types of catalysis, characteristics of catalysts, promoters and catalytic poison, biocatalysts – enzyme catalysis, industrial applications of catalysts. | | | |
| | UNIT II 15 Hrs Carbohydrates and Vitamins Carbohydrates – classification, glucose and fructose – sources, manufacturing method, reactions of glucose, derivatives of starch and cellulose – applications. Vitamins – classification, sources and deficiency diseases of vitamins A, D, E, K, C, B ₁ , B ₂ , B ₅ , B ₆ , and B ₁₂ . | | | |
| | UNIT III 15 Hrs Amino acids, Proteins and Nucleic acids α -Amino acids – essential and non essential amino acids, α -amino acid-preparation by Gabriel-phthalimide reaction and Strecker's method, isoelectric point, zwitter ion formation, action of heat, ninhydrin test. Peptides – definition only, proteins – classification, characteristics and biological functions, elementary treatment of primary and secondary structure. Nucleic acids – DNA & RNA – composition and structure (elementary treatment), differences between DNA & RNA. | | | |
| | UNIT IV 15 Hrs Biochemistry Metabolism – anabolism and catabolism. Digestion and absorption of carbohydrates, glycolysis, TCA cycle, glycogenesis, glycconeogenesis, maintenance of blood sugar level. Digestion and absorption of proteins, urea biosynthesis. Digestion and absorption of lipids - β -oxidation of fatty acids. | | | |
| | UNIT V 15 Hrs Food Chemistry Food additives – sweeteners, preservatives, emulsifying and stabilizing agents, flavouring agents, antioxidants and colouring agents. Food adulteration – definition and types of adulterations – adulterants in soft drinks, milk and milk products, edible oils and fats. Packaging hazards – prevention and control. Simple tests for common adulterants in coffee powder, tea leaves, cane sugar, honey, turmeric, common salt, dhals, and ice creams | | | |

| | |
|--------------------------------------|---|
| Recommended Text | 1. Text Book of Ancillary Chemistry, V.Veeraiyan et al, revised edition, 1997. 2. Allied Chemistry, R. Gopalan and S. Sundaram , S. Chand & Sons, 2 nd edition, 1993. |
| Reference Books | 1. Elements of Physical Chemistry, B.R. Puri, L.R. Sharma, M.S. Pathania , Vishal Publishing Co. 43 rd edition, 2008-09. (Unit I) 2. TextBook of Biochemistry, O.P. Agarwal and G.R. Agarwal , Goel Publishing House, 7 th edition, 1993. (Unit III & IV) 3. Chemistry for Changing Times, John W.Hill , St. edition, subject Publishing House, 1986 (Unit II) 4. Food Science, B.Srilakshmi , New Age International (P) Ltd., Publishers, 3 rd edition, 2003 (Unit V). 5. Food Additives – Characteristics, Detection and Estimation, S.N. Mahindru Tata McGraw Hill Publishing Company Limited. (Unit V). |
| Website and e-learning source | 1. https://gascnagercoil.in/wp-content/uploads/2020/12/allied-chemistry-book.pdf 2 https://ngovernmentcollege.com/chemistry-notes/ 3 https://chemistrynotes.com |

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------|--|-----------------|
| CO1 | Enable the students to understanding the concepts of acids, bases and catalyst | K1 |
| CO2 | know the preparation of carbohydrate and role of vitamins | K2 |
| CO3 | know the function of Amino acids, Proteins and Nucleic acids | K3 |
| CO4 | learn biological process of human body | K5 |
| CO5 | Evaluate the food adulteration | K4 |

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze;

K5 – Evaluate; **K6** – Create

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|------------|-----|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | S | M | S | S |
| CO2 | M | S | S | S | S | M | S |
| CO3 | S | S | M | S | S | S | S |
| CO4 | M | S | S | S | S | M | S |
| CO5 | M | S | M | S | S | M | S |

S– Strong

M– Medium

L – Low

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|------------|------|------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|--|-------------|---|---------------------------|----------------|
| III & IV | 23U4BOCHAPL | Allied chemistry practical (Non – semester) | 3+3 | 3 |
| Objectives of the course are to | | The course aims at giving an over all view of the <ul style="list-style-type: none"> acquire a practical knowledge on volumetric analysis Students learn the techniques of organic qualitative analysis. | | |
| Course Outline | | <p>B. Volumetric Analysis</p> <ol style="list-style-type: none"> 1. Estimation of HCl (or H₂SO₄) by NaOH using a standard oxalic acid solution 2. Estimation of NaOH by H₂SO₄ (or HCl) using a standard Na₂CO₃ solution 3. Estimation of oxalic acid by KmnO₄ using a standard Mohr's salt solution 4. Estimation of Ferrous sulphate by KmnO₄ using a standard oxalic acid solution. 5. Estimation of Mohr's salt by KmnO₄ using a standard oxalic acid solution. 6. Estimation of KMnO₄ by thio using a standard K₂Cr₂O₇ solution. 7. Estimation of K₂Cr₂O₇ by thio using a standard CuSO₄ solution 8. Estimation of CuSO₄ by thio using a standard K₂Cr₂O₇ solution <p>C. Organic qualitative analysis</p> <p>Systematic analysis of an organic compound , Preliminary tests, detection of element present, Aromatic or aliphatic, Saturated or unsaturated, nature of the functional group and exhibiting confirmatory tests for given organic compounds.</p> <p>The following substance are prescribed:</p> <p>Benzoic Acid , Cinnamic acid, Phenol , Cresol, Aniline ,Toludine, Urea, Benzaldehyde, Glucose</p> | | |
| Reference Books | | 1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2nd edition, Sultan Chand & sons, New Delhi, (1997) | | |

Course Outcomes (for Mapping with POs and PSOs)

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | acquire a practical knowledge on volumetric analysis | K1 |
| CO2 | gain knowledge on Dichrometry titration | K3 |
| CO3 | learn the techniques of organic qualitative analysis. | K2 |
| CO4 | Find out the functional group | K5 |
| CO5 | Detect the element present in a compounds | K6 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

CO-PO Mapping (Course Articulation Matrix)

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|-----|-----|-----|-----|-----|-----|-----|-----|
| CO1 | S | S | S | S | S | S | S |
| CO2 | M | S | S | S | M | S | S |
| CO3 | S | S | S | M | S | S | S |
| CO4 | S | S | S | S | S | S | S |

S– Strong M– Medium L – Low

Level of Correlation between PSO's and CO's

| CO/PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 | PSO6 | PSO7 |
|-------|------|------|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| IV | 23U4BOSEC1 | Skill Enhancement course - Digital Literacy in Botany | 2 | 2 |

Nature of the course

| | | | | | |
|---------------------------|---|----------------------------|---|---|---|
| Relevant to Local need | ✓ | Employ ability Oriented | ✓ | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | ✓ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | ✓ | Addresses Environment and Sustain ability | ✓ |
| Relevant to Global need | ✓ | | | Addresses Human Values | ✓ |

Course Objectives

The main objectives of this course are to:

1. To familiarize the student with the fundamentals concepts of bioinformatics.
2. To equip students with computational skills for drug design.
3. To learn about the bioinformatics database, data format and data retrieval from online sources.
4. To develop interdisciplinary skills in using computers in botany to learn about the biological database.
5. Student is aware with the most recent technologies for sequencing and bioinformatics analysis and is able to apply them to the structural and functional genomics of plants.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | INTRODUCTION TO COMPUTERS AND BIOINFORMATICS. Introduction to Computers—classification, computer generation, low, medium and high level languages, characteristics and application, computer memory and its types, data representation and storage. Microsoft office (Word, Excel, Powerpoint) Biological Research on the web: Using search engines, finding scientific articles. Fundamentals of networking, internet, intranet, and search engines-yahoo, Google, etc. telnet ftp. COMPUTER FUNDAMENTALS Computer fundamentals-, role of super computers in biology. Scope of bioinformatics- Genomics, Transcriptomics, Proteomics, Metabolomics, Molecular Phylogeny, Systems Biology and Functional Biology. Applications and Limitations of bio informatics. | 15 |
| II | INTRODUCTION TO DATA BASES. Biological data bases NCBI, EMBL and DDBJ. Data Generation and Data Retrieval Generation of data (Genesequencing, Protein sequencing, BLAST and FASTA; Phylogenetic analysis: Construction of phylogenetic tree, dendrograms, methods of construction of phylogenetic tree. APPLICATIONS: Application of Taxonomic Software for preparation of Dichotomous Key. Phylogenetic analysis. Make line drawing of Plants for description. Usage of plant identification apps on android phones. Computer application in biostatistical construction of phylogenetic trees. | 15 |

TOPICS FOR SELF-STUDY

Introduction to Computers

Textbook:

1. P.K. Gupta. Biotechnology and Genomics. 2016-2017. Rastogi Publications, 7th Reprint (1st Edition.
2. Ghosh, Z., Mallick, B. 2008. Bioinformatics – Principles and Applications, 1st edition. New Delhi, Delhi: Oxford University Press.
3. Baxevanis, A.D. and Ouellette, B.F., John. 2005. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, 3rd edition. New Jersey, U.S.: Wiley & Sons, Inc.
4. Roy, D. 2009. Bioinformatics, 1st edition. New Delhi, Delhi: Narosa Publishing House.
5. Andreas, D., Baxevanis, B.F., Francis, Ouellette. 2004. Bioinformatics: A practical guide to the analysis of genes and proteins, 3rd edition. New Jersey, U.S.: John Wiley and Sons.
6. Pevsner J. 2009. Bioinformatics and Functional Genomics, 2nd edition. New Jersey, U.S.: Wiley Blackwell.
7. Xiong J. 2006. Essential Bioinformatics, 1st edition. Cambridge, U.K.: Cambridge University Press.

References:

1. Gibas, Cand Jambek k, P. 1999. Developing Bioinformatics Skills. O'Reilly Shroff Publishers and Distributors Pvt, Ltd., New York, US.
2. David W. Mount. 2004. Bioinformatics Sequence and Genome Analysis. 2nd Edition, Cold Spring Harbor Laboratory Press, New York, US.
3. Harshitha, D. 2006. Techniques of Teaching Computer Science, International Book Distributor, Dehradun.
4. Chwan- Hwa (John) Wu, J. David Irwin. 2016. Computer networks and cyber security. CRC Press.
5. Rui Jiang, Xuegong Zhang and Michael Q. Zhang. 2013. Basics of Bioinformatics. Springer-Verlag Berlin Heidelberg.
6. Ron Wehrens and Reza Salek. 2019. Metabolomics: Practical Guide to Design and Analysis. Chapman and Hall/CRC; 1st edition.
7. Simon, R. Miller and S.A. Garry. 1998. Internet for the Molecular Biologists. Volume III 2nd Edn. Horizontal Scientific Press, Norwich, UK.

Webresources:

1. <http://www.agrimoon.com/introduction-to-computer-applications-pdf-book/>
2. <https://www.ebooks.com/en-us/subjects/computers/>
3. <https://it.careers360.com/download/ebooks>
4. http://www.aun.edu.eg/molecular_biology/Procedure%20Bioinformatics22.23-4-2015/Xiong%20-%20Essential%20Bioinformatics%20send%20by%20Amira.pdf
5. <http://www.freebookcentre.net/Biology/Bioinformatics-Books.html>
6. https://courses.cs.ut.ee/MTAT.03.242/2017_fall/uploads/Main/Basics_of_Bioinformatics.pdf

Pedagogy: Teaching/Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar.

