

**1. GOVERNMENT ARTS COLLEGE (AUTONOMOUS)
COIMBATORE-641 018**

**Learning outcomes-based Curriculum Framework (LOCF)
for**

B.Sc. BOTANY

(Effect from Academic year 2021-2022)



**POSTGRADUATE AND RESEARCH DEPARTMENT
OF BOTANY**

MAY-2021

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Preamble

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. Such changes have gained momentum with the introduction of Choice Based Credit System (CBCS) which further expects learning outcome-based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome-based curriculum will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

Tamil Nadu State Council for Higher Education (TANSCHE) has formed the State Integrated Board of Studies, with great diligence and expertise has devised the mandatory areas that have to be covered for three-year under graduation and two-year post graduation courses to realize the facilitation of the mobility of faculty and students from one university to another and to easily solve the problem of equivalence among courses. Great care has been taken so that these areas would take 75% of the course content and the remaining 25% can be decided by the individual institutions. The areas that must be covered by the student that are mandatory for earning the degree to have due value has been worked out so that the student will gain enough depth of knowledge in the subject concerned. 25% percent of the syllabus should be designed by the institutions, and the areas covered under this also must have a weightage of 25%. This gives the autonomous institution seamless liberty on every Board of Studies (BOS) to innovate and experiment, and more importantly, it is here that the institution devises appropriate strategies by which (i) to make creative and critical applications of what has been learnt in the mandatory components, and (ii) to meaningfully connect the learners to the career demands and expectations. It is essential that the theoretical subject knowledge of the students must be translated into practical hands-on experience.

One of the significant reforms in the undergraduate education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the country which will help the students to ensure similar quality of education irrespective of the institute and location. With initiatives of University Grants Commission (UGC) for nation-wide

adoption and implementation of the LOCF for bachelor's programmes in colleges, universities and HEIs in general. A Core Expert Committee (CEC) was constituted to formulate the modalities for developing the LOCF in various subjects being taught in the undergraduate courses in sciences, humanities, commerce and professional courses. The CEC also constituted the Subject Expert Committees (SEC) in various subjects to prepare detailed guidelines for the LOCF in subjects concerned.

The key components of the planning and development of LOCF are given in terms of clear and unambiguous description of the Graduate Attributes (GA), Qualification Descriptors (QD), Program Learning Outcomes (PLO) and Course Learning Outcomes (CLO) to be achieved at the end of the successful completion of each undergraduate program to be offered by HEIs.

The Qualification Descriptors (QD), Program Learning Outcomes (PLO) and the Course Learning Outcomes (CLO) were also finalized keeping the broad requirement of the programme in view. The LOCF also gives general guidelines for the Teaching Learning Process (TLP) corresponding to each component of theory, experiment, tutorials, projects and industrial / field visits to be followed in order to achieve the stated outcomes for each component. Finally, some suggestions for using various methods in the assessment and evaluation of learning levels of students are also made.

INTRODUCTION

This curriculum framework for the bachelor-level program in Botany is developed keeping in view of the student centric learning pedagogy, which is entirely outcome-oriented and curiosity-driven. To avoid rote -learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum framework focuses on pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for botany-related careers, careers with general graduate-level aptitude and for higher education in Botany and allied subjects.

Augmented in this framework are graduate attributes including critical thinking, basic psychology, scientific reasoning, moral ethical reasoning and so on, qualification descriptors that are specific outcomes pertinent to the discipline of botany, learning outcomes have been developed, learning outcomes for individual courses, pedagogical methods and assessment methods. While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates.

In line with recent trends in education section, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework pragmatic to the core; it is designed such a way to enable the learners implementing the concepts to address the realworld problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west; for example, biodiversity and conservation of endemic and threatened species that are found in India, Indian climatological variables, Indian biodiversity and so on. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational skepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

Aims:

1. To transform curriculum into outcome-oriented scenario
2. To develop the curriculum for fostering discovery-learning
3. To equip the students in solving the practical problems pertinent to India
4. To adopt recent pedagogical trends in education including e-learning, flipped class, hybrid learning and MOOCs

5. To mold responsible citizen for nation-building and transforming the country towards the future

Course Structure – Types of Courses.

The following types of courses are offered under CBCS-LOCF:

- a) **Core Courses (CC).** A core course is a compulsory discipline specific course. A student of Botany has to take 12 such Botany theory courses and 4 such practical courses over six semesters.
- b) **Elective Courses (EC).** An elective course is a course that is to be chosen from a specified set of courses. These courses are of two types. Which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
 - i. **Discipline Specific Electives (DSE)/Allied Course.** These are elective courses that provide advanced undergraduate training in specialized areas of Botany. A set of four semester-specific, courses of this kind are offered in the First through fourth semester of the Undergraduate programme, Botany.
 - ii. **Project.** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate as a team studies such a course on their own with an advisory support by a teacher/faculty member is called dissertation/project. Such a course is compulsory in sixth semester.
 - iii. **Generic Electives (GE)/Non-Major Elective.** These courses, in disciplines other than Botany, are intended to broaden the training of a student in the Botany Undergraduate programme. A student of Botany will take one such course, offered by another department, in each of Semester V and VI.
- c) **Ability Enhancement Compulsory Course (AECC).** Two such courses are to be taken, one in Semester I (Environmental Studies) and one in Semester II (Value Education– Gandhian Thoughts).
- d) **Skill Enhancement Course (SEC)/Skill Based Subject.** A student is to take one such course each in Semester III through Semester VI.

2.LEARNING OUTCOME BASED CURRICULUM IN B.Sc. BOTANY PROGRAMME

Curriculum is the heart of any educational system. It can be focused either to achieve the objectives of each course of the programme or on the expected learning outcomes from each course. The objective based curriculum refers to the overall targets to be achieved through curriculum which may be long term or immediate. On the other hand, the learning outcome based curriculum is very specific in nature in terms of changes in the cognitive, affective and psychomotor behavior of the students as a result of their exposure to the curriculum. The outcome based curriculum provides the teacher very specific targets which he can achieve through the selected instructional process as compared to the objective based curriculum which provides general outcomes.

The learning outcome based curriculum has very close relationship with the learning of the students whereas objective based curriculum focuses on only providing knowledge to the students. In other words, higher cognitive skills are developed through learning outcome based curriculum. Hence, it is preferred to develop learning outcome based curriculum which will provide specific directions to the teacher with respect to the transaction process and expected changes in the behavior of the students as well.

a. Nature and extent of the B.Sc Botany Programme

Botany, as traditionally delimited epistemologically, is the broad discipline encompassing various subjects involved with the study of plants. Emphasis has been shifted to modern science at the cost of traditional botany. This shift is discussed at various forums. There is need to balance the traditional botany and upcoming modern computational and applied approach. In view of above, adequate balance of topics is proposed displaying latest APG IV based phylogenetic systematics of plants covering higher plants, lower plants, aquatic (fresh and marine water) plants, nature/ field study, functional aspects of various cellular processes of plants, molecular genetics and modern tools i.e. tissue culture, genetic engineering and computational studies are required to be introduced at undergraduate level.

This modified syllabus has been drafted to enable the students to equip for national level competitive exams that they may attempt in future. To ensure implementation of a holistic pedagogical model, several allied disciplines are covered/introduced in this framework, including Chemistry, Mathematics and a number of generic, and ability enhancement electives. In addition, employability of B.Sc. Botany graduate is given due importance such that their

core competency in the subject matter, both theoretical and practical, is ensured. To expand the employability of graduates, a number of skill development courses are also introduced in this framework.

b. Aims of Bachelor's degree programme in Botany

The broad aims of bachelors degree programme in Botany are:

1. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects

2. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.

3. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.

4. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

3. GRADUATE ATTRIBUTES IN B.Sc. BOTANY

The student graduating with the Degree B.Sc (Honours) Botany should be able to acquire

- **Core competency:** Students will acquire core competency in the subject Botany, and in allied subject areas.
 - The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. Algae and Fungi) and higher (Angiosperms and Gymnosperms) plants.
 - Students will be able to use the evidence based comparative botany approach to explain the evolution of organism and understand the genetic diversity on the earth.
 - The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level.
 - Students will be able to understand adaptation, development and behavior of different forms of life.
 - The understanding of network life on earth and tracing the energy pyramids through nutrient flow is expected from the students.
 - Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Botany.
- **Analytical ability:** The students will be able to demonstrate the knowledge in understanding research and addressing practical problems.
- Application of various scientific methods to address different questions by formulating the hypothesis, data collection and critically analyze the data to decipher the degree to which their scientific work supports their hypothesis.
- **Critical Thinking and problem solving ability:** An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinker and acquire problem solving capabilities.
- **Digitally equipped:** Students will acquire digital skills and integrate the fundamental concepts with modern tools.

- **Ethical and Psychological strengthening:** Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.
- **Team Player:** Students will learn team workmanship in order to serve efficiently in the institutions, industry and society.
- **Independent Learner:** Apart from the subject specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes based curriculum would ensure equal academic standards across the country and broader picture of their competencies.

4.QUALIFICATION DESCRIPTORS IN B.Sc.BOTANY PROGRAMME

The qualification descriptors for a Bachelor's degree in Botany may include following:

- (i) To demonstrate a systematic, extensive and coherent knowledge and understanding of academic fields of study as a whole and its applications and links to disciplinary areas of the study; including critical understanding of the established theories, principles and concepts of a number of advanced and emerging issues in the field of Botany.
- (ii) To demonstrate procedural knowledge that creates different types of professionals in the field of Botany i.e. research and development, teaching government and public services. Further application of knowledge can enhance productivity of several economically important product/botanicals. Knowledge of Botany is also necessary for the development and management of forests, parks, wastelands and sea wealth.
- (iii) Develop skills and ability to use knowledge efficiently in areas related to specializations and current updates in the subject.
- (iv) Demonstrate comprehensive knowledge about plants, current research, scholarly and professional literature of advanced Learning areas of Botany.
- (v) Use knowledge understanding and skills for critical assessment of wide range of ideas and problems in the field of Botany.
- (vi) Communicate the results of studies in the academic field of Botany using main concepts, constructs and techniques.
- (vii) Apply one's knowledge and understanding of Botany to new/unfamiliar contexts and to identify problems and solutions in daily life.

5. PROGRAMME LEARNING OUTCOMES IN B.Sc. BOTANY

The programme learning outcomes to B.Sc. Degree in Botany

- will be able to demonstrate:
 - (i) a systematic, fundamental and coherent knowledge and understanding of Botany as a whole and its applications and links to disciplinary areas of the study; including critical understanding of the established theories, principles and concepts of a number of advanced and emerging areas in the field of Botany such as Plant diversity, Functional plant biology, Molecular biology of growth and development and their coexistence in nature since the origin of life to present by interacting with various factors in the changing environment.
 - (ii) the procedural knowledge that creates different types of professionals in the field of Botany like in research and development, teaching government and public services for example, conservationist, plant explorer, ecologist, horticulturist, plant biochemist, geneticist, nursery manager, molecular biologist, plant pathologist, taxonomist, farming consultant and environmental consultant. Further application of knowledge can enhance productivity of several economically important product/botanicals. Knowledge of Botany is also necessary for the development and management of forests, parks, wastelands and sea wealth.
 - (iii) practical skills related to specialization area(s) within botany as well within the subfields of botany (Plant diversity, Plant Molecular development biology, Functional plant biology), and other related fields of study, including broader interdisciplinary subfields (chemistry, agricultural and environmental sciences).
 - (iv) Use, knowledge, understanding and skills to identify the problems faced by various plants and plant communities today and assessment of wide range of ideas and solutions from scholarly and professional literature of advanced learning in the field of Botany such as crop improvement, plant conservation and sustainable ecosystem management.
 - (v) Interpret the results of studies in the academic field of Botany using main concepts, constructs and techniques to the people for the transfer of knowledge, science and technology from laboratory to field.
 - (vi) Apply the disciplinary knowledge and transferable skills for taxonomical identification of suitable medicinal plants and suggest well-defined solutions to common health issues as a complementary and alternative medicine.

(vii) Undertake hands on lab work and activities that help develop practical knowledge and skills, that are required for pursuing career in agricultural, horticultural, phytopharmaceutical industry, teaching, research, environmental monitoring, quality control, consumer goods industry, food products, cosmetics industry, etc. and skills for working safely and competently in the laboratory.

(viii) To think of the adopting expertise in plant structure, functions and solve the problems of environment, ecology, sustainable development, climate change and hunger.

(ix) Demonstrate the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

6. COURSE STRUCTURE IN B.Sc. BOTANY PROGRAMME
UG - SCHEME OF EXAMINATIONS: CBCS & OBE PATTERN
(For the students admitted during the academic year 2021-2022 and onwards)

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext_Min.	Total Pass Mark	Credits
Semester – 1									
I	21TAM11L	Part–I: Language: Tamil I	6	50	50	100	20	40	3
II	21ENG12L	Part–II: English I	6	50	50	100	20	40	3
III	21BBO13C	Core: Paper – I Microbiology and Plant Pathology	6	50	50	100	20	40	4
III	21BZO14A	Allied – 1: Zoology Paper – I	6	30	45	75	18	30	4
		Core: Practical – I (Core Paper – I)	2	Examination during even Semester					
		Allied : Practical – I Zoology	2	Examination during even Semester					
IV	21ENV1GE	Environmental Studies	2	50	50	100	20	40	2
Semester – II									
I	21TAM21L	Part–I: Language: Tamil II	6	50	50	100	20	40	3
II	21ENG22L	Part–II: English II	6	50	50	100	20	40	3
III	21BBO23C	Core: Paper – II Algology, Bryology and Lichenology	4	50	50	100	20	40	4
III	21BBO24C	Core: Paper – III Ecology and Plant Geography	4	50	50	100	20	40	4

III	21BZO25A	Allied – II: Zoology Paper – II	6	30	45	75	18	30	4
III	21BBO26P	Core: Practical – I (Comprised of Core Papers – I, II & III)	2	50	50	100	20	40	3
III	21BZO27P	Allied: Practical – I Zoology (Comprised of Allied Papers – I & II)	2			50	10	20	3
IV	21VAL2GE	Value Education– Gandhian Thoughts	-	50	50	100	20	40	2

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext. Min.	Total Pass Mark	Credits	
Semester – III										
I	21TAM31L	Part–I:Language: Tamil III	6	50	50	100	20	40	3	
II	21ENG32L	Part–II: English – III	6	50	50	100	20	40	3	
III	21BBO33C	Core : Paper – IV Pteridophytes, Gymnosperms and Paleobotany	5	50	50	100	20	40	5	
III	21BCH34A	Allied: III Chemistry Paper – I	5	30	45	75	18	30	4	
		Core: Practical – II (Comprised of Core Paper IV & SBS – I)	2	Examination during even Semester						
		Allied: Practical – II Chemistry	3	Examination during even Semester						
IV	21BBO35S	Skill Based Subject - I: Green Farming	3		25	75	100	30	40	3
Semester – IV										
I	21TAM41L	Part–I:Language: Tamil – IV	6	50	50	100	20	40	3	

II	21ENG42L	Part-II: English – IV	6	50	50	100	20	40	3
III	21BBO43C	Core: Paper V– Wood Science and Technology	5	50	50	100	20	40	5
III	21BCH44A	Allied: IV Chemistry Paper – II	5	30	45	75	18	30	4
III	21BBO45P	Core: Practical – II (Comprised of Core Papers IV, V & SBS – I&II)	2	40	60	100	20	40	3
III	21BCH46P	Allied: Practical – II Chemistry (Comprised of Allied Papers – III & IV)	3	20	30	50	10	20	3
IV	21BBO47S	Skill Based Subject - II: Nursery, Gardening and Horticulture	3	50	50	100	20	40	3
V	21EXA4GE	Extension Activities: NCC/NSS/SPORTS//YRC	-	-	-	-	-	-	1

Part	Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	Ext. Min.	Total Pass Mark	Credits
Semester – V									
III	21BBO51C	Core: Paper – VI Cell and Molecular Biology	5	50	50	100	20	40	5
III	21BBO52C	Core: Paper – VII Morphology, Embryology, Seed Science and Technology	5	50	50	100	20	40	5
III	21BBO53C	Core: Paper – VIII Plant Systematics, Economic Botany, Ethnobotany and Pharmacognosy	5	50	50	100	20	40	5
III	21BBO54C	Core: Paper – IX Genetics, Plant Breeding, Evolution and Biostatistics	5	50	50	100	20	40	4
III	21BBO55P	Core : Practical - III (Comprised of Core Papers VI, VII, VIII, IX and SBS -III)	4	50	50	100	20	40	3

IV	21BBO56S	Skill Based Subject – III: Mushroom Cultivation and Plant Tissue Culture	3	50	50	100	20	40	3
IV	21BBO5EL	Non-Major Elective Paper – I: Plants and Human Welfare-I	3	50	50	100	20	40	2
Semester – VI									
III	21BBO61C	Core : Paper – X Plant Physiology	6	50	50	100	20	40	5
III	21BBO62C	Core : Paper – XI Plant Biochemistry	6	50	50	100	20	40	5
III	21BBO63C	Core : Paper – XII Biotechnology and Bioinformatics	6	50	50	100	20	40	5
III	21BBO64P	Core: Practical – IV (Comprised of Core Papers X, XI, XII and SBS- IV)	4	50	50	100	20	40	3
III	21BBO65V	Group Project and Viva Voce	2	50	50	100	20	40	5
IV	21BBO66S	Skill Based Subject – IV: Post Harvest Technology of Crops	3	50	50	100	20	40	3
IV	21BBO6EL	Non-Major Elective Paper – II: Plants and Human Welfare-II	3	50	50	100	20	40	2
Total						3700			140

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	I	21BBO13C	CORE PAPER – I MICROBIOLOGY AND PLANT PATHOLOGY	6

COURSE LEARNING OUTCOMES:

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

1. Classify bacteria based on structure.
2. Predict the bacterial growth pattern.
3. Design the applications of microbes in industry.
4. Perform the basic laboratory procedures in microbiology – sterilization techniques.
5. Interpret the morphology and multiplication of viruses.
6. Elucidate the role of plant pathology in agriculture.
7. Discuss the plant – pathogen interaction.
8. Develop methods of management of plant disease.

UNIT – I

Whittaker's five-kingdom classification. General characteristics of Bacteria. Classification of bacteria based on Morphological characteristics; Ultrastructure of bacterial cell, locomotion, Chemical composition of cell wall, Gram staining,

Nutrition and growth of Bacteria: Nutritional types: Photolithotrophic Autotrophy, Photoorganotrophic Heterotrophy, Chemolithotrophic Autotrophy, Chemoorganotrophic Heterotrophy. Factors affecting the bacterial growth; endospore formation.

UNIT - II

Sterilization techniques: Physical and Chemical, Culture techniques- Pure culture techniques; Pour plate method, Streak plate, Spread plate method. Growth curve in Batch culture; Mode of cell division; Recombination – Transformation, Transduction and Conjugation. Economic importance of Bacteria.

UNIT – III

Fungi – General characteristics of fungi; Classification (Alexopoulos and Mims, 1979); Structure, Reproduction and life cycle (excluding developmental stages) of *Albugo* sp., *Aspergillus* sp., *Saccharomyces* sp., *Puccinia* sp., *Peziza* sp., and *Colletotrichum* sp.,. Economic importance of fungi.

UNIT – IV

Viruses – Morphology; structure, Types and Classification of viruses based on genetic material; Replication of Bacteriophages - Lytic and Lysogenic cycles. Plant virus- TMV and CaMV.

UNIT – V

Plant Pathology: Introduction; Classification of plant diseases based on causal organisms; List of bacterial, fungal and viral diseases in plants. Study of the causative organisms, symptoms and control measures of the following diseases:

Tikka disease of groundnut (*Cercospora* sp.) 2. Citrus canker (*Xanthomonas* sp.)

Blast disease of rice (*Magnaporthe* sp) 4. Red rot of sugarcane (*Colletotrichum* sp)

PEDAGOGY STRATEGIES

- ❖ Board and Chalk lectures
- ❖ Powerpoint slide presentations
- ❖ Animated demonstration video sessions
- ❖ Assignments
- ❖ MCQ assessments
- ❖ Laboratory practical's

TEXT BOOKS:

1. Sharma, P. D. 1994. Microbiology, 2nd edition. Rastogi Publication, Meerut.
2. Purohit, S. S. 1999. Microbiology Fundamentals and Applications, 6th Edition. Agrobios (India), Jodhpur.
3. Dubey, R. C. and Maheshwari, D. K. 2004. Text book of microbiology. S. Chand and Co. Ltd., New Delhi.
4. Mandahar, C. L. 1978. Introduction to plant viruses. S. Chand & Co. Ltd., New Delhi
5. Rangaswamy, G. and Mahadevan, A. 1999. Diseases of Crop plants in India, 4th edition. Prentice Hall of India Pvt. Ltd., New Delhi.

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1. Pelczar, M. J (Jr), Chan, E.C.S and Krieg, N. R. 1986. Morphology. Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. Scheigel, H. S. 1986. General Microbiology, 6th edition. Cambridge University press, London.
3. Aneja, K. K. 1996. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Cultivation. Wishwa Prakashan, New Delhi.
4. Alexopoulos, C.J., Mims, C. W. and Blackwell, M. 1996. Introductory Mycology. John Wiley & Sons Inc., UK.
5. Clifton, A. 1958. Introduction of bacteria. McGraw-Hill Book Co., New York.
6. Sambamurthy, A.V.S.S. 2009. A text book of Plant Pathology. I.K. International Publishing House Pvt. Ltd, New Delhi.

ONLINE/E-RESOURCES:

<https://www.classcentral.com/course/swayam-general-microbiology-14088>

<https://www.swayamprabha.gov.in/index.php/program/archive/9>

www.nos.org/media/documents/dmlt/microbiology

www.columbia.edu/itc/hs/medical/pathophys/id/2009

<http://microbiologyinfo.com>

<https://www.youtube.com/watch?v=ijSL8vKtV08>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)							
	1	2	3	4	5	6	7	8
Disciplinary Knowledge	√	√			√			√
Communication Skills		√			√			
Critical Thinking			√	√		√		
Research related skills			√			√	√	√
Analytical reasoning		√		√		√		
Problem Solving							√	√
Team Work			√	√			√	
Moral and ethical awareness						√		√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	I	21BBO14A	ALLIED PAPER - I GENERAL BOTANY - PLANT DIVERSITY (For B. Sc. Zoology Students)	6

COURSE LEARNING OUTCOMES:

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

1. Outline the characteristics and compare the life cycle of algae, fungi, bryophytes and gymnosperms.
2. Predict the usage of algae and fungi plant species.
3. Explain the classification and categories of plant taxonomy.
4. Identify the floral structures and point out the modifications.
5. Justify the importance of plant conservation.
6. Discuss the basic concepts in plant morphology and taxonomy.

UNIT - I

A general classification of plant Kingdom. **ALGAE** - Structure and life cycle of the following genera: *Chlamydomonas*, *Dictyota*, *Polysiphonia* and *Anabaena*. Economic importance of Algae.

UNIT - II

FUNGI - Structure and life cycle of the following genera - *Albugo* and *Saccharomyces*. Economic importance of fungi.

BRYOPHYTES - Structure and life cycle of *Marchantia* and *Polytrichum*.

UNIT - III

PTERTERIDOPHYTES - Structure and life history of the following genera: *Lycopodium* and *Adiantum*; Gymnosperms - Structure and life history of *Cycas*.

UNIT - IV

MORPHOLOGY: stem, leaf (shape), inflorescence and flower (outline only); pollination; Types of fruits; Seed germination - Epigeal (Bean) and Hypogeal germination (Paddy) and Vivipary (*Rhizophora*).

UNIT - V

Taxonomy: Outlines classification of Bentham and Hooker's system; Taxonomic features, and economic importance of the following families; *Annonaceae*, *Cucurbitaceae*, *Acanthaceae*, *Lamiaceae*, *Amaranthaceae* and *Liliaceae*.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Assignments
- ✓ MCQ assessments
- ✓ Laboratory practicals

TEXTBOOKS:

1. Narayanaswamy, R.V. and Rao, K.N. 1976. Outlines of Botany. S. Viswanathan Printers & Publishers, Chennai.
2. Pandey, B.P. 2001. College Botany Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd., New Delhi.
3. Muneeswaran, A. 2004. Allied Botany Vol I & II. Titan Books, Madurai, India.
4. Vashishta, B.R., Sinha, A.K. and Singh, V.P. 2008. Botany for Degree Students: Algae. S. Chand & Company Ltd., New Delhi.
5. Pandey, B. P. 1999. Taxonomy of Angiosperms. S. Chand & Co. Ltd., New Delhi.
6. Verma, V. 1974. A Text Book of Economic Botany. Emkay Publications, New Delhi.