Course Outcomes

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

| CO Number | COS tatement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | To familiarize the student with the fundamentals concepts of bioinformatics. | K2 |
| CO2 | To equip students with computational skills for drug design. | K1 |
| CO3 | To learn about the bioinformatics data base, data format and data retrieval from online sources. | K4 |
| CO4 | To develop inter disciplinary skills in using computers in botany to learn about the biological database. | K3 |
| CO5 | Student is aware with the most recent technologies for sequencing and bio informatics analysis and is able to apply them to the structural and functional genomics of plants. | K6 |

Cognitive Level: K1- Remember; K2-Understanding; K3-Apply; K4-Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme Outcomes

| PO CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------------|------------|------------|------------|------------|------------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 3 | 1 | 2 |

S-Strong (3) M-Medium (2) L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| V | 23U5BOC4 | PLANT MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY | 6 | 5 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|--|
| Employability Oriented | | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. Students will have extensive knowledge of the morphology (vegetative structures and floral structures) of flowering plants.
2. Students will know about the basic concepts of classification of plants.
3. Understand major evolutionary trends in Angiospermic plants.
4. To know the characteristic features of the selected families.
5. To know the economic importance of plants.

| SYLLABUS | | |
|----------|--|--------------|
| nit | Content | No. of Hours |
| I | PLANT MORPHOLOGY Morphology – root system – modifications. Shoot system – modifications – (Aerial, sub-aerial and underground). Leaf-Types-simple and compound- phyllotaxy, modifications (phyllode, pitcher), tendrils, stipules. Inflorescences – definition and types – racemose, cymose, mixed and special types. Flower and its parts Fruits - classification. | 18 |
| II | PLANT CLASSIFICATION History of Angiosperm classification – Artificial, Natural and Phylogenetic system of classification. An outline of Bentham and Hooker system of classification, an overview of APG Classification. Herbarium technique–collection, pressing, drying, mounting and preservation of plant specimens, digital herbarium. Botanical Survey of India. Botanical nomenclature–rules, typification and author citation. | 18 |
| III | PLANT FAMILY CHARACTERISTICS Study of the following families based on the Natural system and their economic importance: Annonaceae, Capparidaceae, Tiliaceae, Rutaceae, Papilionaceae, Caesalpinaceae, Mimosaceae, Cucurbitaceae, Asteraceae, Rubiaceae Apocynaceae and Asclepiadaceae. | 18 |

| | | |
|-----------|--|----|
| IV | PLANT FAMILY CHARACTERISTICS Study of the following families based on the natural system and their economic importance: Convolvulaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Verbenaceae, Amaranthaceae, Euphorbiaceae, Liliaceae, Orchidaceae, Cannaceae and Poaceae. | 18 |
| V | ECONOMIC IMPORTANCE Source, cultivation method (brief) and the extraction/processing of the economically important products of the following – Cereal (Rice), Pulses (Black gram), Millets, Sugar (Sugarcane), Beverage (Coffee), Oil seed (Groundnut), spices (Cardamom), essential oil (Rose), natural rubber and timber plants (Teak) and Fibre (Cotton). | 18 |

Textbook:

Lawrence, G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad.

1. Porter, C.L. 1982. Taxonomy of Flowering Plants, Eurasia Publications House, New Delhi
2. Solbrig, O.T. 1970. Principles and Methods of Plant Biosystematics. The MacMillan Co-collier-MacMillan Ltd., London.
3. Solbrig, O.T and Solbrig, D.J. 1979. Population Biology and Evolution, Addison-Wesley Publishing Co. Ind USA.
4. Takhtajan, A.L. 1997. Diversity and Classification of Flowering Plants. Columbia University Press, New York.
5. Woodland, D.W. 1991. Contemporary Plant Systematics. Prentice Hall. New Jersey.
6. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi.

References:

1. Hutchinson, J. 1973. The Families of Flowering plants, Oxford University press, London.
2. Gamble, J.S., Fisher, L.E.F. 1967. The Flora of The presidency of Madras (Vol-III) BSI, Calcutta
3. Davis, P.H and Heywood, V.M. 1965. Principles of Angiosperm Taxonomy, Oliver and Boyd Edinburgh.
4. Clive AS. 1989. Plant Taxonomy and Biosystematics, Chapman and Hall Inc. New York.
5. Harborne, J.B and Turner, B.L. 1984. Plant Chemosystematics, Acad. Press, London.
6. Lawrence, G.H. 1955. Taxonomy of Vascular Plants, MacMillan Co., USA.
7. Jones, S.B. Jr. and Luchsinger, A.E. 1986. Plant Systematics (2nd edition). McGraw-Hill BookCo., New York.

Web resources:

1. https://books.google.co.in/books/about/Plant_Taxonomy_2E.html?id=_px_WAwHiZIC&redirhhttps://books.google.co.in/books/about/Plant_Taxonomy_and_Biosystematics.html?id=VfQnuwh3bw8C&redir_esc=y_esc=y
2. https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFuUC&redir_esc=y_esc=y
3. https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y_esc=y
4. https://books.google.co.in/books/about/Economic_Botany.html?id=2ahsDQAAQBAJ&redir_esc=y_esc=y
5. https://books.google.co.in/books/about/Textbook_Of_Economic_Botany.html?id=XmZFJO_JHv8C&redir_esc=y_esc=y

Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | Define the concepts in plant morphology and rules of IUCN in botanical nomenclature. | K1 |
| CO2 | Classify systems of plant classification and recognize the importance of herbarium and virtual herbarium. | K2 |
| CO3 | Describe the core concepts of economic Botany and relate its applications in human life. | K3 |
| CO4 | Analyze the characters of the families according to the Bentham and Hooker's system of classification. | K4 |
| CO5 | Assess terms and concepts related to Phylogenetic Systematics. | K5 |

Cognitive Level: **K1** - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 1 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--|---------------------------|----------------|
| V | 23U5BOC5 | CELL BIOLOGY, GENETICS AND MOLECULAR BIOLOGY | 5 | 5 |

Nature of the course

| | | | |
|--|---|-------------------------------------|---|
| Employability Oriented | | Relevant to Local need | |
| Entrepreneurship Oriented | √ | Relevant to regional need | |
| Skill development Oriented | | Relevant to national need | |
| Addresses Gender Sensitization | | Relevant to Global development need | √ |
| Addresses Environment and Sustainability | √ | Addresses Professional Ethics | |
| Addresses Human Values | | | |

Course Objectives

The main objectives of this course are to:

1. To enable students to gain insights into cell wall organization and its functions.
2. To familiarize with various cell organelles and their functions.
3. To gain knowledge in classical genetics.
4. To know about sex linked inheritance.
5. To have knowledge about plant breeding techniques for crop improvement.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | CELL BIOLOGY: Introduction-scope-cell organization Ultrastructure of Prokaryotic cell and Eukaryotic cell. Plant cell structure and function. Cell boundaries- cell wall- cell wall layers i.e. middle lamella, primary wall, secondary wall- Structure, chemistry and functions of cell wall, pits (simple and bordered), Plasmodesmata. Plasma membrane occurrence, structure (fluid mosaic model) chemistry, function and origin. Properties of Cytoplasm Membrane transport Passive, active and facilitated transport, endocytosis and exocytosis. | 15 |
| II | CELL ORGANELLS: Occurrence, structure, function and origin of Endoplasmic reticulum, Golgi apparatus, Lysosomes, Ribosomes, Mitochondria, Chloroplast and Micro bodies. Ultrastructure and functions of Nucleus, nuclear envelope, nuclear pore complex, nucleolus, chromosomes structure molecular organization of chromatin, Euchromatin, heterochromatin, Polytene and Lamp brush chromosomes, Centromere: types. Cell inclusion. Cell cycle, Cell division, Mitosis and Meiosis-their significance. | 15 |
| III | GENETICS: Mendelian genetics – monohybrid, dihybrid crosses. Laws of Mendel, Reciprocal cross -Backcross and Testcross. Incomplete dominance <i>Mirabilis jalapa</i> . Interaction of factors – Complementary genes, Supplementary genes, inhibitory genes, epistasis (dominant and recessive), duplicate genes and multiple alleles. Multiple alleles. ABO Blood grouping in Human. Chromosome theory of linkage, crossing over, recombinations and mapping of genes on chromosomes. Sex determination in plants. | 15 |

| | | |
|-----------|--|----|
| IV | GENETICS: Sexlinked inheritance– Haemophilia and colour blindness. Polyploidy origin, types and significance. Mutation- types and significance. chromosomal aberration –addition, deletion, inversion, duplication and translocation. Extra nuclear inheritance and its significance - Male sterility in corn, Maternal inheritance–Plastid Inheritance in <i>Mirabilis jalapa</i> . Genetics of <i>Neurospora</i> . Population genetics – Hardy– Weinberg principle. | 15 |
| V | MOLECULAR BIOLOGY: Transcription & Translation classes of RNA molecules – transcription in prokaryotes, Protein synthesis – Genetic code – characters – codons and anticodons. Gene regulation in Prokaryotes – <i>lac operon</i> and <i>trp operon</i> . | 15 |

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | Enumerate the structure and functions of cells, cellular structures and organelles. | K1 |
| CO2 | Explain about cell cycle, cell division and laws of inheritance with suitable examples. | K2 |
| CO3 | Elucidate concepts of sex determination and sexlinked inheritance. | K3 |
| CO4 | Analyze the importance of genes interactions at population and evolutionary levels. | K4 |
| CO5 | Develop conceptual understanding of plant genetic resources, plant breeding, gene bank and gene pool. | K5 |

Cognitive Level: K1 -Remember; **K2**-Understanding; **K3**-Apply; **K4** -Analyze; **K5**–Evaluate; **K6**–Create

Textbook:

1. Verma, P.S and V. K. Agarwal. 2002. Cytology.S.Chand & Co.Ltd., New Delhi-55.
2. Sinnott, E.W.,Dunn, L.L and Dobzhansky,T.1997. Principles of Genetics, Tata Mc Graw HillPublishing Co. New Delhi.
3. Cohn. N.S. 1979, Elements of Cytology, Freeman Book Co.
4. Singh, R.J.2016. Plant Cytogenetics, 3rd Edition.CRC Press, Boca Raton, Florida, USA.
5. Singh, R.J. 2017. Practical Manual on Plant Cytogenetics. CRC Press, Boca Raton, Florida,USA.

ReferenceBooks:

1. De Robert is and De Robertis.1990.Cell and Molecular Biology, Saunders College, Philadelphia,USA.
2. Gardner, E.J., Simmons, M.J and Snustad, D.1991. Principles of Genetics, John Wiley Sons Inc., 8th Edn., New York.
3. Hackett, P.B., Fuchs, J.A and Messing, J.W. 1988. An Introduction to Recombinant. DNA Techniques: Basic Experiments in Gene Manipulation. The Benjamin/ Cummings Publishing Co.Inc., Menlo Park, California.
4. Cooper, G.M and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C. Sinauer Associates,MA.
5. Becker, W.M., Klein smith, L.J.,Hardin. J and Bertoni, G.P.2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
6. Klug, W.S., Cummings, M.R., Spencer, C.A.2009. Concepts of Genetics. 9th edition. Benjamin Cummings, U.S.A.