REFERENCES:

1. Mehrotra, R.S. and Aneja, K.R. 1999. An Introduction to Mycology, 2nd Edition. New Age International Publishers, New Delhi.
2. Sharma, O. P. 1989. Text Book of fungi. Tata McGraw-Hill Publishers, New York.
3. Smith, G.M. 1955. Cryptogamic Botany Vol. II Bryophytes and Pteridophytes, 2nd edition. Tata McGraw-Hill Publishing Co., New Delhi.
4. Srivastava, H.N. 1998. Gymnosperms. Pradeep Publications, Jalandhar.
5. Hill, A.W. 1952. Economic Botany. Tata McGraw-Hill Publishing Co., New Delhi.

ONLINE/ E-RESOURCES:

<https://www.youtube.com/watch?v=sEEVVCQKx68>

<https://www.youtube.com/watch?v=avK7hGnaRAY>

<https://nptel.ac.in/courses/102/107/102107075/>

http://hhh.gavilan.edu/rmorales/documents/Gymnosperm18_withgneto.ppt

<https://basicbiology.net/plants/angiosperms>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√				√
Communication Skills	√		√		√	
Critical Thinking				√	√	
Research related skills	√		√	√	√	√
Analytical reasoning		√	√	√		√
Problem Solving			√		√	
Team Work					√	
Moral and ethical awareness		√			√	√

AECC-1 @ SEMESTER I

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	I	21ENV1GE	ENVIRONMENTAL STUDIES (For all UG courses)	2

COURSE LEARNING OUTCOMES:

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

1. Recognize the role of the environment and the need to conserve it for sustaining life.
2. Enumerate the natural resources
3. Explores the adverse effects of deforestation and over exploitation of natural resources
4. Associate the components of the ecosystem and need for biodiversity conservation.
5. Evaluate the environmental pollution hazards and their effects on the living system.
6. Interpret the different disaster management procedures.
7. Analyse the climatic change and global effects
8. Infer the need for environmental laws in the constitution of India.
9. Relate the growth of the human population and its impact on the environment.

UNIT I:

Environment – Introduction – Nature - Scope – Content – Need for study. Natural resources- Forest and energy resources- Use and overexploitation - deforestation. Energy resources- renewable and non-renewable energy resources.

UNIT II:

Ecosystem – concept – types- Forest, Grassland, Desert and Aquatic (Pond)- Structure and function of an ecosystem – Producers- consumers and decomposers – Food chain – food web- ecological pyramids- energy flow. Biodiversity and its conservation- *in situ* and *ex situ* conservation- Mega biodiversity centres and hotspots.

UNIT III:

Environmental pollution- definition- causes-effects and control measures of air, water, soil, thermal and nuclear pollution. Waste management- Industrial and solid waste. Disaster management – earthquake, cyclone, flood and landslides.

UNIT IV:

Social Issues and the environment-Urbanization-Urban problems related to energy and watershed management. Environmental Ethics- Issues and possible solutions- Wasteland reclamation- Climate change - causes and effects. Global warming- Acid rain- Ozone layer depletion- Public awareness. Environmental laws- Environment Protection Act, Wildlife Protection Act, Forest Conservation Act.

UNIT V:

Human population and its impact on environment- Population growth- Resettlement and Rehabilitation of project affected persons- Case studies – Sardar Sarovar Project, Maharashtra and Bandipur National Park- Project Tiger, Karnataka, NTPC, India. Role of Indian and Global religions and Cultures in environmental conservation- Case study: sacred groves in Western Ghats (kavu) & Chinese culture. Human and Wildlife Conflict.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ PowerPoint slide presentations
- ✓ Assignments

Textbooks:

1. Sharma, P. D. 2000. Ecology & Environment. Rastogi Publications, Meerut, India.

2. Bharucha, E. 2003. Text book of Environmental Studies. UGC, New Delhi & Bharati Vidyapeeth Institute of Environmental Education and Research, Pune.
3. Arumugam, M. and Kumaresan, V. 2016. Environmental Studies (Tamil version). Saras Publications, Nagerkoil.

Online/E-Resources:

<https://www.edx.org/course/subject/environmental-studies>

https://www.coursera.org/courses?_facet_changed_=true&domains=life-sciences%2Cphysical-science-and-engineering%2Csocial-sciences&query=environmental%20science%20and%20sustainability&userQuery=environmental%20science%20and%20sustainability

<https://www.open.edu/openlearn/nature-environment/free-courses>

COURSE LEVEL MAPPING OF PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)								
	1	2	3	4	5	6	7	8	9
Disciplinary Knowledge		√	√		√	√			
Communication Skills		√		√				√	√
Critical Thinking	√		√		√		√		
Research related skills	√		√			√		√	
Analytical reasoning	√			√		√		√	
Problem Solving		√	√			√			√
Team Work				√	√		√		√
Moral and ethical awareness		√		√		√		√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	II	21BBO23C	CORE PAPER – II ALGOLOGY, BRYOLOGY AND LICHENOLOGY	4

COURSE LEARNING OUTCOMES:

On completion of this course students will be able to:

1. Recall the morphological and reproductive features of Lower cryptogams.
2. Recognize the diversity of Algae and interpret the different structural and reproductive features of them.
3. Relate the life cycle phases in the algal hierarchy and to categorize the economically important algae.
4. Interpret the range of bryophyte diversity and analyse their structural, reproductive characteristics.
5. Analyse the alternation of Generation in bryophytes and recognize the ecological and economic importance of bryophytes.
6. Compare the thallus organization and reproduction in Lichens and assess their ecological and biological significance.

ALGOLOGY:

UNIT-I

A general account and classification of Alga (Smith, 1955) – distribution - range of thallus organization – pigmentation- flagellation- reserve food – Reproduction (vegetative-asexual-sexual), Life cycle patterns. Detailed study of structure, reproduction and life cycle of the following: *Anabaena*, *Chlamydomonas*, *Volvox*, *Caulerpa* and *Chara*.

UNIT-II

Detailed study of structure, reproduction and life cycle of the following: *Diatom*, *Dictyota*, and *Polysiphonia*. Economic importance of algae. General account of fossil algae.

BRYOLOGY:

UNIT-III

General characters and classification (Smith, 1965) of Bryophytes. Morphology, structure and reproduction of the following: *Marchantia* and *Porella*.

UNIT – IV

Morphology, structure and reproduction of the following: *Anthoceros* and *Polytrichum*. Bryophytes as indicators of pollution; Fossil bryophytes. Economic importance of Bryophytes.

LICHENOLOGY:

UNIT – V

Lichens: Introduction, habit, habitat, occurrence and distribution, types, external and internal structural organization, reproduction. Ecological significance of Lichens. Economic importance of Lichens.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated demonstration video sessions
- ✓ Assignments
- ✓ MCQ assessments
- ✓ Laboratory practical's

TEXT BOOKS:

1. Sharma, O. P. 1986. Textbook of Algae. Tata McGraw-Hill Publishing Co., New Delhi.
2. Kumar, H. D. 1989. Introductory Phycology. East-West Press, Madras.
3. Vashishta, B. R., Sinha, A. K. and Singh, V. P. 2008. Botany for Degree Students - Algae. S. Chand and Co. Ltd., New Delhi.
4. Kashyap, S. R. 1972. The Liverworts of Western Himalayas and Punjab. Plains I & II. Research Company Publications, New Delhi.
5. Vashista, S. 1986. Bryophytes. S. Chand & Co. Pvt. Ltd., New Delhi.
6. Sharma, O. P. 2014. Bryophytes. Tata McGraw-Hill Publishing Co., New Delhi.
7. Hale, M. E. Jr. 1983. Biology of Lichens. Edward Arnold, Maryland.

REFERENCES:

1. Fritsch, F. E. 1976. Structure and Reproduction of the Algae. Vol. I & II. Cambridge University Press, London.
2. Ian Morris. 1967. An Introduction to the Algae. Hutchinson University Library, London.
3. Smith, G. M. 1976. Cryptogamic Botany. Vol. I. Algae and Fungi. Tata McGraw-Hill Publishing Co., New Delhi.
4. Bold, H. C. and Wynne, M. J. 1978. Introduction of Algae - Structure and Reproduction. Prentice Hall, New Jersey.
5. Chapman, C.J. and Chapman, D.J. 1981. The Algae, 2nd edition. Macmillan, London.
6. Smith, G. M. 1971. Cryptogamic Botany-Vol. II-Bryophytes and Pteridophytes. Tata McGraw-Hill Publishing Co., New Delhi.
7. Parihar, N. S. 1972. An Introduction to Embryophyta-I: Bryophyta. Central Book Depot, Allahabad.
8. Prem Puri. 1973. Bryophytes: A Broad Perspective. Atma Ram and Sons, New Delhi.

Online/E-Resources:

https://www.powershow.com/viewfl/7336f9-MzVIM/Algae_-_3_powerpoint_ppt_presentation

<https://www.slideshare.net/BIYYANISUMAN/algae-suman-81289656>

https://onlinecourses.swayam2.ac.in/cec20_bt11/preview

https://onlinecourses.swayam2.ac.in/nce19_sc12/preview

<https://www.slideshare.net/sailajareddy123/lichens-ppt>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√	√			
Communication Skills			√		√	√
Critical Thinking		√	√	√		√
Research related skills				√	√	
Analytical reasoning		√			√	
Problem Solving	√			√		√
Team Work			√		√	
Moral and ethical awareness						√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	II	21BBO24C	CORE PAPER – III ECOLOGY AND PLANT GEOGRAPHY	4

COURSE LEARNING OUTCOMES:

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

1. Discuss the basic concepts of biotic and abiotic factors in an ecosystem.
2. Illustrate the different levels of plant succession in vegetation.
3. Recognize the significance of biogeochemical cycles for a balanced ecosystem.
4. Identify various ecological adaptations in plants.
5. Discover the impact of human interference in an ecosystem.
6. Criticize the adverse effects of different types of pollutants on a healthy environment.
7. Summarize the mega biodiversity hotspots of our country and the world.
8. Prioritize the methodologies for conservation of biodiversity.
9. Assess the vast phytogeographical resources of India and plan exploration of value added forest produce.

UNIT – I

Ecology: Scope and objectives. Effect of Individual factors on vegetation, Triggering and Holistic impacts of climatic, Abiotic, Edaphic and Biotic factors on plant life. Community concepts, Population Ecology and Plant Succession. Methods of studying vegetation – Quadrats and transects. Population ecology, Ecophene, Ecotypes.

UNIT – II

Ecosystem – concept, structure, types and functions- energy flow and biogeochemical cycle- Nitrogen cycle, Phosphorus cycle and Water cycle. Ecosystem diversity – Hydric system – hydrophytic adaptations, Xeric systems – xerophytic adaptations and halophytic adaptations.

UNIT – III

Patterns in Plant biodiversity – Levels and types of biodiversity, significance of biodiversity. Human impact on biodiversity. Social impact on plant diversity: Pollution - air, water, soil, Noise, radioactive and e-waste pollution - Global warming, acid rain. Pollution disasters – Bhopal gas and Chernobyl tragedies. Pesticides and its impacts. Pollution law enforcement and monitoring. Pollution impact assessment.

UNIT – IV

Bio-Conservation, Types of Conservation (*In situ* and *Ex situ* conservation). Red data list, Mega biodiversity centres in World, India and Tamilnadu. Hotspots. Chipko movement and Environmentalist Views on Silent valley project.

UNIT – V

Plant geography and forestry: Principles of plant geography – Biogeographical regions in India. Distribution types – continuous, discontinuous and endemic. Continental drift. Vegetation mapping, GIS and its application in forestry. Vegetation types - Rainforest, Deciduous forest, Mangrove forest and Scrub jungle. Minor forest produce. Agroforestry – Concepts, Definitions and Social forestry.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lecture
- ✓ Powerpoint slide presentations
- ✓ Assignments
- ✓ Online and Offline Class Practicals
- ✓ Quizzes
- ✓ Field visits

TEXT BOOKS:

1. Sharma, P. D. 1994. Environmental Biology. Rastogi and Company, Meerut.
2. Concepts of Ecology; R.S. Verma and V.K. Agarwal, 1998. S. Chand and Company Ltd. New Delhi.
3. Agarwal, A.K. and Deo, P.P. 2006. Plant Ecology. Agrobios (India), New Delhi.
4. Kumar, H.D. 2007. Modern concepts of Ecology. 8th Edition. UBS Publishers & Distributors Pvt. Ltd. New Delhi.
5. Shukla, R.S. and Chandel, P.S. 2007. A text book of Plant Ecology, 11th edition. S. Chand and Company Ltd. New Delhi.
6. Ambasht, R.S. and Ambasht, N. K. 2011. A textbook of Plant Ecology, CBS Publishers and Distributors Pvt. Ltd., New Delhi.

REFERENCES:

1. Weaver and Clements. 1966. Plant Ecology. TMH Publishing Company Ltd. Delhi.
2. Clifford B. Knight. 1971. Basic Concepts of Ecology. The Macmillan Company Collier – Macmillan Ltd. London.
3. Misra, K.C. 1974. Manual of Plant Ecology. Oxford & IBH Publishing Co., New Delhi.
4. Etherington, J.R. 1976. Environment and Plant Ecology. Wiley Eastern Ltd., New Delhi.
5. Simmons, I.G. 1986. The Ecology of Natural Resources, 2nd edition. ELBS. London.
6. Sharma, P.D. 2009. Ecology and Environment, 10th edition. Rastogi Publications, New Delhi.

ONLINE/E-RESOURCES:

<https://www.youtube.com/watch?v=6p1TpVJYTds>
<https://www.youtube.com/watch?v=1C3XSwQ62iw>
<https://www.youtube.com/watch?v=V49IovRSJDs>
https://onlinecourses.nptel.ac.in/noc19_ge23/preview
<https://nptel.ac.in/content/storage2/courses/122103039/pdf/mod6.pdf>
<https://nptel.ac.in/courses/122/102/122102006/>
<https://www.slideshare.net/jayanshugundaniya9/ecology-and-ecosystem-41045015>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)								
	1	2	3	4	5	6	7	8	9
Disciplinary Knowledge	√		√	√		√	√		√
Communication Skills		√	√			√	√		
Critical Thinking		√			√	√			√
Research related skills			√	√			√	√	
Analytical reasoning		√				√	√		
Problem Solving	√		√	√			√		√
Team Work	√		√		√	√		√	
Moral and ethical awareness	√				√	√			√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	II	21BBO25A	ALLIED PAPER - II PLANT STRUCTURE AND FUNCTIONS (For B. Sc. Zoology students)	6

COURSE LEARNING OUTCOMES:

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

1. Describe the structure of cell and tissues of plants
2. Identify the different tissue types and organ systems in plants
3. Distinguish monocot and dicot root and stem.
4. Summarize the alternative generation of flowering plants
5. Extrapolate the Mendelian genetics and plant breeding.
6. Evaluate horticultural practices
7. Predict the environmental influences on individual organisms.

UNIT - I

CYTOLOGY - Ultra structure of plant cells. Structure and functions of chloroplast, mitochondria and nucleus.

ANATOMY - Simple and complex tissues; Anatomy of stem and root of dicot and monocot plants.

EMBRYOLOGY - Structure of mature anther and ovule. Fertilization (double fertilization and triple fusion). Structure, types and functions of endosperm. Structure of a mature dicot embryo (*Capsella bursa-pastoris*).

UNIT - II

GENETICS - Mendelism - Monohybrid and Dihybrid ratios - Laws of dominance, Segregation and Independent assortment.

PLANT BREEDING – Aim and Scope. Selection (Mass and pureline), Hybridization and Heterosis (Outline only).

UNIT – III

PLANT PHYSIOLOGY –Absorption of water (active and passive). Types of transpiration. Stomatal movement. Photosynthesis: Light reaction and dark reaction (C3 Cycle). Phytohormones – Auxins. Plant movements (phototropism and geotropism).

UNIT - IV

PLANT BIOTECHNOLOGY – Aim and Scope of Biotechnology; Introduction to Plant tissue culture and genetic engineering – Golden Rice.

HORTICULTURE – Importance and scope of Horticulture; plant propagation methods – stem cutting, layering and approach grafting, kitchen garden

UNIT - V

ECOLOGY - Factors of Environment (Abiotic and Biotic Factors), Morphological and Anatomical adaptations of Hydrophytes (*Hydrilla*) and Xerophytes (*Nerium*) Phytogeography- Vegetation types of India.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Assignments
- ✓ MCQ assessments
- ✓ Laboratory practical's

TEXTBOOKS:

1. Verma, P. S. and Agarwal, V. K. 1986. Cell Biology and Molecular Biology (Cytology). S. Chand and Company Ltd., New Delhi.
2. Maheswari, P. 1985. An Introduction to the Embryology of Angiosperms. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Jain, V.K. 1995. Fundamentals of Plant Physiology. S. Chand & Co. New Delhi.
4. Gupta, P. K. 2007. Genetics: Classical to Modern, 1st Edition. Rastogi Publications, Meerut, India.
5. Sharma, O. P. 2007. Plant Taxonomy. Tata McGraw-Hill Publishing Company, New Delhi.

Online/E-Resources:

<https://nptel.ac.in/courses/102/103/102103012/>

<http://virtualplant.ru.ac.za/Main/ANATOMY/prac5.htm>

<https://www.google.com/search?q=genetics+principles+of+inheritance+and+variation+neelabakore>

<https://www.swayamprabha.gov.in/index.php/program/archive/9>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)						
	1	2	3	4	5	6	7
Disciplinary Knowledge	✓	✓	✓				
Communication Skills		✓		✓		✓	
Critical Thinking			✓		✓		✓
Research related skills			✓				✓
Analytical reasoning	✓			✓			✓
Problem Solving		✓	✓				
Team Work				✓			
Moral and ethical awareness						✓	

AECC-2 @ SEMESTER II

Year	Semester	Sub Code	Subject Title	Semester	Sub Code
2021 -22 Onwards	II	21VAL2GE	VALUE EDUCATION – GANDHIAN THOUGHTS (For all UG courses)	II	21VAL2GE

COURSE LEVEL OUTCOMES:

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

1. Interpret Gandhiji's experiments to his spiritual pursuits and search for purity, political activities through fasting protests, and even his role as an educator using diet and meals as teaching exercises.
2. Lead a life marked with humility and truthfulness and subsequent realization of the Truth as the purpose of human life.
3. Infer lessons that are fundamental to living in harmony and social progress such as respect, empathy, equality, solidarity and critical thinking.
4. Promote tolerance and understanding above and beyond our political, cultural and religious differences.
5. Create special emphasis on the defense of human rights, the protection of ethnic minorities
6. Emerge as responsible citizens with clear conviction to practice values and ethics in life.
7. Transform themselves to become good leaders.
8. Realize their role and contribution to the nation building.

UNIT I: Birth and Parentage - Childhood - At the High school - Stealing and Atonement - Glimpses of Religion - Gandhi's choice - Experiments in Dietetics - Acquaintance with Religions - The Great Exhibition.

UNIT II: The first case - Preparing for South Africa - same experiences - on the way to Pretoria – Coolie - Natal Indian Congress - Education of Children - Brahmacharya.

UNIT III: Simple life - The Boer war - Sanitary Reform and Famine Relief - Lord Curzon's Darbar - A month with Gokhale - Experiments in Earth and water treatment - Indian opinion - Coolie Locations or Ghettoes - The Black plague.

UNIT IV: The Magic spell of a Book - The Zulu Rebellion - The Birth of Satyagraha - More experiments in Dietetics - Kasturbai's Courage - Domestic Satyagraha- Fasting - Shanti Niketan - Woes of Third-Class passengers.

UNIT V: Kumbha mela - Lakshman Jhula - Founding of the Ashram - Abolition of Indentured Emigration

- The Kheda Satyagraha - The Rowlatt Bills - Navajivan and young India - Congress Initiation - The Birth of Khadi.

TEXT BOOKS

1. M.K. GANDHI, "The Story of My Experiments with Truth", An Autobiography Apple publishing International(P) Ltd, Chennai.
2. மகாத்மா காந்தியின் சுயசரிதை - சத்தியசோதனை தமிழாக்கம் - ரா. வேங்கடராஜலு, நவஜீவன் பரகராலயம், அகமதாபாத்

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lecture
- ✓ Powerpoint slide presentations
- ✓ Seminar
- ✓ Assignments
- ✓ Quizes
- ✓ Group discussion

COURSE LEVEL MAPPING OF PROGRAM LEVEL OUTCOMES.

Program Level Outcomes (PLO)	Course Level Outcomes (CLO)							
	1	2	3	4	5	6	7	8
Reflective thinking	✓	✓			✓		✓	✓
Communication skills		✓		✓	✓	✓	✓	✓
Critical thinking	✓			✓		✓	✓	✓
Multicultural competence				✓	✓	✓	✓	✓
Analytical reasoning		✓	✓	✓		✓		
Problem solving		✓	✓	✓		✓	✓	✓
Team work	✓		✓		✓	✓	✓	
Leadership readiness/qualities			✓		✓	✓		✓
Moral and ethical awareness	✓		✓		✓	✓		✓

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 Onwards	I&II	21BBO26P	CORE PRACTICAL – I (Microbiology, Plant Pathology, Algology, Bryology, Lichenology, Ecology and Plant Geography)	2

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Identify the microorganisms isolated from various samples soil/milk
2. Distinguish the types of microorganisms based on characters
3. Classify and prepare the chart for a group of Organisms collected from a site
4. Differentiate and illustrate the hierarchy of organisms
5. Measure the microbial diversity in an environment
6. Determine the types of forest, flora and climatic zones

MICROBIOLOGY:

1. Glassware handling and lab practices (Microscope handling).
2. Sterilization techniques & Types.
3. Preparation of Basal medium – solid agar and broth
4. Preparation of agar plates, agar slants and agar deep tubes.
5. Isolation and culturing techniques of microbes – streak plate and pour plate methods.
6. Simple staining of bacteria.
7. Gram's staining of bacteria.
8. Isolation of microorganisms from air and water.
9. Assessing the milk quality by Methylene Blue Reductase Test (MBRT).

MYCOLOGY:

1. Whole mount of *Albugo*, *Puccinia*, *Neurospora* using cotton blue.
2. Study of morphology and anatomy of the genera as given in the syllabus.

PATHOLOGY- Observation of disease specimens of

- Tikka disease of groundnut (*Cercospora* sp.)
- Citrus canker (*Xanthomonas* sp.)
- Blast disease of rice
- Red rot of sugarcane

ALGOLOGY

Study of morphology and anatomy of *Anabaena*, *Chlamydomonas*, *Volvox*, *Caulerpa* *Chara*, *Diatom*, *Dictyota*, and *Polysiphonia*; Study of economically important products of Algae

BRYOLOGY

Study of morphology and anatomy of *Marchantia*, *Porella*, *Anthoceros* and *Polytrichum*; Study of economically important products of Bryophytes

LICHENOLOGY:

Types of Lichens and its reproductive structures. Study of economically important products of Lichens.

ECOLOGY AND PLANT GEOGRAPHY

1. Practice to handle the instruments for measuring temperature (soil, air, water), moisture (rainfall, relative humidity, soil moisture), wind (velocity and direction) and light intensity.
2. To study ecological adaptations in plants (hydrophytes - *Hydrilla* and xerophytes - *Nerium*)
3. To determine minimum area of sampling unit (quadrat) for the study of plant community.
4. To prepare maps of India with respect to (i) climatic zones (ii) forest types and (iii) phytogeographical regions and comment on it.
5. Collection and submission of any 10 minor forest products.
6. Visit to biosphere reserve / museum / national park /sanctuary / mangrove vegetation / Botanical Survey of India / Forest Research Institutes.

PEDAGOGY STRATEGIES

- ✓ Demonstrations
- ✓ Specimen observation/sectioning
- ✓ Microscopic Examination
- ✓ Illustration and chart making

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√	√	√		√
Communication Skills			√	√		
Critical Thinking	√	√		√		√
Research related skills	√	√		√	√	
Analytical reasoning	√	√	√		√	
Problem Solving	√	√				√
Team Work			√			√
Moral and ethical awareness					√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	I&II	21BBO27P	ALLIED PRACTICAL – I PLANT DIVERSITY, PLANT STRUCTURE AND FUNCTIONS	2

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Distinguish the various types of microorganisms based on characters
2. Compare and contrast the morphological features of plant species
3. Rank the plant species based on Taxonomic features
4. Distinguish the Monocot and Dicot plant species based on sectioning
5. Demonstrate the vital physiological processes of plants
6. Determine the vegetation types and plant adaptations
7. Explain the types of crosses in plants
8. Create new hybrids using horticulture techniques

PLANT DIVERSITY: Morphological and anatomical features of the genera of

- Algae – *Chlamydomonas*, *Dictyota*, *Polysiphonia* and *Anabaena*
- Fungi – *Albugo* and *Saccharomyces*
- Bryophytes - *Marchantia* and *Polytrichum*.
- Pteridophytes - *Lycopodium* and *Adiantum*
- Gymnosperms - *Cycas*
- Morphology of leaf and fruits. Types of germination in dicot and monocot seeds.