7. Lewin. 2007. Gene IX. Jones and Barlett Pub.ISBN.O763752223.
8. Strickberger, M.W.1999. Genetics. Prentice Hall of India Pvt Ltd,New Delhi.
9. Jogdand, SN. 1997. Gene biotechnology, Himalaya Publishing House, New Delhi.
10. Ernst L. Winnacker. 2002. From Genes to Clones-introduction to gene technology, VCR Pub.,Weintein.
11. James, D Watson et al., 1992. Recombinant DNA (2nd Edition), WH Freeman and Co., New York.
12. Maniatis and Sambrook. 2003. Molecular Cloning- A lab manual Vol.I, II & III, Coldspring HarborLaboratory Press, New York.
13. Old, RW and Primrose, SB. 2001. Principles of Gene Manipulation-an introduction to geneticengineering, Black Well Science Ltd., New York

Webresources:

1. <http://www.freebookcentre.net/Biology/Cell-Biology-Books.html>
2. <https://www.us.elsevierhealth.com/medicine/cell-biology>
3. <https://www.amazon.in/Cell-Biology-Thomas-D-Pollard-ebook/dp/B01M7YAL2A>
4. http://www.freebookcentre.net/medical_text_books_journals/genetics_ebooks_online_text_s_download.html
5. <https://www.us.elsevierhealth.com/medicine/genetics>
6. <https://libguides.uthsc.edu/genetics/ebooks>
7. <https://www.kobo.com/us/en/ebook/principles-of-plant-genetics-and-breeding>
8. <http://sharebooks.com/content/plant-breeding-ebooks-raoul-robinson>
9. <https://www.amazon.com/Introduction-Plant-Physiology-William-Hopkins-ebook/dp/B006R6I850><http://www.freebookcentre.net/Biology/Molecular-Biology-Books.html>
10. <https://www.amazon.in/Molecular-Biology-Multicolour-Verma-Agarwal-ebook/dp/B06XKVVWT3>

Pedagogy: Teaching/Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar

Mapping with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO 3 | 3 | 3 | 2 | 3 | 1 | 2 | 1 | 3 | 3 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| VI | 23U5BOCP5 | PRACTICAL COVERING – CORE V, VI PARCTICAL -V | 4 | 4 |

Nature of the course

| | | | |
|---|---|---------------------------------|---|
| EmployabilityOriented | | Relevantto Localneed | |
| EntrepreneurshipOriented | √ | Relevanttoregionalneed | |
| SkilldevelopmentOriented | | Relevanttonationalneed | |
| AddressesGenderSensitization | | RelevanttoGlobaldevelopmentneed | √ |
| AddressesEnvironment and Sustainability | √ | AddressesProfessional Ethics | |
| AddressesHuman Values | | | |

Course Objectives

The main objectives of this course are

- To study the anatomy of the plant organs using various techniques.
- To study the embryology of the plant.
- To identify the structure of various cell organelles.
- To understand genetics through problem solving.
- To study various plant breeding techniques.

| SYLLABUS | |
|-----------------|---|
| Unit | Content |
| I | TAXONOMY 20 Hrs 1. Morphology of root, stem and leaf modification, types of inflorescence. 2. Plants of local flora included under theory syllabus and family identification and derivation based on reasoning. 3. Dissection, identification, observation and sketching the floral parts of the plants belonging to the families included in the syllabus. 4. Students must describe the floral parts, draw the L.S., floral diagram and write the floral formula of at least one flower from each family. 5. Twenty (20) Herbarium sheets, field notebook and bonafide record to be submitted. 6. Study the products of plants mentioned in the syllabus of economic botany with special reference to the morphology, botanical name and family. 7. Field trips to places for observation, study and collection of plants prescribed in the syllabus for 2 to 5 days under the guidance of faculties. |
| II | CELLBIOLOGY 20 Hrs 1. Studyof the photo micro graphs of cell organelles. 2. Ergastic substances - starch grains, aleurone grains, crystals – cystolith andraphide. Study the polytene and lamp brush chromosome structure through photograph 3. Identification of different stages of mitosis by using squash and smear techniquesOnionroot tip. |
| III | GENETICS 20 Hrs 1. Genetic problems –testcross, backcross and allelic interaction. 2. Construction of chromosome map –three point testcross 3. Multiple alleles problems. MOLECULAR BIOLOGY –PHOTOGRAPHS 1. DNA Structure 2. tRNA 3. DNA–Replication 4. DNA–Repair |

Textbook:

1. Gupta P.K. 2017. Cell and Molecular Biology (5th ed.), Rastogi Publications, Meerut.
2. Krebs J.E., Goldstein E. and Kilpatrick S.T. 2017. Lewin's GENES XII (12th ed.). Jones & Bartlett Learning.
3. Jackson, S.A., Kianian, S.F., Hossain, K. and Walling, J.G. 2012. Practical laboratory exercises for plant molecular cytogenetics. In Plant Cytogenetics (pp. 323-333). Springer, New York.

References

- a. Gardener, J, Simmons, H.J and Snustad, D.P. 2006. Principle of Genetics, John Wiley & Sons, New York.
- b. DeRobertis E. D. P. and De Robertis E. M. P. 2017. Cell and Molecular Biology (8th ed.) (South Asian Edition), Lea and Febiger, Philadelphia, USA
- c. Jackson, S.A., Kianian, S.F., Hossain, K.G., and Walling, J.G. 2012. Practical laboratory exercises for plant molecular cytogenetics. In Plant Cytogenetics (pp. 323-333). Springer, New York, NY.

Webresources:

1. <https://www.amazon.in/Cell-Biology-Dr-Renu-Gupta/dp/8193651219>
2. <https://www.amazon.in/Practical-Handbook-Genetics-Vikas-Pali/dp/932727248X>
3. <https://www.amazon.in/Practical-Handbook-Plant-Breeding-Vikas/dp/9327272498>

Pedagogy: Teaching/Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | Identify the structure of cell organelles and stages of cell division. | K1 |
| CO2 | Classify the types of stomata and ovules. | K2 |
| CO3 | Compare the functions of various ergastic substances present in plant tissues. | K3 |
| CO4 | Perform free hand sectioning of plant material and decipher the internal tissue organization. | K4 |
| CO5 | Interpret the given genetic data to develop genetic map based on the principles of Mendel's inheritance and gene interaction. | K5 |

Cognitive Level: K1 -Remember; K2-Understanding; K3-Apply; K4 -Analyze; K5-Evaluate; K6-Create

Mapping of Course Outcomes with Programme Outcomes

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 1 | 3 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3) M-Medium (2) L-Low (1)

| Semester | Course Code | Course Title of the paper | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| V | 23U5BOEL1A | Major Elective – I Bio-Analytical Techniques | 4 | 4 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To understand the principle, operation and maintenance of various tools/equipment in the laboratory.
2. Perform experiments using the laboratory instruments, formulate experiments for project work and evaluate critically the acquisition of data.
3. To equip students to collect, analyze and evaluate data generated by their own inquiries in a scientific manner.
4. To give an exposure to various forms of field research and data analysis techniques.
5. To provide an overview on modern equipments that they would help students gain confidence to instantly commence research careers and/or start entrepreneurial ventures.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | MICROSCOPY: Principles of microscopy; Light microscopy; compound microscopy, bright field microscope, dark field microscope, phase-contrast microscope, Fluorescence microscopy; Transmission and Scanning electron microscopy. Microscopic measurements-micrometry, Microscopy drawing: Camera Lucida. | 12 |
| II | CHROMATOGRAPHIC PRINCIPLES AND APPLICATIONS: Principle; Paper chromatography, Thin Layer Chromatography (TLC), Column chromatography, Gas chromatography – Mass spectrometry (GCMS), High Performance Liquid Chromatography (HPLC). | 12 |
| III | ELECTROPHORESIS AND PH METER: Basic principle, construction and operation of pH meter. Polyacrylamide gel electrophoresis (PAGE), Agarose Gel Electrophoresis. | 12 |
| IV | SPECTROPHOTOMETRY AND CENTRIFUGATION TECHNIQUE: Principle and law of absorption, construction, operation and uses of colorimeter and UV-Visible spectrophotometer, Principles, methods of centrifugation, types of centrifuge and applications. | 12 |

| | | |
|----------|---|----|
| V | BIOSTATISTICS: Data collection methods, population, samples, parameters; Representation of Data: Tabular, Graphical– Histogram – frequency curve – Bar diagram–measures of central tendency – Mean, Median and Mode; Standard deviation, Standard error, Chi-square test and goodness of fit –t–test. | 12 |
|----------|---|----|

Textbook:

1. Sharma, V.K. 1991. Techniques in microscopy and cell biology, Tata McGraw Hill, New Delhi.
2. Sawhney, S.K and Randhir Singh. 2000. Introductory practical biochemistry, Narosa Publishing House.
3. Asokan, P. 2001. Basics of analytical biochemistry. Chinna Publications.
4. Bajpai, P.K. 2006. Biological instrumentation and methodology. S. Chand & Company, New Delhi.
5. Veerakumari, L. 2009. Bioinstrumentation. MJP Publications.
6. Palanivelu, P. 2013. Analytical Biochemistry and Separation techniques, 20th century publications, Palkalai

References Books:

1. Rana, S.V.S. 2009. Biotechniques: Theory and Practice. Rastogi Publications.
2. Zar, J.H. 2012. Biostatistical Analysis. 4th edition. Pearson Publication. U.S.A.
3. Sundar Rao, P.S.S and Richard, J. 2011. Introduction to Biostatistics and research methods, PHI learning Private Ltd., New Delhi.
4. Johansen, D.A. 1940. Plant Micro technique, TATA McGraw Hill Book Co., Ins., New Delhi.
5. Cooper, T.G. 1991. The Tools of Bio - chemistry, John Wiley & sons, London.
6. Dey, P.M and Harborne, J.B. 2000. Plant Biochemistry Harcourt Asia Pvt. Ltd.
7. Plummer, D.T. 2003. An introduction to practical Biochemistry. 3rd Edn. Tata McGraw Hill Publishing Company

Web resources:

1. <https://www.kobo.com/in/en/ebook/bioinstrumentation-1>
2. <https://www.worldcat.org/title/bioinstrumentation/oclc/74848857>
3. <https://www.amazon.in/Bioinstrumentation-M-H-Fulekar-Bhawana-Pandey-ebook/dp/B01JP3M9TW>
4. https://www.amazon.in/Handbook-Biomedical-Instrumentation-R-S-Khandpur-ebook/dp/B0129ZDO9W?ref=kindlecontentin50-21&tag=kindlecontentin50-21&gclid=CjwKCAiAx_DwBRAfEiwA3vwZYkqkwRb_EGf73exaWpY8D9JNpJZsOcXQCQ4pZIRzTrYH2lopaVP1xxoCIPgQAvD_BwE
5. <https://www.kobo.com/us/en/ebooks/biostatistics>
6. <https://www.amazon.in/Biostatistics-Veer-Bala-Rastogi-ebook/dp/B07LDPCXDG>

Pedagogy:

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | Relate to the various biological techniques and its importance. | K1 |
| CO2 | . Explain the principles of Light microscopy, compound microscopy, Fluorescencemicroscopy and electron microscopy. | K2 |
| CO3 | Apply suitable strategies in data collections and disseminating research findings. | K3 |
| CO4 | Compare and contrast the significance of different types of chromatography techniques | K4 |
| CO5 | Develop methodologies for extraction and analysis of biochemical compounds. | K5 |

CognitiveLevel:K1 -Remember; **K2**-Understanding; **K3**-Apply; **K4** -Analyze; **K5**–Evaluate; **K6**–Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 1 | 3 |
| CO 2 | 3 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 1 | 2 |
| CO 3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 2 | 3 | 1 |
| CO 4 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 2 | 3 | 2 |
| CO 5 | 3 | 2 | 2 | 3 | 2 | 3 | 1 | 2 | 2 | 3 |

S-Strong(3) M-Medium(2) L-Low(1)

| Semester | Course Code | Course Title of the paper | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--------------------------------------|---------------------------|----------------|
| V | 23U5BOEL1B | Major Elective – I Aquatic Botany | 4 | 3 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To give an overview of the distribution of lower plants forms and its ecological significance.
2. To enable students to understand the ecological functions and economic uses of aquatic plants.
3. To equip students to collect, analyze and identify the planktons.
4. To give an exposure to various forms seaweeds.
5. To know about the values and uses of aquatic plants..

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | MARINE AND LIMNETIC MACRO ALGAE: Common seaweeds of Indian subcontinent: <i>Ulva</i> , <i>Caulerpa</i> , <i>Sargassum</i> , <i>Gracilaria</i> , etc. Common terrestrial algae, including cyanobacteria and lichen photobionts of Indian subcontinent and its life cycle, ecology and taxonomy: <i>Anabaena</i> , <i>Chlorella</i> , <i>Scenedesmus</i> . | 12 |
| II | MANGROVES: Mangrove forests of India, including Sundarbans, Pichavaram, Kerala mangroves, Rathnagiri mangroves. Common species of mangroves and mangrove associated plants, including <i>Avicennia</i> , <i>Rhizophora</i> , <i>Acanthus</i> and <i>Aegiceras</i> . Ecological significance of mangroves. | 12 |
| III | ALGAL REPRODUCTION: Reproduction-Vegetative, asexual, sexual reproduction and life histories (haplontic-, <i>Oedogonium</i> and <i>Chara</i> , diplontic Diatoms and <i>Sargassum</i> , diplohaplontic- <i>Ulva</i> and diplobiontic- <i>Gracilaria</i>) | 12 |
| IV | AQUATIC ANGIOSPERMS: Common aquatic angiosperms of India, including Lotus, Water Lilly, Water hyacinth. Ecology, life cycle, taxonomy and economic importance of aquatic angiosperms. | 12 |
| V | VALUES AND USES OF AQUATIC PLANTS: Economic importance of aquatic plants, Ecosystem services of aquatic plants, including biogeochemical cycles, oxygen production and carbon sequestration and so on, edible seaweed and algal resources of India, aesthetic, cultural, spiritual importance of aquatic plants. | 12 |

Textbook:

1. Lee, R.E. 2008. Phycology. 4th edition. Cambridge University Press, Cambridge.
2. Wile, J.M, Sherwood, L.M and Woolverton, C.J. 2013.. Prescott's Microbiology. 9th Edition. Mc Graw Hill International.
3. Kumar, H.D. 1999. Introductory Phycology. Affiliated East-West Press, Delhi.
4. Hoek, C. Van, D. 1999. An Introduction to Phycology. Cambridge University Press.
5. Daubenmire, R.F.1973. Plant and Environment. John Willey.
6. Sharma, J.P.2004. Environmental Studies, Laxmi Publications (P) Ltd. New Delhi.
7. Bast, F. 2014. Seaweeds: Ancestors of land plants with rich diversity. Resonance, 19(2) 1032-1043 ISSN: 0971-8044.

References Books:

1. Kathiresan, K and S.Z. Qasim 2005. Biodiversity of Mangrove Ecosystems. Hindustan Lever Limited.
2. Allan, J.D. and Castillo, M.M. 2009. Stream Ecology (Second Ed.). Springer, Netherlands.
3. Barnes, R.S.K. 1974. Fundamentals of Aquatic Ecosystems, (R.S.K. Barnes & K.H. Mann, eds.), Blackwell Sci. Publ., London, 229 pp.
4. Bennet, G.W. 1971 Management of Lakes and Ponds. von Nostrand Reinhold Co., NY. 375 pp.
5. Goldman, C.R. & A.J. Horne 1983. Limnology. McGraw Hill Internat. Book Co. Tokyo, 464 pp.
6. Boney, A.D., 1975. Phytoplankton. Edward, Arnold, London.

Web resources:

7. <http://kyry6.gq/73447c/aquatic-botany-published-by-elsevier-science.pdf>
8. <http://fuls7.gq/82442e/aquatic-botany-published-by-elsevier-science.pdf>
9. <https://www.springer.com/gp/book/9788132221777>
10. <http://dwit21.cf/7744a1/aquatic-botany-published-by-elsevier-science.pdf>
11. <https://www.amazon.in/Aquatic-Plants-iFlora-Plant-Guide-ebook/dp/B07NS9V7LN>

Pedagogy:

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | Recognize aquatic plants and their ecological importance. | K1 |
| CO2 | Explain about commonly occurring marine and limnetic algae of the Indian coasts. | K2 |
| CO3 | Apply techniques for conservation of aquatic plants for value addition. | K3 |
| CO4 | Analyze and decipher the significance and properties of mangroves, other aquatic angiosperms and microalgae | K4 |
| CO5 | Develop new strategies to conserve mangroves and devise innovative methods for cultivation of aquatic plants. | K5 |

Cognitive Level: K1 -Remember; K2-Understanding; K3-Apply; K4 -Analyze; K5-Evaluate; K6- Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO3 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 3 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 1 | 1 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong(3)

M-Medium(2)

L-Low(1)

| Semester | Course Code | Course Title of the paper | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| V | 23U5BOEL2A | Major Elective – II Applied Microbiology | 4 | 3 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | ✓ | Relevant to Local need | | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | | Relevant to regional need | | Addresses Environment and Sustainability | |
| Skill development Oriented | ✓ | Relevant to national need | | Addresses Human Values | |
| | | Relevant to Global development need | ✓ | Addresses Professional Ethics | ✓ |

Course Objectives

The main objectives of this course are to:

1. To understand the fundamental of fermentation process.
2. To know the microbial based industries.
3. To gain knowledge about industrial fermentations and products.

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | Introduction: Introduction-general Information on microbe based industries-Substrate for industrial fermentation. | 12 |
| II | Food and Dairy Industries: Single Cell Protein (SCP) advantages-Microbes as source of SCP (Algae, Fungi and Bacteria) – Mass production of SCP (Spirulina, Bacterial SCP) – Yogurt and Cheese production. | 12 |
| III | Pharmaceutical and related industries: Antibiotics-Sources and types-Production of Penicillin and Streptomycin-Recombinant drugs and vaccines-Insulin and Hep-B Vaccine-Vitamin B12-Advantages of vaccines. | 12 |
| IV | Industrial Production: Industrial Production of Alcohol (Ethanol) –Organic acids-Citric acid and Acetic acid production-Vinegar production-Lactic acid production. | 12 |
| V | Microbial: Microbial Enzymes-Amylases, Proteases-Microbes used for amino acid production- production of hormones. Commercial production of L-glutamic acid-application of enzymes. | 12 |

References:

- ❖ Adams, M.R. and Moss, M.O.,(1995).Food Microbiology Tata cGraw Hill.
- ❖ Agarwal,(2006).Industrial Microbiology:Fundamentals and Application.M/S.IBP Publishers and Distributes,New Delhi.
- ❖ Crueger, F. and Anneliese Cruger, (2000).Biotechnology: Industrial Microbiology, Panima Publications.
- ❖ Dubey, R.C. and Maheswari, D.K.,(2003).A text book of Microbiology.S.Chand and Campus,New Delhi.

- ❖ Kumaresan,V.,(2001).Biotechnology SarasPublications,Nagarcoil.
- ❖ Purohit, (2005). Microbiology Fundamentals and Applications. 6th Ed.,International Book Distributors,Dehradun.
- ❖ Ratledge and Kristenson, (2001).Basic Biotechnology.Oxford University Press.

Web contents-

1.https://portal.abuad.edu.ng/lecturer/documents/1585662755MICROBIAL_BIOTECHNOLOGY_Fundamentals_of_Applied_Microbiology_Second_Edition.pdf

e-resources-

1. <https://nptel.ac.in>
2. <https://swayam.gov.in>
3. <https://mooc.org>

Pedagogy:Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation & Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | Gain knowledge about the fundamental of fermentation process. | K1, K2,K3, K4 |
| CO2 | Knowing the microbial based industries. | K2, K3,K4 |
| CO3 | More information about fermentations products. | K3, K4, K6 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomeswith Programme Outcomes

| PO CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|----------|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |

3 - Strongly Correlated; 2 - Moderately Correlated;1 - Weakly Correlated;0 – No correlation

| Semester | Course Code | Course Title of the paper | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---------------------------------------|---------------------------|----------------|
| V | 23U5BOEL2B | Major Elective – II BIOINFORMATICS | 4 | 3 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | √ |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | |
| | | Relevant to Global development need | | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To demonstrate the different online bioinformaticstools
2. To learn the essential features of the interdisciplinary field of science for betterunderstanding on biological database
3. To recollect the information on bioinformatics database, databank, data formatand data retrieval from the online sources.
4. To create awareness about modular nature of proteins and phylogenetic analysis.
5. To layout a strong foundation for performing further research in bioinformatics.

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | BIOINFORMATICS AND INTERNET: Introduction to computers and Bioinformatics. Types of hardware and software operating systems. Fundamentals of networking, operation of networks, telnet, ftp, www.internet . | 12 |
| II | GENBANK SEQUENCE D ATABASE: Biological Research on the Web: Using search engines, finding scientific articles, public biological databases - searching biological databases. Use of nucleic acid and protein data banks - NCBI, EMBL, DDBJ, SWISSPROT - multiple sequence alignment. | 12 |
| III | STRUCTURE DATABASES: Sequence analysis, pair wise alignment and Databases search. Phylogenetic analysis, profiles and motifs. Protein structure – visualizing, prediction and function from a sequence. | 12 |
| IV | SEQUENCE ALIGNMENT AND DATA BASE SEARCHING: Introduction- Evolutionary Basis of Sequence Alignment- Modular Nature of Proteins- Chemicalcomposition – Bio molecules, DNA, RNA. Structure of DNA, development of DNA sequence methods. Gene finder and feature detection in DNA. | 12 |
| V | PREDICTIVE METHODS: Gene finding, pair wise sequence comparison, sequencequeries in biological databases – drug designing and drug delivery. | 12 |

Textbook:

1. Baxevanis, A.D. & Ouellette, B.F. 2001. Bioinformatics: A practical guide to the analysis of genes and proteins. New York: Wiley-Interscience.
2. Bourne, P.E., & Gu, J. 2009. Structural bioinformatics. Hoboken, NJ: Wiley-Liss.
3. Lesk, A.M. 2002. Introduction to bioinformatics. Oxford: Oxford University Press.
4. Mount, D.W. 2001. Bioinformatics: Sequence and genome analysis. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
5. Pevsner, J. 2015. Bioinformatics and functional genomics. Hoboken, NJ: Wiley-Blackwell.
6. Baldi, P. and Brunak, (2001). Bioinformatics, A Machine Approach, MIT press.
7. Khanimtiyaz Alam, (2006). Elementary Bioinformation (HB), Dehradun.
8. Gibas and Jamback, (2001). Developing Bioinformatics Computer Skills, O'Reilly Associates.
9. Misenes, S. and Cravetes, S.A., (1999). Methods in molecular biology Vol. 132, Bioinformatics methods and protocols.

References:

1. Campbell, A. and Heyer, L.J. 2003. Discovering genomics, proteomics, and bioinformatics. San Francisco: Benjamin Cummings.
2. Green, M. and Sambrook, J. 2012. Molecular cloning: A laboratory manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
3. Liebler, D.C. 2002. Introduction to proteomics: Tools for the new biology. Totowa, NJ: Humana Press.
4. Old, R.W., Primrose, S.B., and Twyman, R.M. 2001. Principles of gene manipulation: An introduction to genetic engineering. Oxford: Blackwell Scientific Publications.