TAXONOMY of locally available plants belonging to the families

- Annonaceae
- Cucurbitaceae
- Acanthaceae
- Lamiaceae
- Amaranthaceae and
- Liliaceae.

ANATOMY: Types of tissues, T.S of Young stem and Root of Dicot and Monocot plants.

EMBRYOLOGY: Structure of mature Anther, Ovule and dicot embryo (Observation only).

PHYSIOLOGY:

1. Demonstration of ascent of sap (ring experiment)
2. Demonstration of Ganong's Potometer
3. Demonstration of evolution of oxygen during photosynthesis

ECOLOGY: Hydrophytes and Xerophytes. Vegetation types of India.

GENETICS: Mono and Di-hybrid crosses.

BIOTECHNOLOGY: PTC- Callus, Genetic engineering - golden rice

HORTICULTURE: Stem cutting and layering

PEDAGOGY STRATEGIES

- ✓ Demonstrations
- ✓ Experimental setups
- ✓ Specimen observation/sectioning
- ✓ Microscopic Examination
- ✓ Illustration and chart making

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)							
	1	2	3	4	5	6	7	8
Disciplinary Knowledge	√	√	√	√	√	√		
Communication Skills			√		√		√	
Critical Thinking	√	√				√		√
Research related skills	√	√	√		√			
Analytical reasoning						√		√
Problem Solving	√		√			√		
Team Work			√		√			√
Moral and ethical awareness						√	√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	III	21BBO33C	CORE PAPER – IV PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY	5

COURSE LEARNING OUTCOMES:

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

1. Distinguish different classes of Pteridophytes,
2. Judge the phylogeny of the vascular system in pteridophytes.
3. Comprehend that life cycle patterns in ferns have two independent individuals as sporophytic generation and gametophytic generation that alternate each other.
4. Discuss the heterospory leading to seed habit in phanerogams.
5. Justify the wide classes of gymnosperms and correlate their different morphological, anatomical and reproductive characters.
6. Categorize the evolution of plants upon evolution of Earth, different life forms on Earth.
7. Assess the Indian contribution to Paleobotany

PTERIDOPHYTES:

UNIT- I

Pteridophytes - General characteristics, Classification (Reimer's System, 1954). A detailed study of the morphology and anatomy of the following genera –*Psilotum*, *Lycopodium*, *Selaginella*, Homospory, heterospory, origin of seed habit

UNIT- II

A detailed study of structure, reproduction and life cycle of the following genera –*Equisetum*, *Ophioglossum*, *Adiantum* and *Salvinia*. Stellar evolution, apospory and apogamy, Economic importance of Pteridophytes.

GYMNOSPERMS:

UNIT- III

General characters of Gymnosperms, Classification (Sporne-1965), Morphology, structure, reproduction and life history of *Cycas*.

UNIT- IV

A detailed study of morphology, structure, reproduction and life cycle of *Pinus* and *Gnetum*. Economic Importance of gymnosperms.

PALEOBOTANY:

UNIT- V

Geological time scale; fossils and fossilization- kinds of fossils-petrifaction, cast, impression and compression. Radiocarbon dating. Contribution of Prof. Birbal Sahni (brief outline). *Rhynia*, *Lepidocarpon*, *Lepidodendron*, *Calamites*, and *Williamsonia*. Living fossil – *Ginkgo biloba*.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated demonstration video sessions
- ✓ Assignments
- ✓ MCQ assessments
- ✓ Laboratory practical's

TEXTBOOKS:

1. Palaniyappan, S. 1988. Pteridophyta (Tamil Version). T.K. Publishing House, Chennai.
2. Vashista, P. C. 1997. Botany for Degree Students - Pteridophyta. S. Chand and Company Ltd., New Delhi.
3. Sharma, O. P. 2012. Textbook of Pteridophyta, Tata-McGraw Hill Education, New Delhi.
4. Parihar, N. S. 2019. An Introduction to Embryophyta - Pteridophytes. 5th Edition, Surjeet Publication, Delhi
5. Bhatnagar, S. P. and Moira, A. 1996. Gymnosperms. New age international Pvt. Ltd., New Delhi.
6. Vashishta, P. C. 1996. Botany for Degree Students-Gymnosperms (2ndEd.). S. Chand and Company Ltd., New Delhi.
7. Shripad, N. A. 1998. Paleobotany, Oxford and IBH Publishing Co. Pvt Ltd., New Delhi.
8. Venkatachala, B. S., Shukla, M. and Sharma, M. 1992. Plant Fossils-a Link with the Past (A Birbal Sahni Birth Centenary Tribute). Birbal Sahni Institute of Paleobotany, Lucknow.

REFERENCE:

1. Sporne, K. R. 1967. Morphology of Pteridophytes: the structure of ferns and allied plants. Hutchinson University Library, London.
2. Sporne, K.R. 1971. The Morphology of Gymnosperms (The Structure and Evolution of Primitive Seed Plants). Hutchinson University Library, London.
3. Srivastava, H.N. 1998. Gymnosperms. Pradeep Publications, Jalandhar.
4. Bower, F.O. 1908. The origin of Land Flora. Macmillan Press, London.
5. Arnold, C.A. 1947. An Introduction to Paleobotany. Academic Press, New York.

Online/E-Resources:

https://swayam.gov.in/nd2_cec20_bt11/preview
<https://www.youtube.com/watch?v=sEEVVCQKx68>
<https://www.youtube.com/watch?v=avK7hGnaRAY>
<https://www.youtube.com/watch?v=zZ6XPDDDeVwk>
<https://www.youtube.com/watch?v=aNsFLFh--vI>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)						
	1	2	3	4	5	6	7
Disciplinary Knowledge	√		√		√	√	
Communication Skills		√					√
Critical Thinking		√		√			√
Research related skills			√	√	√		
Analytical reasoning		√				√	√
Problem Solving		√				√	
Team Work	√			√		√	√
Moral and ethical awareness		√		√		√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	III	21BBO35S	SKILL BASED SUBJECT – I GREEN FARMING	3

COURSE LEARNING OUTCOMES:

On completion of this course students will be able to:

1. Outline the importance of Biofertilizers.
2. Interpret the characteristics of Biofertilizers – Symbiotic and Non-Symbiotic
3. Identify the strains for Biofertilizer production
4. Reproduce the characteristics and production technology for Biofertilizers.
5. Illustrate the standards for quality control and for approval for seeds
6. Select and apply the appropriate biopesticides
7. Choose the biopesticide for eco-friendly agricultural practice
8. Judge the potentials of organic farming for sustainable agriculture.
9. Plan to execute entrepreneurship using organic farming techniques.

UNIT I

Biofertilizers -Introduction and importance – symbiotic bacterial biofertilizers – Rhizobium (Leguminosae family) – nodulation – N₂ fixation - sterilization techniques – isolation of Rhizobium – identification – quality and standard – purification – mass production of Rhizobium sp., - application methods – seed treatment and seedling treatment.

UNIT II

Non symbiotic bacterial biofertilizers – Azospirillum sp., Azotobacter sp., PSB (*Bacillus megaterium*), isolation, identification, purification, mass production method- application methods – seedling treatment and soil application. Mechanism of N₂ fixation.

UNIT III

Algal biofertilizers – BGA – Azolla – Mass production and field application method – mechanism of N₂ fixation in heterocystous BGA. Mycorrhizae- VAM fungi – mode of action – mass production and field application method.

UNIT IV

Biopesticides– Bacterial biopesticides (*Bacillus thuringiensis*), (Insects - *Bacillus subtilis*), fungal biopesticides (root knot nematode – *Paecilomyces lilacinus*)- Plant biopesticides (Neem), biocontrol agents – *Trichoderma viride*, mechanism, uses and advantages of biopesticides in agriculture.

UNIT V

Introduction and importance of organic farming- types – green manuring – composting method, FYM – composting method, vermicomposting method and applications, panchagavya preparation and application.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated demonstration video sessions

- ✓ Laboratory practical's
- ✓ Case study/Analysis
- ✓ Field visits

TEXT BOOKS:

1. Subba Rao, N. S. 1982. Biofertilizers in Agriculture, 2nd edition. Oxford and IBH Co. Pvt. Ltd. New Delhi.
2. Natarajan,S. Devasenapathy, P. Kalpana, R. and Sudhalakshmi, C. 2010. Organic Farming: An overview. Centre for Soil and Crop Management Studies, Tamil Nadu Agricultural University, Coimbatore.
3. Somani, L. L. 2019. Textbook on Principles of Organic Farming. Agrotech Publishers, Udaipur.

REFERENCES:

1. Sathe, T.V. 2004. Vermiculture and Organic Farming. Daya publishers.
2. Subha Rao, N.S. 2000. Soil Microbiology. Oxford & IBH Publishers, New Delhi.
3. Vayas, S.C, Vayas, S. and Modi, H.A. 1998. Bio-fertilizers and organic Farming. Akta Prakashan, Nadiad.
- 4.

ONLINE/E-RESOURCES:

https://agritech.tnau.ac.in/org_farm/orgfarm_EM_tech_index.html
https://agritech.tnau.ac.in/org_farm/orgfarm_index.html
<https://nptel.ac.in/courses/126/104/126104003/>
<http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loV3FoZU4xZ0NXZjVJRkNkSzZYQ2x2UVZNRzhLMGNxOUZTb3RXNnkxTFNKZg>
<http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loWGI2b0FVZ1c4V11WNDdCMEILSjV1RTRUa3RpTmZIZDJnWml6c0QzV2s0Kw>
<http://ndl.iitkgp.ac.in/document/Z2JzN0ZmU2VhdW5kODBJdWRCTmg3RWtMWmZaQjBGN2tBb0JPMUNjZ2ZyeFNTeStOVmR1SjUyMUlIQVpSaUZ5cnV0YXR4WnpjUE9KUE1ZMFN6My9meHc9PQ>
<http://ndl.iitkgp.ac.in/document/Z2JzN0ZmU2VhdW5kODBJdWRCTmg3RWtMWmZaQjBGN2tB>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)								
	1	2	3	4	5	6	7	8	9
Disciplinary Knowledge	✓		✓		✓		✓		✓
Communication Skills		✓		✓		✓	✓		
Critical Thinking				✓			✓		
Research related skills		✓			✓				✓
Analytical reasoning		✓	✓			✓	✓		
Problem Solving		✓				✓		✓	
Team Work	✓		✓	✓		✓			✓
Moral and ethical awareness		✓		✓			✓		✓

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	IV	21BBO43C	CORE PAPER – V WOOD SCIENCE AND TECHNOLOGY	5

COURSE LEARNING OUTCOMES:

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

1. Discuss plant tissue types
2. Explain the internal structure of various parts of the plant
3. Identify and describe the secondary growth and anomalous growth.
4. Evaluate the stages of Nodal anatomy
5. Perform Microtechniques in Botanical studies
6. Distinguish different types of wood and characteristics.

Anatomy

UNIT – I

Meristems– Characters and types – structure and function of apical meristems – root apex and shoot apex – theories of meristems. Structure and function of simple tissues– parenchyma, collenchyma, sclerenchyma.

UNIT- II

Complex tissues- xylem, phloem. Types, structure and function of cambium. Primary structures of dicot root (*Vigna*), monocot root (*Maize*), dicot stem (*Tridax*), monocot stem (*Maize*), dicot leaf (*Tridax*) and monocot leaf (*Polyanthus*). Stomata – types. Hydathodes and its functions.

UNIT – III

Secondary growth: normal secondary growth in dicot stem and root. Anomalous secondary growth in *Nyctanthes*, *Boerhaavia* and *Dracaena*. Anatomy of special roots (Pneumatophore roots, prop roots, Epiphytic roots); Nodal anatomy: unilacunar node (*Polyalthia*), trilacunar node (*Gynandropsis*) and multilacunar node (*Aralium*).

UNIT – IV

Microtechniques – Introduction- plant material collection – Processing. Brief outline of Killing and fixation- Dehydration (butyl alcohol method), clearing (Xylol) and Infiltration (Paraffin wax method) - Embedding (wax) – Sectioning – Microtomes (Rotary). Staining- simple and double staining (Safranin-Fast Green) - Mounting (DPX).