Web resources:

1. Bioinformatics: Algorithms & Applications by Prof. M. Michael Gromiha IIT-Madras.
<https://nptel.ac.in/courses/102/106/102106065/#>.
2. Christopher Burge, David Gifford, and Ernest Fraenkel. 7.91J Foundations of Computational and Systems Biology. Spring 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, <https://ocw.mit.edu>.
3. <https://link.springer.com/book/10.1007/978-3-540-72800-9>.
4. <https://www.amazon.in/Applied-Bioinformatics-Paul-Maria-Selzer-ebook/dp/B001AUOYY2>.
5. https://books.google.co.in/books/about/Applied_Bioinformatics.html?id=PXZZDwAAQBAJ&redir_esc=y

Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | Learn and recognize the role of computers and internet through bioinformatics studies. | K1 & K2 |
| CO2 | Know and implement the various biological databases by using computer. | K2 & K3 |
| CO3 | Practice by visualizing and prediction of protein structure. | K3 & K4 |
| CO4 | Interpret the characteristics of phylogenetic methods by the application of bioinformatics. | K3 & K4 |
| CO5 | Analyze and fabricate drug designing and drug delivery through molecular docking studies. | K4 & K5 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |

S-Strong (3) M-Medium (2) L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| V | 23U5BONME | Non Major Elective - HERBAL MEDICINE | 2 | 2 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are:

1. To enable the students to identify local medicinal plants.
2. To impart this students knowledge on botany and phytochemistry of medicinal plants.
3. To make the students to cure common human ailments with medicinal plants.
4. This study will be useful in the preparation of various herbal products.
5. To know the importance of herbal drugs

| SYLLABUS | | |
|----------|---|--------------|
| Unit | Content | No. of Hours |
| I | HERBAL DRUGS Importance and Relevance of Herbal drugs in Indian Systems of Medicine, Pharmacognosy – Aim and scope. HERBAL GARDENING Gardens in the Hills and plains; House gardens; plants for gardening – Poisonous plants – Types of plant poison; action of poisons; treatment for poisons, some poisonous plants; their toxicity and its action. ADULTERATION Adulteration of crude drugs and its detection – methods of adulteration; types of adulteration. Medicinal plants of export values; rejuvenating herbs; Medicinal uses. | 15 |
| II | BOTANICAL DESCRIPTION Botanical description and active principles of Root drugs (<i>Glycorrhiza glabra</i> -Aswagantha); Rhizomes (Ginger, Turmeric) woods(Sandal and Rosewoods) bark drugs (Chincona, <i>Cinnamon zeylanica</i>). BOTANICAL DESCRIPTION Botanical description and active principles of leaves (Solanum, Andrographis); Flowers (Saffron, Clove); Fruits (<i>Carica papaya</i> , <i>Centella asiatica</i>), seed (<i>Piper nigrum</i> , <i>Eletaria cardomemom</i>) and entire plants as drugs. Taxonomic study of some selected herbals (Eclipta and Adothoda). | 15 |

Textbook:

1. Somasundaram, S. 1997. Medicinal botany (Maruthuvar Thavaraviyal) – (Tamil Medium Book).
2. Wallis, T.E. 1967. Text Books of Pharmacognosy. J. & A. Churchill Ltd., London,

3. Jains, S.K.. 1996. Medicinal Plants. Deep Publications, New Delhi.
4. Srivastava, A.K. 2006, Medicinal Plants, International Book Distributors, Dehradun.
5. Agarwal, O.P. 1985, Vol. II, Chemistry of organic – natural products. S Chand & Company, New Delhi.
6. Gamble, J.S. and Fisher, 1921, CEC I, II, III Flora of the Presidency, Madras Volumes.
7. Mathew K.M., 1988, Flora of the Tamilnadu and Carnatic.

General References:

1. Nair, N.C and Henrry, A.N. 1983, Flora of Tamil Nadu, India, Botanical Survey of India.
2. Chopra, R.N., Nagar S.L., and Chopra, I.C. 1956, Glossary of Indian Medicinal Plants.
3. Chopra, R.N., Chopra, I.C., Handa, K.L., and Kapur L.D., 1994, Indigenous drugs of India.
4. Chopra, R.N., Badhuvar R.L and Gosh, G. 1965. Poisonous plants in India.
5. Miller, L and Miller, B. 2017. Ayurveda & Aromatherapy: The Earth Essential Guide to Ancient
6. Wisdom and Modern Healing. *Motilal Banarsidass, Fourth edition.*
7. Patri, F and Silano, V. 2002. Plants in cosmetics: Plants and plant preparations used as ingredients for cosmetic products - Volume 1. ISBN 978-92-871-8474-0, pp 218.

Web resources:

1. https://www.barnesandnoble.com/b/free-ebooks/nook-books/alternative-medicine-natural-healing/herbal-medicine/_/N-ry0Z8qaZ11iu
2. <https://www.springer.com/gp/book/9783540791157>
3. <https://www.gpatonline.com/gpat/book-reference-pharmacognosy>
4. https://www.researchgate.net/publication/334670695_Book_review-Herbal_Drug_Technology
5. <http://www.eurekaselect.com/node/173492/herbal-medicine-back-to-the-future>

Pedagogy: Teaching / Learning methods:

Virtual Class room, LCD projector, Guest Lectures, Tutorial, Assignment, Net Surfing, NPTEL CourseMaterials.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | To understand the nuances of medicinal plants and their phytochemical constituents commercial value | K1, K2 |
| CO2 | To design and develop medicinal garden. | K2, K3 |
| CO3 | To apply the knowledge to cultivate medicinal plants. | K2, K3 |
| CO4 | To know the pharmacological importance of medicinal plants. | K3, K4, K6 |
| CO5 | To enlist phytochemicals and secondary metabolites of market and commercial value. | K6 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping of Course Outcomes with Programme

| PO/PSO CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PSO1 | PSO2 | PSO3 |
|--------------|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 |
| CO3 | 2 | 2 | 1 | 3 | 1 | 2 | 1 | 3 | 2 |
| CO4 | 3 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 1 | 1 | 3 | 3 | 1 |

3 - Strongly Correlated; 2 - Moderately Correlated; 1 - Weakly Correlated; 0 – No correlation

| Semester | Course Code | Course Title of the paper | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| VI | 23U6BOC7 | PLANT ECOLOGY, EVOLUTION AND PHYTOGEOGRAPHY | 6 | 4 |

Nature of the course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | ✓ | Employability Oriented | ✓ | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | ✓ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | ✓ | Addresses Environment and Sustainability | ✓ |
| Relevant to Global need | ✓ | | | Addresses Human Values | |

Course Objectives

The main objectives of this course are to:

1. to relate to the significance of the biotic and abiotic components of the ecosystems
2. to understand the energy flow in ecosystem.
3. to conceptualize the biodiversity.
4. to know implication of pollution on the environment.
5. to study about the phytogeographic vegetation.

SYLLABUS

| Unit | Content | No. of Hours |
|------|--|--------------|
| I | ECOLOGY Definition and Scope of ecology, Approaches to the study of ecology, Autecology – Synecology – Population ecology – Community ecology – Units of vegetation - Ecosystem concept - Components – Abiotic and Biotic factors-Factors in ecological pyramids influencing vegetation- Climatic, edaphic and biotic factors | 18 |
| II | STRUCTURE AND ORGANIZATION Structure, trophic organization Food chain -Food web - Ecological pyramids - energy flow of ecosystem – pond ecosystem – production and productivity of ecosystem-Types of ecosystems: pond, forest and grassland. Ecological pyramids and Biogeochemical cycles of carbon and nitrogen and phosphorus | 18 |
| III | CLASSIFICATION Ecological succession of hydrosere– Xerosere - Ecological classification hydrophytes, xerophytes, mesophytes, halophytes and epiphytes - Morphological and anatomical adaptations of hydrophytes and xerophytes. EVOLUTION - origin of life, chemosynthetic theory - evidences (any five).Theories of evolution- Darwin, Lamarck and Deveries, modern synthetic theory. Variation - analysis and sources, adaptive radiation,Concept of species-Allopatric and sympatric. | 18 |
| IV | PHYTOGEOGRAPHY Phytogeography; principles and concepts of phytogeography; Vegetation types of India. Floristic regions of India; Endemism - center of origin, theories of endemism, endemic plants; continental drift – Centers of origin and distribution of plants; Methods of, migrations, and isolation; Factors influencing plant distribution | 18 |

| | | |
|----------|--|----|
| V | HOTSPOTS Endemic distribution, Age and Area Hypothesis. theory. Conservation – Insitu and Ex situ. Theory of tolerance; Brief description of major terrestrial biomes (tropical, temperate and tundra); Local vegetation – forest, agriculture | 18 |
|----------|--|----|

Textbook:

1. Odum E. P. 1983. Basic Ecology, Holt Saunders International Editions.
2. 5. Simmons, I. G. 1979. Biogeography: Natural and Cultural. Edward Arnold Ltd
3. Sharma, P.D (2009). Ecology and Environment. Rastogi Publications.
4. Shukla, R.S. & P.S. Chandel (1991) : Plant Ecology & Soil Science. S.Chand & Co., New Delhi
5. Vasishta, P.C, 1979 Plant Ecology. Vishal Publication
6. Singh, J.S., Singh, S.P., Gupta, S. 2006. Ecology Environment and Resource Conservation. Publications, New Delhi, India.
7. Sharma, P.D. 2010. Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
8. Krishna Iyer. V.R. 1992. Environmental protection and legal defence. Sterling Publishers Pvt.Ltd.,
9. Shukla, R.S and Chandel, P.S. 1990. Plant Ecology, S.Chand & Co. Pvt. Ltd.,
10. Krishnamurthy, K.V. 2003. An advanced text book on Biodiversity - Principle and Practice. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Book for References:

1. Kumar H. D 1990. Modern concepts of Ecology, Vikas Publishing House Pvt. Ltd
2. MacDonald, G. 2003. Biogeography: Introduction to Space, Time, and Life. John Wiley & Sons, Inc.
3. Annadurai, B. 2007. Text Book of Biostatistics. New Age International, New Delhi.
4. Sharma, P.D., (1992). Ecology and Environment, Rastogi Publications, Meerut, UP.
5. David N. Sen. (1978). Concept in Indian Ecology, Shoban Lalin Chand & Co., M5, Industrial Area, Jalandhar City 144 004, India.
6. Odum, E.P. 2005. Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
7. Wilkinson, D.M. 2007. Fundamental Processes in Ecology: An Earth Systems Approach. Oxford University Press. U.S.A.
8. Kumar, H.D. 1990. Modern concepts of Ecology, Vikas Publishing House Pvt. Ltd.,
9. Smith, W.H. 1981. Air pollution and forest: Interactions between air contaminants and forest ecosystems.
10. Vickery, M.L. 1984. Ecology of Tropical plants, John Wiley and Sons.
11. Melchias, G., 2001. Biodiversity and Conservation, Science Publishers Inc. USA.
12. Asthana, D.K and Meera Asthana. 2006. A text book of Environmental studies. S.Chand and Company Ltd. New Delhi.
13. Brian Groombridge. 1992. Global Biodiversity, Chapman and Hall, UK.
14. IUCN. 1985. The World Conservation Strategy, IUCN, Switzerland.
15. Ambasht, R.S. 2017. A textbook of plant ecology 15ed (pb 2019). CBS Publishers Distributors.
16. Stewart, W.N and Rath well, G.W. 1993. Paleobotany and the Evolution of Plants. Cambridge University Press.
17. Raup, D. Mand Steven, M. Stanley. 2004. Principles of paleontology. San Francisco: W.H. Freeman, 1971.

Web resources:

1. <https://www.kobo.com/us/en/ebook/plant-ecology-3.n>
2. <https://www.worldcat.org/title/plant-ecology/oclc/613206385>
3. https://books.google.co.in/books/about/Plant_Ecology.html?
4. <https://www.kopykitab.com/Plant-Ecology-by-Agrawal-AK-And-Deo-PP-5>.
5. <http://www.freebookcentre.net/Biology/Ecology-Books.html> <https://www.amazon.in/Plant-Ecology-Ernst-Detlef-Schulze/dp/354020833X>
6. <https://www.tandfonline.com/toc/tped20/current> (Plant Ecology and Diversity)

Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|--|-----------------|
| CO1 | Relate to the significance of the biotic and abiotic components of the ecosystems and energy flow. | K1 |
| CO2 | acquaint with vast knowledge on the ecological pyramids, food chain and food webs | K2, K6 |
| CO3 | Explain the implication of pollution on the environment | K3 K5 |
| CO4 | Summarize the phytogeographical division of India. | K4 |
| CO5 | Develop mitigations for the effective conservation of biodiversity and disaster management. | K5 K3 |

Cognitive Level:

K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate;

K6 – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 1 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 2 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 1 |
| CO 5 | 3 | 3 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 2 |

S-Strong (3) M-Medium (2) L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|-----------|-----------------|--|---------------------------|----------------|
| VI | 23U6BOC8 | PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY | 5 | 5 |

Nature of the course

| | | | |
|--|---|-------------------------------------|---|
| Employability Oriented | √ | Relevant to Local need | √ |
| Entrepreneurship Oriented | √ | Relevant to regional need | |
| Skill development Oriented | √ | Relevant to national need | √ |
| Addresses Gender Sensitization | | Relevant to Global development need | |
| Addresses Environment and Sustainability | | Addresses Professional Ethics | |
| Addresses Human Values | | | |

Course Objectives

The main objectives of this course are to:

1. know various aspects of biotechnology
2. know the concept and techniques of plant tissue culture.
3. familiarize with the gene transfer techniques.
4. know about DNA replication and repair.
5. familiarize with gene regulation.

SYLLABUS

| Unit | Content | No. of Hours |
|------------|---|--------------|
| I | WATER RELATIONS: Properties of water imbibition, diffusion, osmosis and plasmolysis ascent of sap, mechanism of water absorption active and passive, apoplast and symplast pathway. Transpiration types and factors affecting transpiration and significance. Opening and closing of stomata-mechanisms and theories of transpiration. | 15 |
| II | PHOTOSYNTHESIS: Radiant energy, Photosynthetic unit, photosynthetic pigments and their role, photosystems, path of carbon in photosynthesis Light reaction, electron transport system in the chloroplast (Z-Scheme). Dark reaction - C3 cycle, C4 cycle, CAM pathway, Photo respiration | 15 |
| III | RESPIRATION: Aerobic, Glycolysis, Krebs Cycle, Electron Transport System, oxidative phosphorylation, respiratory quotient, Anaerobic fermentation Respiratory quotient. NITROGEN METABOLISM: Biological nitrogen fixation, nitrogen cycle. | 15 |
| IV | GROWTH: Growth plant growth regulators (auxins, gibberellins, cytokinins, ethylene and abscisic acid) - Practical applications - Photo morphogenesis – photo periodism – vernalization – dormancy- phytochromes. Stress Physiology: Concepts of plant responses to stresses (water, salt, temperature). | 15 |
| V | PLANT BIOCHEMISTRY: Classification, properties of carbohydrates, proteins, lipids and nucleic acids. Enzyme – properties – classification – nomenclature of enzymes – mode of enzyme action – factors influencing enzyme action. | 15 |

Textbook:

1. Noggle and Fritz. 1976. Introductory Plant Physiology, Prentice Hall, New Delhi.
2. Pandey, SN and Sinha, BK. 1989. Plant Physiology, Vikas Publishing House Ltd., New Delhi.
3. Robert M. Devlin. 1970. Plant Physiology, East West Press, New Delhi.
4. Westhoff, P. 1998. Molecular Plant Development from Gene to Plant. Oxford University Press, Oxford, UK.
5. Jain, J.L. 1979. Fundamentals of Biochemistry, Chand & Co. Ltd., New Delhi.
6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd., New Delhi.
7. Conn, E and Stumpf, P.K. 1979. Outline of Biochemistry Niley Eastern Ltd., New Delhi.
8. Metz, E.T. 1960. Elements of Biochemistry. V.F&S (P) Ltd., Bombay.
9. Verma, V. 2008. Textbook of plant Physiology, Ane's student edition, New Delhi. [Verma P.S and Agarwal V.K. 2010. Molecular Biology. S Chand Publishers.](#)

References:

1. Buchanan, B.B., Gruissem, W and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, Maryland, USA.
2. Dennis, D.T., Turpin, D.H., Lefebvre, D.D and Layzell, D.B. (Eds) 1997. Plant Metabolism (second edition). Longman Essex, England.
3. Galston, A.W. 1989. Life Processes in Plants. Scientific American Library, Springer-Verlag, New York, USA.
4. Hooykaas, P.J.J., Hall M.A and Libbenga, K.R. (eds). 1999. Bio chemistry and Molecular Biology of Plant Hormones, Elsevier, Amsterdam, The Netherlands.
5. Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
6. Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones (second edition). Springer-Verlag, New York, USA.
14. Nobel, P.S. 1999. Physio chemical and Environmental Plant Physiology (second edition), Academic Press, San Diego, USA.
15. Salisbury, F. and Ross, C.W. 1992. Plant Physiology (4th edition). Wadsworth Publishing Co., California, USA.
16. Singhal, G.S., Renger, G., Sopory, S.K., Irrgang, K.D and Govindjee. 1999. Concepts in Photobiology: Photosynthesis and Photomorphogenesis. Narosa Publishing House, New Delhi.
17. Taiz, Land Zeiger, E. 1998. Plant Physiology (2nd edition). Sinauer Associates, Inc., Publishers, Massachusetts, USA.
18. Thomas, B and Vince-Prue, D. 1997. Photoperiodism in Plants (second edition). Academic Press, San Diego .USA. Bernard R Glick and Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C.
19. Jogdand, SN. 1997. Gene biotechnology, Himalaya Publishing House, New Delhi.

Webresources:

1. <https://www.kobo.com/us/en/ebook/biochemistry-and-molecular-biology-of-plants>
2. <https://www.amazon.in/Plant-Biochemistry-Hans-Walter-Heldt-ebook/dp/B004FV4RS6>
3. <https://www.kobo.com/us/en/ebook/plant-biochemistry>
4. <https://www.kobo.com/us/en/ebook/a-textbook-of-plant-physiology-15>
5. <https://www.amazon.in/Advances-Plant-Physiology-P-Trivedi-ebook/dp/B01JP5L0YA>
6. <https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692>

Pedagogy: Teaching/Learning methods

Lecture, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar

Course Outcomes

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

| Course outcomes: CO | On completion of this course, the students will be able to: | Programme outcomes |
|----------------------------|---|---------------------------|
| CO1 | Relate to water relation of plants with respect to various physiological phenomenon. | K1 |
| CO2 | Explain the process and significance of photosynthesis and respiration. | K2 |
| CO3 | Elucidate properties of nutrients and their deficiency symptoms in plants. | K3 |
| CO4 | Analyze the biological role of plant growth regulators, carbohydrates, proteins, lipids, nucleic acids and enzymes. | K4 |
| CO5 | Decipher the phenomenon of seed dormancy and germination in plants. | K5&K6 |

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 1 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---|---------------------------|----------------|
| VI | 23U6BOCP6 | PRACTICAL COVERING-CORE VII & VIII - P RACTICAL – VI | 5 | 4 |

Nature of the course

| | | | |
|--|---|-------------------------------------|---|
| Employability Oriented | √ | Relevant to Local need | √ |
| Entrepreneurship Oriented | √ | Relevant to regional need | |
| Skill development Oriented | √ | Relevant to national need | √ |
| Addresses Gender Sensitization | | Relevant to Global development need | |
| Addresses Environment and Sustainability | | Addresses Professional Ethics | |
| Addresses Human Values | | | |

Course Objectives

The main objectives of this course are to:

1. to study morphological and anatomical adaptations of plants of various habitats.
2. to demonstrate techniques of plant tissue culture
3. to familiarize the structure of DNA, RNA
4. to carryout experiment related with plant physiology
5. to perform biochemistry experiments.

| EXPERIMENTS | |
|--------------------|--|
| | Content |
| I | <p>ECOLOGY & PHYTOGEOGRAPHY</p> <ol style="list-style-type: none"> 1. Study of morphological and anatomical adaptations of locally available hydrophytes, xerophytes, mesophytes and halophytes and correlate to their particular habitats. Hydrophytes : <i>Nymphaea</i>, <i>Hydrilla</i> Xerophytes : <i>Nerium</i>, <i>Casuarina</i> Mesophytes : <i>Tridax</i>, <i>Vernonia</i> Halophytes : <i>Avicennia</i>, <i>Rhizophora</i> Epiphytes: <i>Vanda</i> 2. Map of the phytogeographical regions of India. 3. Quadrant study and line transect. 4. Plan for a green building. 5. Field trip to any one scrub jungle or wetland (Gulf of Mannar marine National park/ Nanmangalam Scrub jungle/ Pallikaranai Marsh / Picchavaram Scrub / Vedanthangal Bird Sanctuary / Kelampakkam Marsh / Adyar Poonga). |
| II | <p>PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY</p> <ol style="list-style-type: none"> 1. Determination of water potential by plasmolytic method. 2. Effect of chemicals on membrane permeability. 3. Effect of environmental factors on rate of transpiration by gravimetric method. 4. Separation of plant pigments by paper chromatography. 5. Separation of amino acids by using paper chromatography 6. Study the rate of photosynthesis under different light intensities by using Willmott's bubble counter. 7. Study of rate of photosynthesis under different wavelengths (red & blue) of light. 8. Comparison of rate of respiration of different respiratory substrates. 9. Measurement of pH of expressed cell sap and different soils using pH meter. |

| | |
|------------|---|
| III | DEMONSTRATION – EXPERIMENTS <ol style="list-style-type: none">1. Study the rate of transpiration by using Ganong's photometer2. Demonstration of stomatal movement.3. Induction of roots in leaves by auxins |
|------------|---|

Text books

1. Sharma, P.D. 2017. Ecology and Environment- Rastogi Publication, Meerut.
2. Bhojwani, S.S and Razdan, M.K. 1996. Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Jackson, S.A., Kianian, S.F., Hossain, K.G and Walling, J.G. 2012. Practical laboratory exercises for plant molecular cytogenetics. In Plant Cytogenetics (pp. 323-333). Springer, New York.
4. Plummer, D. 1988. An introduction to Practical Biochemistry, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Palanivelu, P. 2004. Laboratory Manual for analytical biochemistry and separation techniques, School of Biotechnology, Madurai Kamaraj University, Madurai.
6. Jayaraman, J. 1981. Laboratory Manual in Biochemistry. Wiley Eastern Limited, New Delhi.
7. Bendre, A.M. and Ashok Kumar, 2009. A text book of practical Botany. Vol. I & II. Rastogi Publication. Meerut. 9th Edition.

Books for references

1. Mick Crawley. 1996. Plant Ecology, 2nd Edition Wiley-Blackwell.
2. Gamborg, O.L and G.C. Phillips (eds). 1995. Plant cell, tissue and organ culture. Springer Lab Manual.
3. Glick, B.R and J.E. Thompson. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.
4. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. 2013. Practicals in plant physiology and biochemistry. Scientific Publishers (India).
5. Wilson, K and J. Walker (Eds). 1994. Principles and Techniques of Practical Biochemistry (4th Edition) Cambridge University Press, Cambridge.
6. Bendre, A.M and Ashok Kumar. 2009. A text book of practical Botany. Vol. I & II. Rastogi Publication. Meerut. 9th Edition.
7. Manju Bala, Sunita Gupta, Gupta, N.K. 2012. Practicals in Plant Physiology and Biochemistry. Scientific Publisher.

Web resources

1. <https://www.amazon.com/Practical-plant-ecology-beginners-communities/dp/B00088FDQK>
2. <https://www.amazon.in/Practical-Biotechnology-Plant-Tissue-Culture/dp/8121932009>
3. <https://www.elsevier.com/books/molecular-biology-techniques/carson/978-0-12-815774-9>
4. <https://www.amazon.in/Practical-Physiology-Biochemistry-Sunita-Sangha/dp/9386102633>
5. <https://www.amazon.in/Practical-Biochemistry-Muriel-Wheldale-Onslow/dp/1107634318>

Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | Relate to the distribution and adaptations of plants pertaining to their habitat | K1 |
| CO2 | Demonstrate skills in green planning and callus culture. | K2 |
| CO3 | Elucidate the basic principles involved in the plant physiology and biochemistry experiments. | K3 |
| CO4 | Appreciate the structure and functions of DNA and RNA. | K4 |
| CO5 | Estimate the biochemical components and determine the factors controlling photosynthesis and transpiration of plants | K5 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze; K5 – Evaluate; K6 – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 1 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| CO 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

S-Strong (3)

M-Medium (2)

L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--|---------------------------|----------------|
| VI | 23U6BOEL3A | Majopr Elective III – PLANT BIOTECHNOLOGY | 5 | 3 |

Nature of the course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | ✓ | Employability Oriented | ✓ | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | ✓ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | ✓ | Addresses Environment and Sustainability | ✓ |
| Relevant to Global need | ✓ | | | Addresses Human Values | ✓ |

Course Objectives

The main objectives of this course are to:

- 1.know various aspects of biotechnology
- 2.know the concept and techniques of plant tissue culture.
- 3.familiarize with the gene transfer techniques.
- 4.know about dna replication and repair.
5. Know various aspects of biofertilizers and biopesticides