UNIT – V

Wood Technology: Dendrochronology – Definition, growth rings; classification of wood - heartwood and softwood; Mechanical properties of wood; durability of wood - wood seasoning and preservation; commercial wood species of India (Teak and RoseWood); composite wood: adhesive – types and uses; engineered wood – veneers, plywood, MDF, particle board

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Power point slide presentations
- ✓ Animated video sessions
- ✓ Assignments

- ✓ MCQ assessments & Laboratory practical's

TEXT BOOKS:

1. Pandey, B.P. 2009. Plant Anatomy. S. Chand and Co., Ltd., New Delhi.
2. Tayal, M.S. 1996. Plant Anatomy. Rastogi Publications. New Delhi.
3. Pandey, B.P. 2011. College Botany, Vol II. S. Chand and CO., Ltd., New Delhi.
4. Toji Thomas. 2005. Essentials of Botanical Microtechnique. Apex Infotech Publishing Company, Chennai.
5. Brown, H. P. 1985. Manual of Indian Wood Technology. International Books and Periodicals Supply Service, New Delhi.

REFERENCES:

1. Katherine Esau. 1965. Anatomy of seed plants, 2nd Edition. Wiley Publishing Co., New York.
2. Suan, R. F. and Eichhorn, E. 2006. Esau's Plant Anatomy: Meristems, Cells, and Tissue of the Plant Body, 3rd Edition. Wiley Publishing Co., New York.
3. Fahh, A. Plant Anatomy, 3rd Edition 1985. Pergamon Press New York.
4. Carlquist, S. 2001. Comparative Wood Anatomy. Springer Science Publication, London, UK.
5. Singh, V., Pandey, P.C. and Jain, D.K. 1998. Anatomy of a Seed Plant. Rastogi Publications, Meerut
6. Ray F. Evert. 2006. Plant Anatomy. Wiley Interscience, Madison.

Online/E-Resources:

<http://virtualplant.ru.ac.za/Main/ANATOMY/prac5.html>.

<https://www.youtube.com/watch?v=Q1VosdthSLM>

<https://www.youtube.com/watch?v=WfURKyslthI>

<https://www.google.com/search?q=neela+bakore+reproduction+in+flowering+plants>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)						
	1	2	3	4	5	6	7
Disciplinary Knowledge	√		√			√	
Communication Skills		√			√		√
Critical Thinking		√	√			√	
Research related skills	√			√	√		√
Analytical reasoning		√				√	√
Problem Solving		√			√	√	
Team work	√			√		√	
Moral and ethical awareness		√		√			√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	IV	21BBO47S	SKILL BASED SUBJECT - II NURSERY, GARDENING AND HORTICULTURE	3

COURSE LEARNING OUTCOMES:

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

1. Recall the importance of nursery practice and gardening.
2. Demonstrate gardening skills.
3. Assess the various types of formal and informal gardens.
4. Construct the components of a formal garden.
5. Illustrate the different horticultural practices.
6. Develop the cultivation techniques for flowers, vegetables and fruits.

UNIT - I

Nursery – Definition, objectives and scope of nursery, nursery layout, nursery maintenance – soil preparation –planting, direct seeding and transplants – nursery management and routine garden operations.

UNIT - II

Gardening – Objectives and scope – gardening pot mixture – soil, compost, vermiculite and coir pith. Garden implements and accessories. Growing structures –pot, glass house, mist chamber, shade house. Garden types – Formal and informal garden – Landscape, lawn, rockery, water garden, bonsai, vertical garden, terrace garden, kitchen garden and hydroponics.

UNIT - III

Irrigation- types of irrigation, garden practices – pruning and thinning, notching, budding and mulching. Vegetative propagation methods – cutting – root, wood and leaf cutting, layering – simple, mound and air layering, grafting – approach and tongue grafting, budding – T and ring budding.

UNIT - IV

Ornamental plants- annuals, biennials, perennials, Divine vines, shade and ornamental trees, succulents, cacti, bulbs and palms. Fresh and dry flower arrangement.

Floriculture - Cultivation of jasmine and rose.

Olericulture: Cultivation of brinjal and bhendi.

Pomology – Cultivation of Papaya and guava.

UNIT – V

Plant Pests, Pest control – Chemical and Biopesticides; Integrated pest management - Concepts and Methods.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated demonstration video sessions
- ✓ Case study/Analysis & Hands on practice

TEXT BOOKS:

1. Andrews, F.S, and Edmond, J.B. 1977. Fundamentals of Horticulture. Tata McGraw-Hill Publishers Co. Ltd., New Delhi.
2. Kumar, N. 1987. Introduction to Horticulture. Rajalakshmi Publishers, Nagercoil.
3. Mani Bhushan Rao, K. 1991. Textbook of Horticulture. Macmillan Publishing Co., New York.
4. Arora, J. S. 1992. Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
5. Rao, K. M. 2000. Text Book of Horticulture. Macmillan India Ltd., New Delhi.
6. George Acquaah. 2002. Horticulture: Principles and Practices, 2nd edition. Pearson Education, Delhi.

REFERENCES:

1. Arnold, R.W. 1960. Principles of Plant Breeding. John Wiley & Sons, Inc, New York.
2. Vishnu Swarup. 1997. Ornamental Horticulture. Macmillan India Ltd., New Delhi.
3. Trivedi, P. P. 2004. Home Gardening. ICAR Publications, New Delhi.
4. Hartmann, H. T., Kester, D.E., Davies Jr., F. T., and Geneve, R. L. 2010. Hartmann & Kester's Plant Propagation: Principles and Practices. Pearson, UK.
5. Singh, B.D. 2018. Plant Breeding: Principles and Methods. Kalyani Publishers, New Delhi.

ONLINE E-RESOURCES:

<https://nptel.ac.in/courses/126/105/126105014/>
<https://www.udemy.com/topic/gardening/>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√		√	√		√
Communication Skills		√			√	
Critical Thinking		√	√	√		√
Research related skills	√			√	√	
Analytical reasoning		√				√
Problem Solving	√			√		√
Team Work	√		√			√
Moral and ethical awareness		√		√	√	

Year	Sem.	Subject Code	Title of the paper	Hours/ Week
2021 -2022 onwards	IV	21BBO45P	CORE PRACTICAL – II (Pteridophytes, Gymnosperms, Paleobotany, Green Farming, Wood Science and Technology, Nursery Gardening and Horticulture)	2

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Describe and List out the features of lower group of plants
2. Identify plants based on sectioning
3. Prepare the microbial biofertilizers
4. Evaluate the anatomical features of the wood
5. Differentiate the types of woods
6. Asses the age of Trees
7. Develop new plant varieties based on horticulture techniques
8. Design new ideas based on vegetable carving

PTERIDOPHYTES: Study of morphology and anatomy of the following genera *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Ophioglossum*, *Adiantum*, *Salvinia*

GYMNOSPERMS: Study of morphology and anatomy of the following genera *Cycas*, *Pinus*, *Gnetum*.

PALEOBOTANY: Study of the fossil specimens *Rhynia*, *Lepidocarpon*, *Lepidodendron*, *Calamites*, *Williamsonia*

GREEN FARMING:

1. Sterilization techniques
2. Medium preparation – solid and liquid – Nutrient Agar, Potato Dextrose Agar
3. Inoculation, incubation and final product – Carrier material for biofertilizer production.

WOOD SCIENCE AND TECHNOLOGY:

1. Observation and identification of different types of tissues (slides).
2. Observation and study of internal structure of stem and root in monocot and dicot
3. Observation and study of the internal structure of monocot and dicot leaf (slides).
4. Observation and study of anomalous secondary growth in *Nyctanthes*.
5. Observation and study of nodal anatomy – unilacunar, trilacunar (slides).
6. Observation of stomatal types.
7. Preparation of double staining – Demonstration
8. Microtome - Demonstration
9. Observation of growth rings
10. Observation of Heartwood and softwood
11. Observation of engineered woods - veneers, plywood, MDF, particle board

NURSERY, GARDENING AND HORTICULTURE

1. Learning the methods of micropropagation
2. Layering, cutting and grafting as specified in the theory syllabus.
3. Fresh and dry flower arrangement
4. Vegetable and fruit carving and arrangement
5. Field trip to Botanical garden and Nursery

PEDAGOGY STRATEGIES

- ✓ Demonstrations
- ✓ Experimental setups
- ✓ Specimen observation/sectioning
- ✓ Microscopic Examination
- ✓ Illustration and chart making

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)							
	1	2	3	4	5	6	7	8
Disciplinary Knowledge	√	√		√	√	√		
Communication Skills	√	√			√			
Critical Thinking						√	√	√
Research related skills				√			√	√
Analytical reasoning	√	√			√			
Problem Solving			√				√	
Team Work							√	√
Moral and ethical awareness	√							√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	V	21BBO51C	CORE PAPER-VI CELL AND MOLECULAR BIOLOGY	5

COURSE LEARNING OUTCOMES:

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

1. Discuss the structure and chemical composition of plant cell
2. Design the model of a plant cell.
3. Identify cytological features
4. Demonstrate the structure of cell organelles, locate its parts and their functions
5. Compare and contrast the events of cell cycle and its regulation
6. Describe the organization, structure and functions of cell organelles
7. Predict mechanism of cell cycle and division
8. Evaluate the sequential events that occur during mitosis and meiosis
9. Assess the regulation of gene expression using operon concept and gene expression in Eukaryotes.

UNIT-I

The cell: Cell theory; Structure of the plant cell; comparative account of prokaryotic and eukaryotic cell. Chemical composition and functions of cell wall; Plasma membrane – Structure, model (Fluid mosaic) and functions.

UNIT-II

Structure and functions of Chloroplast (Light & Dark reaction), Mitochondria (Kreb's cycle & oxidative phosphorylation), Ribosomes, Golgi apparatus, lysosomes, endoplasmic reticulum and peroxisomes.

UNIT-III

Nucleus – Nuclear membrane, nuclear pores and nucleolus; Nucleic acids – chemical structure of DNA – Watson and Crick model, Unusual form of DNA (A and Z DNA), denaturation and renaturation of DNA; Chromatin – nucleosome model; RNA – types; Metaphase chromosome – karyotypes and idiograms; Special type of chromosomes – Giant and lampbrush chromosomes.

UNIT – IV

Cell division and cell cycle – Phases of cell cycle, mitosis and meiosis: Differences between Mitosis and Meiosis; significance of Meiosis; cytokinesis; DNA replication (Rolling circle model and semi conservative model); Genetic code.

UNIT - V

Central Dogma of molecular biology, one gene - one polypeptide hypothesis. Regulation of gene expression; Gene expression in prokaryotes – Operon concept (lac operon and trp operon); structure of mRNA gene; Gene expression in eukaryotes – Post-transcriptional and translational processing.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated video sessions
- ✓ Assignments
- ✓ MCQ assessments
- ✓ Laboratory practical's

TEXT BOOKS:

1. Verma, P.S. and Agarwal, V.K. 1986. Cell Biology and Molecular Biology (Cytology). S. Chand and Company Ltd., New Delhi.
2. De Robertis & De Robertis. 1990. Cell and Molecular Biology, Saunders College, Philadelphia, USA.
3. Freifelder, D. 1993. Essentials of Molecular Biology, Jones & Bartlett, Boston.
4. Elliott, W. H. and Elliott, D. C. 2005. Biochemistry and Molecular Biology, 3rd edition. Oxford University, Oxford.

REFERENCES

1. Watson, J. D. 1987. Molecular Biology of Gene. Benjamin. Gummings publishing co. inc. California.
2. Hopkins, W. 1988. Molecular biology of the gene. Benjamin Publishing Company. California.
3. Gupta, P. K. 1999. A Textbook of Cell and Molecular Biology. Rastogi Publications, Meerut, India.
4. Geoffrey M. Cooper, Robert, E. Hansman. 2007. The cell-A Molecular approach. Sinauer Associates. USA.
5. Lee, P. J. 1999. Plant Biochemistry and Molecular Biology, 2nd edition. John Wiley and Sons, New York.
6. Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular cell biology, 4th edition. W.H. Freeman and Co. New York, USA.