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | INTRODUCTION OF BIOTECHNOLOGY Biotechnology – definition, history and scope. Application of plant biotechnology- Medicine–Antibiotics (Penicillin) Recombinant vaccines, insulin and interferons. Industry – ethanol production (yeast), citric acid production(<i>Aspergillusniger</i>) and Proteases production(<i>Bacillussp</i>). | 15 |
| II | PLANT TISSUE CULTURE Plant tissue culture - introduction, history, scope and importance, basic requirements for tissue culture. Laboratory, Maintance of aseptic condition. Totipotency, M.S Mediapreparation-- Sterilization of explant -inoculation of explant - Callus induction –regeneration of plants from callus-organogenesis –embryogenesis method. Micropropagation. Artificial seeds. | 15 |
| III | VECTORS Vectors- plasmid, bacteriophage, viral vectors, cosmids. Restriction enzymes. Recombinant DNA technology, gene transfer – indirect method, <i>Agrobacterium</i> mediated gene transfer Pros and cons of GM food. Trangenicplants. | 15 |
| IV | GENETIC MATERIALS Nature and function of genetic materials, Nucleic acid–base paring–Chargaff’s rule, DNA–structure.T ypes, denaturation- renaturation. Replication of DNA in prokaryotes. RNA structure and types. DNA repair mechanism.applications of genetic engineering. | 15 |

| | | |
|----------|---|----|
| V | BIOTECHNOLOGY IN AGRICULTURE Biofertilizers–General account on microbes used as biofertilizer for crops-. Biological nitrogen fixation –Mass production of <i>Rhizobium</i> , Mechanism - <i>nif</i> gene. Mass production of <i>BGA</i> and <i>Anabaena azollae</i> . Biological control of crop pest-predators-parasitoids- bacterial pesticides- fungal biopesticide . | 15 |
|----------|---|----|

Textbook:

1. Bhajwani, S and Razdan, 1984. Plant tissue culture. Theory and practice.
2. Ignacimuthu, S.J. 2003. Plant Biotechnology. Oxford & IBH Publishing, New Delhi.
3. Bhojwani, S.S and Razdan, M.K. 2004. Plant Tissue Culture, Read Elsevier India Pvt. Ltd.
4. Purohit, S.S. 2010. Plant tissue culture, Student edition, Jodhpur.
5. Bajaj, Y.P.S. 1987. Biotechnology in agriculture and forestry. Springer-Verlag.

References:

1. Halder, T and Gadgil, V.N. 1981. Plant cell culture in crop improvement. Plenum, New York.
2. Neuman, K.H., Barz, W and E. Reinhard. 1985. Primary and secondary metabolism of plant cell cultures– Springer– Verlag, Berlin.
3. Barz, W., Reinhard, E and Zenk, M.H. 1977. Plant tissue culture and its
4. Biotechnology application– Springer– Verlag, Berlin.
5. Hu, C.Y and P.J. Wang. 1984. Handbook of plant cell culture Vol.1. Macmillan, New York.
6. Hammond, J.C. McGarvey and V. Yusibov. 2009. Plant Biotechnology, Springer Verlag. New York.

Web resources:

1. <http://www.freebookcentre.net/Biology/BioTechnology-Books.html>
2. https://books.google.co.in/books/about/Introduction_to_Plant_Biotechnology.html?id=RgQLISN8zT8C
3. <https://www.kobo.com/us/en/ebook/plant-biotechnology-1>
4. <https://www.kobo.com/us/en/ebook/plant-biotechnology-1>
5. <https://www.worldcat.org/title/molecular-biology/oclc/1062496183>

Pedagogy: Teaching/Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------|---|-----------------|
| CO1 | Recognize the fundamentals concepts of plant biotechnology | K1 |
| CO2 | Develop the competency on different types of plant tissue culture. | K2 |
| CO3 | Elucidate gene cloning and evaluate different methods of gene transfer. | K3 |
| CO4 | Analyze the major concerns and applications of genetic engineering. | K4 |
| CO5 | Develop the competency on different types of biofertilizers | K5 |

Cognitive Level: **K1** -Remember; **K2**-Understanding; **K3**-Apply; **K4** -Analyze; **K5**-Evaluate; **K6**-Create.

Mapping of Course Outcomes with Programme Outcomes

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-------------|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 1 | 3 |
| CO 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 |
| CO 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | 3 | 3 |
| CO 4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 |
| CO 5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3)

M-Medium (2)

L-Low (1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|------------------------------------|---------------------------|----------------|
| I | 23U6BOEL3B | Majopr Elective III – SEED BIOLOGY | 5 | 3 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to Regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to National need | √ | Addresses Human Values | |
| | | Relevant to Global development need | | Addresses Professional Ethics | √ |

Course Objectives

The main objectives of this course are to:

1. To study the morphology, structural details of economically important seeds.
2. To know about chemical composition and seed germination techniques.
3. To Perform seed germination test.
4. To Understand seed viability, tetrazolium test and seed vigour test.
5. To Learn dormancy, it's various kinds and significant factors to break dormancy.

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | INTRODUCTION TO SEED BIOLOGY: Morphology and structural details of seeds: Cereals : Paddy / Wheat Pulses : Dolichos /Glycine Oil seeds : Castor Fibers : Cotton Vegetables : Cucurbita Study on importance of seed. | 15 |
| II | SEED GERMINATION: Chemical composition of seeds mentioned above. Germination - General account. Factors affecting germination. Changes that take place during germination (physical and chemical) Treatments given to quicken germination. | 15 |
| III | SEED GERMINATION TEST AND EVALUATION: Seed germination test under laboratory conditions. Using paper (BP & TP) sand and soil. The environmental test conditions also are discussed. Evaluation of germination test. | 15 |
| IV | SEED VIABILITY: Seed viability; Topographical Tetrazolium Test. Preparation of solution and methods of application & evaluation. Seed vigour: Concept, Direct and Indirect vigour tests. | 15 |
| V | SEED DORMANCY: Dormancy – Primary and secondary dormancies. Significance, factors involved, methods used to break dormancy. | 15 |

Recommended Text:

1. Mayer A. M & Poljakoff Mayer. 1975. Germination of seeds. Springer. Pergamon Press, Oxford—New York—Toronto—Sydney—Paris
2. Bryant, J. A. 1985. Seed physiology —Edward Arnold. London.
3. Agarwal, R.L. 1982. Seed Technology -. Oxford and IBH Publishing Company, New Delhi.
4. Bewley, J.D and M. Black. 1978. Seed Biology Vol. I & II Academic press, New York.
5. Agarwal, R.L. Seed Technology. 2020. CBS Publishers and Distributors Pvt Ltd. Reference Books:

Reference Books

1. Mayer, AM and Poljakoff-Mayber, A. 1989. The Germination of Seeds 4th edn. Pergamon Press, England.
2. Baskin, C.C and Baskin, J.M. 2001. Seeds: Ecology, Biogeography and Evolution of Dormancy and Germination, Academic Press, San Diego.
3. Bedell, PE. 1998. Seed Science and Technology: Indian Forestry Species. Allied Publishers Limited, New Delhi.
4. Bewley, J.D and Black, M. 1994. Seeds: Physiology of Development and Germination. 2nd edn. Plenum Press, New York.
5. Khan, A.A. (Latest Edition) (Ed.). 1977. The Physiology and Biochemistry of seed Dormancy and germination. North-Holland Publishing Company: Amsterdam New York- Oxford.

Web resources

1. https://swayam.gov.in/nc_details/NPTEL
2. <https://swayam.gov.in/NPTEL> 3
3. <https://swayam.gov.in/explorer>
4. <https://www.classcentral.com/course/swayam-principles-of-seed-technology-17741>
5. <https://www.classcentral.com/course/swayam-plant-groups-19787> 6
6. <https://www.kanchiuniv.ac.in/assets/SWAYAM-BOOKLET.pdf> 7. <https://www.hindiyojana.in/swayam-free-online-course-registration/> 8 7. https://www.aicte-india.org/sites/default/files/SWAYAM_1.pdf

Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content Seminar)

Course Outcomes

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

| Course outcomes: | On completion of this course the student will be able to | Programme outcomes |
|------------------|---|--------------------|
| CO1 | Understand seed biology and morphology of different seeds. | K1 & K2 |
| CO2 | Learn about seed viability test (Tetrazolium test), seed vigour concepts . | K3 |
| CO3 | Know about chemical composition of the above seeds, their germination, factors affecting it and treatment to quicken germination. | K4 |
| CO4 | Gain knowledge on various seed germination tests. seed germination. | K5 |
| CO5 | Overview what is dormancy, its kind, significance and how to break it. | K6 |
| CO1 | Understand seed biology and morphology of different seeds. | K1 & K2 |

Cognitive Level: K1 - Remember; K2 - Understanding; K3 - Apply; K4 - Analyze;

K5 – Evaluate; K6 – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |

S-Strong (3)

M-Medium (2)

L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|---------------------------------|---------------------------|----------------|
| VI | 23U6BOEL4A | Major Elective - IV FORESTRY | 4 | 3 |

Nature of the course

| | | | | | |
|---------------------------|---|----------------------------|---|---|---|
| Relevant to Local need | ✓ | Employability Oriented | ✓ | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | ✓ | Addresses Environment and Sustain ability | ✓ |
| Relevant to Global need | ✓ | | | Addresses Human Values | ✓ |

Course Objectives

The main objectives of this course are to:

1. To study the distribution pattern, composition and diversity of forest ecosystem
2. To understand the method of forest management principles and conservation
3. To enable them to meaningfully contribute in the forest conservation
4. To raise student awareness of the need to create a sustainable way of living and the current global issues with forestry caused by human interference
5. To provide a platform to appreciate biodiversity and the importance

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | FORESTS AND BIODIVERSITY: Forests - definition. Extent of forests in India and other countries. Classification of India's forests. Forest types of India and Tamil Nadu. Role of forests. Factors of locality - climatic - edaphic - topographic - biotic - interaction of forest with the environment. Biodiversity - Definition, origin, types - factors endangering biodiversity - biodiversity hotspots - endemism - Red Data Book. | 12 |
| II | FOREST ECOLOGY: Forest ecology - definition - biotic and abiotic components - forest ecosystem - forest community - concepts - succession - primary productivity - nutrient cycling. Composition of forest types in India - species composition - association and diversity. Restoration ecology - global warming - green house effects - ozone layer depletion - acid rain - role of trees in environmental conservation. | 12 |
| III | SILVICULTURE: Silviculture - objectives - scope - general principles. Regeneration of forests - natural and artificial. Nursery techniques - containerized seedling production. Vegetative and clonal propagation techniques and methods - macro and micro propagation techniques. Forest Genetics and Tree Breeding - Definition and concepts - Steps in tree improvement. | 12 |

| | | |
|-----------|---|----|
| IV | AGROFORESTRY AND SOCIAL FORESTRY: Agroforestry - definition, concept and objectives. Classification of agroforestry systems - primary systems and subsystems - inheritance effects. Ecological aspects of agroforestry - benefits and limitations of agroforestry. Social forestry - objectives and scope and necessity - its components and implementation in local and national levels - social attitudes and community participation. | 12 |
| V | FOREST UTILIZATION: Forest products - Timber, fuel, pulp, paper, rayon and match. Wood Composites - plywood, particle board, fiber boards, hardboard, insulation boards - production technology. Non timber forest products (NTFPs) - collection - processing and storage of NTFPs. Gums and resins - dyes - lac and shellac. | 12 |

Textbooks:

1. Manikandan, K and S. Prabhu. 2013. Indian forestry, a breakthrough approach to forest service. Jain Bros.
2. Roger Sands. 2013. Forestry in a global context, CAB international.
3. Balakathiresan. S. 1986. Essentials of Forest Management. Natraj Publishers, Dehradun.
4. Agarwala, V.P. 1990. Forests in India, Environmental and Protection Frontiers. Oxford & IBH Publishing Co. New Delhi.
5. Chundawat, B.S. and Gautham, S.K. 1996. Text book of Agro forestry. Oxford and IBH publisher, New Delhi.
6. Singhi, G.B. 1987. Forest Ecology of India, Publisher: Rawat.
7. Ramprakash. 1986. Forest management. IBD Publishers, Dehra Dun.
8. Tiwari, K.M. 1983. Social forestry in India. Nataraj Publishers, Dehra Dun.
9. Mehta, T. 1981. A handbook of forest utilization. Periodical Expert Book Agency, New Delhi.
10. Nair, N.C and Henry, A.N. 1983. Flora of Tamilnadu, India. Vol.1-III. BSI, Coimbatore, India.