ONLINE/E-RESOURCES:

<https://www.google.com/search?q=neela+bakore+tutorials+cell+the+unit+of+life+hq=neela+bakore+tutorials>

<https://nptel.ac.in/courses/102/103/102103012/>

<http://www.bio-nica.info/Biblioteca/Bolsover2004CellBiology.pdf>

https://www.academia.edu/36419728/LECTURE_NOTES_CELL_BIOLOGY

<https://www.google.com/search?q=meiosis+by+neela+bakore>

<https://www.youtube.com/watch?v=VdNhREmkrmE>

<https://www.youtube.com/watch?v=NFdeXi9Gfpc>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)								
	1	2	3	4	5	6	7	8	9
Disciplinary Knowledge	√		√		√	√	√		
Communication Skills	√	√		√					
Critical Thinking		√			√				√
Research related skills				√			√	√	√
Analytical reasoning		√		√			√	√	
Problem Solving		√						√	
Team Work							√		√
Moral and ethical awareness			√						√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	V	21BBO52C	CORE PAPER-VII MORPHOLOGY, EMBRYOLOGY, SEED SCIENCE AND TECHNOLOGY	5

COURSE LEARNING OUTCOMES:

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

1. Recall the terminologies in plant morphology and identify morphological peculiarities.
2. Point out the morphological adaptations in plants.
3. Evaluate the external organization of angiosperms
4. Discuss the development of male and female gametophyte (Microsporogenesis and Megasporogenesis)
5. Infer the reproduction in Angiosperms
6. Evaluate the potential and significance of seeds

UNIT- I

Vegetative morphology: The plant body (Angiosperm) – Habit and Habitat -root-stem-bud- leaves and their modifications.

UNIT – II

Floral morphology – Flower as a modified shoot; Inflorescence- types; Floral parts-Patterns of floral symmetry - fusion of floral parts, Placentation. Fruits and seeds.

UNIT – III

Embryology of Angiosperms: Structure and development of microsporangium – Microsporogenesis- Microgametogenesis – Pollen wall features. Megasporangium – Types of ovule, nucellus, integument- Obturator – caruncle- Hypostase and epistase.

UNIT – IV

Megasporogenesis and megagametogenesis. Development of female gametophyte types - monosporic (*Polygonum*), Bisporic (*Allium*), tetrasporic (*Peperomia*). Pollination types and agents. Fertilization- Double fertilization and triple fusion. Endosperm types. Aleurone tissue. Embryogeny - Dicot (*Capsella*) and Monocot (*Najas*). Outlines of polyembryony.

UNIT –V

Seed Science and Technology

Amphimixis – Scope, Aim and importance of seed technology, structure of seed and seed coat; Seed germination and factors affecting germination, Vivipary, Seed dormancy and its types; Orthodox and recalcitrant seeds. Seed dispersal – types; seed viability – Tetrazolium test; overview of seed collection, processing, storage and seed certification.

PEDAGOGY STRATEGIES

- ❖ Board and Chalk lectures
- ❖ Powerpoint slide presentations
- ❖ Animated video sessions
- ❖ Assignments
- ❖ MCQ assessments

❖ Laboratory practical's

TEXTBOOKS:

1. Bharathi Bhattacharyya. 2009. Systematic Botany. Narosa Publishing House. India.
2. Akhil Baruah. 2008. Advanced Morphology of Angiosperms. Pointer Publishers. Jodhpur.
3. Suniti Sharan. 2011. Plant Morphology. Pacific Books International. New Delhi.
4. Verma, B.K. 2011. Introduction to Taxonomy of Angiosperms. PHI Learning Pvt. Ltd., New Delhi.
5. Sundararajan, S. 2003. Practical Manual of Plant Morphology. Anmol Publishers and Distributors, New Delhi.
6. Bhojwani, S.S. and Bhatnagar, S. 2009. Embryology of Angiosperms. Vikas Publishing House Pvt. Ltd., New Delhi.
7. Agarwal, V. K. 1995. Principles of Seed Technology, 2nd edition. Oxford and IBH Publications Pvt. Ltd. New Delhi.

REFERENCES:

1. Pandey, B.P. 2011. College Botany, Vol.I. S. Chand and Co., Ltd. New Delhi.
2. Subrahmanyam, N. S. 2005. Modern Plant Taxonomy. Vikas Publishing House Pvt. Ltd. New Delhi.
3. Singh, V. and Jain, D.K. 2010. Taxonomy of Angiosperms, 2nd edition. Rastogi Publications, Meerut.
4. Maheswari, P. 1963. An Introduction to embryology of angiosperms. McGraw-Hill, New York.

ONLINE/E-RESOURCES:

<https://www.youtube.com/watch?v=qIAoMgHtyOc>
<https://www.youtube.com/watch?v=vMs16X1H4tk>
https://www.youtube.com/watch?v=q3_8pvZebXQ
<https://www.youtube.com/watch?v=bkyi83fnJyo&t=10s>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√	√			
Communication Skills		√				√
Critical Thinking	√		√	√		
Research related skills				√		√
Analytical reasoning	√				√	
Problem Solving	√		√			
Team Work					√	√
Moral and ethical awareness						√

Year	Sem.	Subject Code	Title of the paper	Hours/ Week
2021 -2022 onwards	V	21BBO53C	CORE PAPER-VIII PLANT SYSTEMATICS, ECONOMIC BOTANY, ETHNOBOTANY AND PHARMACOGNOSY	5

COURSE LEARNING OUTCOMES:

On completion of this course, students will be able:

1. Recall the classical taxonomic parameters of Angiosperms.
2. Discuss the principles of plant systematics.
3. Infer the diversity of Plant and plant products in everyday life.
4. Evaluate Tribal medicine.
5. List the economically and medicinally important indigenous plant species
6. Assess the diversity of crude drugs and its utility.

UNIT – I

Scope and importance of Taxonomy. Classification of Angiosperms- Bentham and Hooker system. Cronquist. Flora, revision and Monographs. Botanical nomenclature (ICBN), Taxonomic hierarchy, typification, principles of priority, publication, Keys and their types, Preparation and role of Herbarium. Importance of Botanical gardens.

UNIT - II

Systematics and economic importance of the following families: Magnoliaceae, Sterculiaceae, Rutaceae, Anacardiaceae, Myrtaceae, Cucurbitaceae and Apiaceae, Rubiaceae, Asteraceae.

UNIT – III

Systematics and economic importance of the following families: Apocynaceae, Solanaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae and Poaceae.

UNIT – IV

Economic Botany: Binomials, Family, Morphology of useful parts and uses of the following commercially important plants. Cereal (Paddy). Timber (Red Sander), Pulse (Green gram), Oil yielding plant (coconut), Spices (*Cinnamon*), Fiber (Cotton), Beverage (Coffee). Medicinal Plant (*Phyllanthus amarus*). Paper and pulp (*Casuarina*).

UNIT - V

Ethnobotany: Brief outline of ethnobotany. Medicinal practices of Irulas.

Pharmacognosy: Definition, Indian system of medicine- Siddha, Ayurveda, Unani & Homeopathy, Systematics study of crude drugs with reference to their vernacular name, Family, Preparation and uses. Root-Rauwolfia, Bark-Cinnamomum, Leaf-Aloe, Flower-Rose, Fruit-Emblica, Seed-Cardamom.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated video sessions
- ✓ Assignments
- ✓ MCQ assessments

TEXTBOOKS:

1. Sharma, O.P. 2007. Plant Taxonomy. Tata McGraw-Hill Publishing Company, New Delhi.
2. Singh, V. and Jain, D.K. 2010. Taxonomy of Angiosperms, 2nd Edition. Rastogi Publications Meerut, India.
3. Singh, V. 2004. Plant Systematics. Oxford & IBH Publishing Co., Pvt. Ltd. New Delhi.
4. Pandey, B.P. 2011. College Botany, Vol. I. S. Chand and Co., Ltd. New Delhi.
5. Pandey, B.P. 2009. Economic Botany. S. Chand and Co., Ltd. New Delhi
6. Sharma, O. P. 1996. Economic Botany. Tata McGraw-Hill Co., Ltd., New Delhi.
7. Pandey, B. P. 2011. College Botany, Vol.III. S. Chand & Co., Ltd. New Delhi.
8. Kumar, N.C. 2004. An Introduction to Medical Botany & Pharmacognosy. EMKAY Publications, New Delhi.

REFERENCES:

1. Subrahmanyam, N.S. 1999. Modern Plant Taxonomy. Vikas Publishing House Pvt. Ltd, New Delhi.
2. Mondal, A.K. 2009. Advanced plant Taxonomy. New Central Agency Pvt. Ltd., New Delhi.
3. Bharathi Bhattacharyya. 2009. Systematic Botany. Narosa Publishing House, India.
4. Verma, B.K. 2011. Introduction to Taxonomy of Angiosperms. PHI Learning Pvt. Ltd, New Delhi.
5. The useful Plants of India. 1986. CSIR Publications and Information Directorate, New Delhi.
6. Kochar, S.L. 2000. Economic Botany of the Tropics. Macmillan India Pvt. Ltd. New Delhi.
7. Kumar, N. 2018. A Textbook of Pharmacognosy. AITBS Publishers, India.

ONLINE/E-RESOURCES:

https://swayam.gov.in/nd2_cec19_bt10/preview

<https://nptel.ac.in/courses/102/107/102107075/>

<https://www.swayamprabha.gov.in/index.php/program/archive/9>

<https://www.youtube.com/watch?v=qIAoMgHtyOc>

<https://www.youtube.com/watch?v=vMs16X1H4tk>

https://www.youtube.com/watch?v=q3_8pvZebXQ

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√	√		√	√
Communication Skills		√	√			√
Critical Thinking	√		√	√	√	
Research related skills		√		√		√
Analytical reasoning		√		√		√
Problem Solving	√	√	√		√	√
Team Work		√	√	√	√	√
Moral and ethical awareness	√			√	√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	V	21BBO54C	CORE PAPER - IX GENETICS, PLANT BREEDING, EVOLUTION AND BIOSTATISTICS	5

COURSE LEARNING OUTCOMES:

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

1. Demonstrate the Mendelian principles of inheritance
2. Associate the relationship between alleles and their interaction in inheritance.
3. Evaluate the variations in chromosome number and ploidy of an organism
4. Infer the significance of chromosomal mutations in inheritance of a character
5. Recognize extra chromosomal inheritance and population genetics.
6. Explain the process of sex determination in plants
7. Extrapolate the various plant breeding methods for production of new varieties and theories of evolution.
8. Organize and interpret the data from biological experiments statistically.

Genetics

UNIT –I

Mendel's Experiments (Monohybrid and Dihybrid cross) and Principles of inheritance (Law of Dominance, Law of Segregation, Law of Independent assortment); Back cross and test cross; Gene interaction: Allelic interaction (Incomplete dominance, Complementary factor); Non allelic interaction (Dominant epistasis); Linkage and crossing over (Brief outline only),

UNIT-II

Variation in chromosome structure (Deletion, Duplication, Insertion, Inversion and Translocation); Variation in chromosome number: Euploidy (Autopolyploidy and Allopolyploidy); Aneuploidy (Trisomics, Monosomics and Nullisomics); Mutation (Spontaneous and induced mutations); Physical and chemical mutagens; Molecular basis of mutation.

UNIT-III

Extra-Chromosomal inheritance: Cytoplasmic male sterility (Maize) and Plastid inheritance (*Mirabilis*); Sex determination in plants. Population Genetics: Gene frequency, Hardy- Weinberg's Law, Factors affecting Hardy- Weinberg Equilibrium.

UNIT-IV

Plant Breeding: Selection (Mass, Pure line and clonal selection), Hybridization- Types, Selection of parents, Methods of Emasculation- Bagging and tagging. Heterosis in crop improvement. Breeding achievements in Rice.

Evolution: Origin of Life, Evidences for organic evolution; Theories of organic evolution (Darwinism, Lamarckism & Mutation Theory).

UNIT-V

Biostatistics: Data - types (Primary and Secondary Data), methods of data collection, Sampling methods, Frequency distribution, Tabulation - General rules, parts and types of tables, Diagrammatic

and Graphical representation of Data. Analysis of Data - Measures of Central tendency (Mean, Median and Mode), Measures of Dispersion (Range, Standard Deviation and Standard Error), Test of Significance: Chi-square test. ANOVA.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Animated video sessions
- ✓ Assignments
- ✓ MCQ assessments

TEXTBOOKS:

1. Gupta, P. K. 1979. A Textbook of Cytology, Genetics and Evolution, 3rd edition. Rastogi Publications, Meerut, India.
2. Basu, S. B. and Hossain, M. 2006. Principles of Genetics. Books & Allied (P) Ltd, Kolkata.
3. Gupta, P. K. 2007. Genetics: Classical to Modern, 1st edition. Rastogi Publications, Meerut, India.
4. Veer Bala Rastogi and Kedar Nath Ram Nath. 2007. Organic Evolution, 12th Revised edition. KNRN Publications, Meerut, New Delhi.
5. Shukla, R. S. and Chandel, P. S. 1988. Cytogenetics, Evolution and Plant Breeding. S. Chand & Company (P) Ltd, New Delhi.
6. Sharma, J. R. 1994. Principles and Practice of Plant Breeding. Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. Antonisamy, B., Solomon Christopher and Prasanna Samuel, P. 2010. Biostatistics: Principles and Practice. Tata McGraw-Hill Education Private Limited, New Delhi.