References:

1. Donald L. Grebner, Jacek P. Siry and Pete Bettinger. 2012. Introduction to forestry and Natural resources Academic Press.
2. West, P.W. 2015. Tree and forest measurement, Springer international publishing Switzerland.
3. Kollmann, F.F.P and Cote, W.A. 1988. Wood Science & Technology. Springer Verlag, New York.
4. Agarwala, V.P. 1990. Forests in India, Environmental and Protection Frontiers. Oxford IBH Publishing Co., New Delhi.
5. Rao, K.R. and Juneja, K.B.S. 1992. Field identification of 50 important timbers of India. ICFRE Publi. Dehradun 123 p.

Webresources:

1. http://www.wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2006/10/19/000112742_20061019150049/Rendered/PDF/367890Loggerheads0Report.pdf.
2. <https://www.britannica.com/science/forestry>
3. <https://en.wikipedia.org/wiki/Forestry>.
4. <https://www.biologydiscussion.com/forest/essay-forest-importance.major-products-and-its-conservation/25119>
5. <https://academic.oup.com>
6. <https://www.cbd.int/development/doc>.
7. <https://www.sciencedirect.com/topics/agriculture-and-biological-science-forest-product>.

Pedagogy: Teaching/Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content, Seminar

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|--|------------------------|
| CO1 | Relate to the basic concepts related to forest distribution, degradation, protection, management and resource utilization | K1 |
| CO2 | Understand complex interactions of humans and forest ecosystems in a global context | K2 |
| CO3 | Demonstrate skills for ecological measurements and interpretation of forest ecology management | K3 |
| CO4 | Examine and decipher the factors influencing forest vegetation, forest degradation and methods of wood preservation | K4 |
| CO5 | Develop new strategies and apply the knowledge gained for problem-solving analysis in the conservation and management of forest ecosystems | K5 & K6 |

Cognitive Level: **K1**- Remember; **K2**-Understanding; **K3**-Apply; **K4**-Analyze; **K5** – Evaluate; **K6** – Create

Mapping of Course Outcomes with Programme Outcomes

| PO CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|------------------|------------|------------|------------|------------|------------|
| CO1 | 3 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 2 | 3 | 1 | 2 |
| CO5 | 3 | 2 | 1 | 3 | 1 |

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|-----------|-------------------|--|---------------------------|----------------|
| VI | 23U6BOEL4B | Major Elective - IV BIONANOTECHNOLOGY | 4 | 3 |

Nature of the course

| | | | | | |
|---------------------------|---|----------------------------|---|--|---|
| Relevant to Local need | ✓ | Employability Oriented | ✓ | Addresses Professional Ethics | |
| Relevant to national need | | Entrepreneurship Oriented | ✓ | Addresses Gender Sensitization | |
| Relevant to regional need | | Skill development Oriented | ✓ | Addresses Environment and Sustainability | ✓ |
| Relevant to Global need | ✓ | | | Addresses Human Values | ✓ |

Course Objectives

The main objectives of this course are to:

1. To enable the students understand and appreciate the various applications of nanoparticles.
2. To give perspective to researchers and students who are interested in nanoscale physical and biological systems and their applications in medicine.
3. To introduce the concepts in nanomaterials and their use with biocomponents to synthesize and interact with larger systems.
4. To impart knowledge on the most recent molecular diagnostic and therapeutic tools used to treat various diseases.

| SYLLABUS | | |
|-----------------|--|---------------------|
| Unit | Content | No. of Hours |
| I | INTRODUCTION TO NANOTECHNOLOGY: History, Concepts, Prospects and Challenges. Scope of nanotechnology in Indian and global perspectives. Definition - Nanoscience, Nanotechnology. Classification based on the dimensionality- Overview of nanoparticles, nanoclusters - nanotubes, nanowires and nanodots. | 15 |
| II | SYNTHESIS OF NANOPARTICLES: Synthesis of nanoparticles - Top down and bottom up approach. Methods of synthesis: Physical, Chemical reduction – reducing agents, capping agents, stabilizing of nanoparticles and Biological – Novel synthetic methods using plant extracts, bacteria and fungi. | 15 |
| III | FOREST UTILIZATION AND WOOD TECHNOLOGY: Characterization of nanoparticles using UV-Visible spectroscopy, SEM, TEM, Atomic force microscopy, X-ray Crystallography | 15 |
| IV | NANOCARRIERS: Introduction. Nanocarriers for drug delivery (DDS) – Polymeric nanotubes and solid lipid nanoparticles (SLN) as carriers, controlled release, site specific targeting. Magnetic nanoparticles as drug carriers and its applications. | 15 |
| V | APPLICATIONS OF NANOPARTICLES: Textiles, Food industry - nutraceutical, Medicine - antimicrobial activity, wound healing and dressing; Environment – green manufacturing. Agriculture - nanofertilizers and nanopesticides. Smart biosensors – Components and its application. | 15 |

TOPICS FOR SELF-STUDY

Nanofertilizers

Textbook:

1. Charles, P. Poole, Jr. & Frank J. Owens. 2003. Introduction to Nanotechnology, A John Wiley & Sons, INC., Publication.
2. George, K. Knopf & Amarjeet S. Bassi. 2006. Smart Biosensors. CRC Press.
3. Pradeep, T. 2007. Nano: The Essentials, Understanding Nanoscience and
4. Sulabha, K. Kulkarni. 2007. Nanotechnology: Principles and Practices. Capital
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Web resources:

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Pedagogy: Teaching / Learning methods

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|------------------|---|------------------------|
| CO1 | Recognize advanced resources for accessing scholarly literature from the internet. | K2 |
| CO2 | Explain the concept of databases and use of different public domain for DNA and proteins sequence retrieval. | K1 |
| CO3 | Apply various software resources with advanced functions to carry out analysis of data procured through research. | K4 |
| CO4 | Decipher the effective utilization of bibliography management software while typing and downloading citations. | K3 |
| CO5 | 5. Determine how the knowledge gained can be used for designing experiments and data interpretation. | K6 |

Cognitive Level: K1 - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

Mapping of Course Outcomes with Programme Outcomes

| PO CO | PO1 | PO2 | PO3 | PO4 | PO5 |
|--------------|------------|------------|------------|------------|------------|
| CO1 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 |

S-Strong (3) M-Medium(2) L-Low(1)

| Semester | Course Code | Course Title | Hours of Teaching / Cycle | No. of Credits |
|----------|-------------|--|---------------------------|----------------|
| VI | 23U6BOSEC2 | Skill Enhancement Course – Training for Competitive examinations | 2 | 2 |

Nature of the course

| | | | | | |
|----------------------------|---|-------------------------------------|---|--|---|
| Employability Oriented | √ | Relevant to Local need | √ | Addresses Gender Sensitization | |
| Entrepreneurship Oriented | √ | Relevant to regional need | | Addresses Environment and Sustainability | √ |
| Skill development Oriented | √ | Relevant to national need | | Addresses Human Values | √ |
| | | Relevant to Global development need | √ | Addresses Professional Ethics | |

Course Objectives

The main objectives of this course are to:

1. To develop the student for competitive examination.
2. To select the important topics as far as possible, with reference to the examination point of view. It gives a comprehensive account of botany.
3. To understand not only the basics of botany and also gives the broader perspective to prepare for the competitive examinations.
4. The essays give a detailed account of each aspect of botany to help students preparing for IAS, IFS and state civil services.
5. General understanding of plants around us, the different biophysical and biochemical processes that occur within them and their importance to human life.

| SYLLABUS | | |
|----------|--|--------------|
| Unit | Content | No. of Hours |
| I | <p>PLANT WORLD: Plant science and its branches . Five kingdom classification. Outline of Kingdom plantae General characters and Economic importance of Algae, Fungi and Lichens.</p> <p>GENERAL CHARACTERS OF PLANT GROUPS: General characters and Economic importance of Bryophytes, Pteridophytes and Gymnosperms.</p> <p>PLANT MORPHOLOGY AND TAXONOMY: Root system and shoot system. Modifications (Pneumatophore, Stilt root, Epiphytic root, Cladode, Phylloclade ,Pitcher and Phyllode) Parts of a flower - Fruits types(Outline) Parthenocarpy- Pollination – types, Seed dispersal – types, Seed Germination types. Taxonomy –definition. Types of classification- Taxonomic hierarchy, ICN, Binomial nomenclature and BSI. Herbarium and Major Herbaria of the world.</p> | 6 |

| | | |
|----|---|---|
| II | CYTOLOGY AND GENETICS: Cell –Prokaryotic and Eukaryotic – Cell organelles with functions . DNA and RNA (Basic concepts) -Cell division and its significance -Mitosis and Meiosis (outline) ECOLOGY AND BIODIVERSITY: Ecosystem – abiotic and biotic components. Energy flow in an ecosystem, Aforestation, Deforestation- Chipko movement –Forest Conservation act- Pollution types and effects- Eutrophication, Global warming ,Ozone depletion, Climate change. Biodiversity and types- Hot spots, Mega diversity countries, Conservation – <i>ex situ</i> and <i>in situ</i> methods. Endangered plants and Red data Book. | 6 |
|----|---|---|

Textbook:

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6. Power, C.B and Daginawa, H.F. 2010. General Microbiology : [Himalaya Publishing House Pvt Ltd](#),
7. Rangasamy, G. 2006. Disease of crop plants in India (4th edition). Tata Mc Graw Hill New Delhi.

Web resources:

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2. <https://www.amazon.in/Botany-Competitive-Examinations-UPSC-Indian-Competitive/dp/B08VWB64BC>
3. <https://www.ssclatestnews.com/botany-book-pdf-free-download-for-competitive-exams/>
4. <https://sscstudy.com/botany-for-competitive-exams-pdf/>
<https://www.amazon.in/Botany-Entrance-Examination-Anupam-Rajak-ebook/dp/B089S1GLMP>

Pedagogy:

Lecture, Tutorial, Assignment, PPT presentation, Quiz, Group Discussion, e-content and Seminar.

Course Outcomes

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

| CO Number | CO Statement | Cognitive Level |
|-----------|---|-----------------|
| CO1 | Identify and define different groups of plants with their taxonomic position. Compare the different groups of plants and evaluate their economic importance. | K1, K2 & K5 |
| CO2 | List down the general characters of Bryophytes, Pteridophytes and Gymnosperms Classify the types of fossils and recognize the fossil beds of Tamil Nadu Analyse and trace the origin of different plant groups using Geological Time scale. | K1,K3 & K5 |
| CO3 | Appreciates the morphology of plant and analyse different modifications of plant organs. Explore the major Herbaria of the world and recognize the importance. | K3 & K5 |
| CO4 | Differentiate Prokaryotic and Eukaryotic cell. Evaluate the significance of cell division. Justify the cause for the sex linked inheritance. Tabulate the different cell organelles with their functions. | K2,K3 &K5 |
| CO5 | Define and appreciates biodiversity. Identify the cause and solve environmental related issues Design eco friendly approaches to protect earth and generate new conservation strategies. | K1, K5& K6 |

Cognitive Level: K1 - Remember; **K2** - Understanding; **K3** - Apply; **K4** - Analyze; **K5** – Evaluate; **K6** – Create

Mapping with Programme Outcomes:

| COs | PO1 | PO2 | PO3 | PO4 | O5 | SO6 | PSO7 | PSO8 | PSO9 | PSO10 |
|-----|-----|-----|-----|-----|----|-----|------|------|------|-------|
| CO1 | 3 | 3 | 1 | 3 | 2 | 1 | 1 | 2 | 3 | 1 |
| CO2 | 3 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 2 | 1 |
| CO3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 3 | 3 | 2 |

S-Strong (3)

M-Medium (2)

L-Low (1)