REFERENCE:

1. Peter J Russell. 1987. Essential Genetics, 2nd edition. Blackwell Scientific Publications, London.
2. Gardner, Simmons and Snustad. 1991. Principles of Genetics, 8th edition. John Wiley & Sons, Inc., New York.
3. Mahabal Ram. 2010. Fundamentals of Cytogenetics and Genetics. PHI Learning Private Limited, New Delhi.
4. Sanjib Chattopadhyay. 2007. Origin, Evolution and Adaptation. Books and Allied (P) Ltd, Calcutta.
5. Irfan A. Khan and Atiya Khanum. 1994. Fundamentals of Biostatistics, 1st edition. Ukaaz Publications, Hyderabad, Andhra Pradesh, India.
6. Sundar Rao, P.S.S. and Richard, J. 2004. Introduction to Biostatistics and Research Methods, 4th edition. Prentice-Hall of India, New Delhi.
7. Marcello Pagano and Kimberlee Gauvreau. 2008. Principles of Biostatistics, 2nd edition. Cengage Learning India Private Limited, New Delhi.

ONLINE/E-RESOURCES:

https://swayam.gov.in/nd2_cec20_bt03/preview https://swayam.gov.in/nd2_cec20_bt07/preview
https://swayam.gov.in/nd2_cec20_bt06/preview <https://www.youtube.com/watch?v=8ATRfaiaOLg>
<https://www.google.com/search?q=genetics+principles+of+inheritance+and+variation+neela+bakore>
<https://www.youtube.com/watch?v=S6tNSFisIcU>
<https://www.youtube.com/watch?v=uEM1qvbdQCQ>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)							
	1	2	3	4	5	6	7	8
Disciplinary Knowledge	√				√	√		√
Communication Skills		√	√				√	√
Critical Thinking		√	√		√			
Research related skills	√		√			√		√
Analytical reasoning	√			√	√	√		
Problem Solving		√					√	√
Team Work	√			√			√	√
Moral and ethical awareness	√			√		√		

Year	Sem.	Subject Code	Title of the paper	Hours/ Week
2021 -2022 onwards	V	21BBO56S	SKILL BASED SUBJECT – III MUSHROOM CULTIVATION AND PLANT TISSUE CULTURE	3

COURSE OUTCOME:

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

1. Identify the edible and harmful mushrooms and demonstrate the nutritional and commercial value of mushroom
2. Design the infrastructure facilities for mushroom cultivation and design the procedure for mushroom cultivation
3. Design Post-harvest procedures in mushroom cultivation
4. Plan a Plant Tissue Culture Laboratory
5. Demonstrate micropropagation and callus culture using different explants
6. Analyze haploid and triploid cultures and apply protoplast culture for somatic hybridization.
7. Illustrate artificial seed production.
9. Compile secondary metabolite synthesis from plants.

Mushroom Cultivation

UNIT-I

Mushroom cultivation - Classification and identification of edible and poisonous mushrooms. Nutritional and medicinal value of mushrooms. Morphology and characteristics of commonly cultivated edible mushrooms - Paddy straw mushroom (*Pleurotus* sp.), Button mushroom (*Agaricus bisporus*), Milky mushroom (*Calocybe indica*). Life cycle of *Agaricus*.

UNIT-II

Mushroom cultivation site selection and construction of mushroom shed infrastructure. Mushroom mother stock culture; preparation of spawn, mass cultivation button mushroom. Preservation and storage of mushrooms. Delicious recipes for mushrooms (mushroom soups and pickle).

Plant Tissue Culture

UNIT-III

Introduction – Laboratory organization - culture Media (MS medium), Stock Preparation, and Sterilization Techniques.

UNIT –IV

Callus culture and Micropropagation, Somaclonal variation - Suspension culture. Haploid production - Anther culture, pollen culture and ovary culture, Triploid production.

UNIT –V

Protoplast isolation and culture, Somatic Hybridization, Somatic Embryogenesis and synthetic seed. Production of secondary metabolites – alkaloids, steroids, and terpenoids (Brief account only). Cryopreservation and germplasm preservation.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Assignments
- ✓ Online and Offline Class Practicals
- ✓ Group discussions

TEXTBOOKS:

1. Nita Bahl, 1988. Hand book of Mushrooms, II Edition, Vol. I & Vol. II. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
2. Swaminathan, M. 1990. Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., Bangalore.
3. Suman, B.C. and Sharma, V. P. 2007. Mushroom Cultivation in India. Daya Publishing House, New Delhi.
4. Reinert, J. and Bajaj, Y. P. S. 1977. Plant Cell Tissue and Organ Culture: A Laboratory Manual, Narosa Publishing House, New Delhi.
5. Bhojwani, S. S. and Razdan, M. K. 1983. Plant Tissue Culture: Theory and Practice. Elsevier Science Publishers, Netherlands.
6. Kalyan Kumar De. 1992. An Introduction to Plant Tissue Culture. New Central Book Agency, Calcutta.
7. Razdan, M. K. 2004. Introduction to Plant Tissue Culture, 2nd edition. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Aneja, K.P. 2001. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom production, New Age International (P) Ltd. New Delhi.
2. Vasil, I. K. 1986. Cell Culture and Somatic Cell Genetics of Plants. 3 Volumes. Academic Press Inc., New York.
3. Hammond, J., McGarvey, P. and Yusibov, V. (2000). Plant Biotechnology. Springer Verlag, New York.

ONLINE/E-RESOURCES:

<https://www.classcentral.com/course/swayam>

<https://www.classcentral.com/report/list-of-mooc-based-microcredentials>

<https://nptel.ac.in/courses/102/103/102103015>

<https://nptel.ac.in/courses/102/103/102103016/>

<http://ugcmoocs.inflibnet.ac.in/ugcmoocs/spoc.php?coordinator=574>

<https://www.youtube.com/watch?v=bi755vQVNx8>

<https://www.youtube.com/watch?v=Vkh7L-qcnT0>

<https://www.youtube.com/watch?v=Umoz4KYBBmE&t=183s>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)							
	1	2	3	4	5	6	7	8
Disciplinary Knowledge	√		√	√		√	√	√
Communication Skills		√		√				√
Critical Thinking	√	√		√			√	
Research related skills	√		√			√		√
Analytical reasoning		√				√		√
Problem Solving	√	√	√		√	√		√
Team Work			√		√	√	√	
Moral and ethical awareness	√			√			√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 Onwards	V	21BBO5EL	NON MAJOR ELECTIVE PAPER - I PLANTS AND HUMAN WELFARE- I	3

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Identify plants based on various aspects and factors related to plant growth.
2. Distinguish the nutritional impacts in soil fertility.
3. Demonstrate the multiplication of important soil organisms.
4. Produce microbial biofertilizer.
5. Identify, prepare, use and supply Biopesticides Integrate the use of biopesticides.
6. Create awareness on importance of eco-friendly farming and its safety aspects.

UNIT - I

Introduction to Plant kingdom. Plant body-vegetative and reproductive parts. Plant types (Herb, Shrub, Trees, Climbers, Creepers, Twiners); Annuals, biennials, Perennials; Mesophytes, hydrophytes, xerophytes and halophytes. Food crops (Cereals, pulses and oil yielding plants), Medicinal Plants, Ornamental plants - Flowering plants and cacti. Factors affecting plant growth (Edaphic, biotic and abiotic).

UNIT - II

Soil fertility and microorganisms. Isolation, Identification, Mass Cultivation and Methods of application of Rhizobium, Azospirillum, Azotobacter, Phosphate Solubilizing bacteria and carrier materials.

UNIT - III

Cyanobacterial Fertilizers – Anabaena and Azolla – Mass production and method of application; Mycorrhiza – ectomycorrhiza, endomycorrhiza, VAM association, types, isolation and inoculum production.

UNIT - IV

Biological control of Pest and Disease: biofungicides (Trichoderma), bioherbicides, (Phytophthora) and bioinsecticides (*Bacillus thuringiensis*), Biopesticides (Baculoviruses) mechanism of action, method of production and applications. Advantages of Biopesticides and Commercialization

UNIT - V

Green manure production –Methods, advantages and mode of application; Plant waste management and organic cultivation; Integrated pest Management and Integrated nutrient management – Concept and advantages

PEDAGOGY STRATEGIES

- ✓ Board and Chalk Lecture
- ✓ Powerpoint Presentation
- ✓ Seminar
- ✓ Assignments
- ✓ Group Discussions
- ✓ Demonstrations

TEXTBOOKS:

1. Ashok Bendre and Pande, P. C, 2008, Introductory Botany, Rastogi Publications.
2. Subba Rao, N. S. 1982. Biofertilizers in Agriculture, 2nd edition. Oxford and IBH Co. Pvt. Ltd. New Delhi.
3. Natarajan, S. Devasenapathy, P. Kalpana, R. and Sudhalakshmi, C. 2010. Organic Farming: An overview. Centre for Soil and Crop Management Studies, Tamil Nadu Agricultural University, Coimbatore.
4. Somani, L. L. 2019. Textbook on Principles of Organic Farming. Agrotech Publishers, Udaipur.

REFERENCES:

1. Sathe, T.V. 2004. Vermiculture and Organic Farming. Daya publishers.
2. Subha Rao, N.S. 2000. Soil Microbiology. Oxford & IBH Publishers, New Delhi.
3. Vayas, S.C, Vayas, S. and Modi, H.A. 1998. Bio-fertilizers and organic Farming. Akta Prakashan, Nadiad.

ONLINE/E-RESOURCES:

https://agritech.tnau.ac.in/org_farm/orgfarm_EM_tech_index.html
https://agritech.tnau.ac.in/org_farm/orgfarm_index.html
<https://nptel.ac.in/courses/126/104/126104003/>
<http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loV3FoZU4xZ0NXZjVJRkNkSzZYQ2x2UVZNRzhLMGNxOUZTb3RXNnkxTFNKZg>
<http://ndl.iitkgp.ac.in/document/Qkh4R2FGUkRNZjFicFUvWmpzQ2loWGI2b0FVZ1c4V11WNDdCMEILSjV1RTRUa3RpTmZIZDJnWml6c0QzV2s0Kw>
<http://ndl.iitkgp.ac.in/document/Z2JzN0ZmU2VhdW5kODBJdWRCTmg3RWtMWmZaQjBGN2tBb0JPMUNjZ2ZyeFNTeStOVmR1SjUyMUllQVpSaUZ5cnV0YXR4WnpjUE9KUE1ZMFn6My9meHc9PQ>
<https://www.youtube.com/watch?v=ZxxurjxzqTI>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√			√	
Communication Skills		√		√	√	√
Critical Thinking	√	√		√		
Research related skills		√		√	√	
Analytical reasoning		√	√	√		
Problem Solving		√	√			√
Team Work				√	√	√
Moral and ethical awareness		√	√			√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	V	21BBO55P	CORE PRACTICAL - III (Cell and Molecular Biology, Morphology, Embryology, Seed Science and Technology, Plant Systematics, Economic Botany, Ethnobotany, Pharmacognosy Genetics, Plant Breeding, Evolution, Biostatistics, Mushroom Cultivation and Plant Tissue Culture)	4

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Identify and Isolate the Cell organelles
2. Distinguish the different stages of cell division
3. Observe significant modifications in plants
4. Recognize the types of fruits and seeds
5. Test the viability of seeds
6. Interpret the characters and rank the plant species
7. Analyze and identify the ethnobotanical important crude drugs
8. Design and develop Plant tissue culture lab and Mushroom cultivation unit

CELL AND MOLECULAR BIOLOGY

- Observation and study of ultrastructure of cell organelles (chart, slides, models & micrographs).
- Isolation of Chloroplast and Mitochondria using ultracentrifuge (Protocol).
- Observation of different stages of mitosis in onion root tip squash preparation.
- Observation of the Scheme/ Photograph of Structure of DNA, tRNA, and mRNA, Transcription, Translation, 'Lac' operon, 'Trp' operon.

MORPHOLOGY:

- Observation of taxonomically significant root modifications (Beet root, Carrot)
- Observation of taxonomically significant stem modifications (*Coccinia*, Ginger)
- Observation of taxonomically significant leaf modifications (*Gloriosa*)
- Observation of taxonomically significant inflorescence types (Capitulum, Verticillaster)
- Fruits – fleshy (Berry), Dry - dehiscent (*Calotropis*) and indehiscent (Samara)
- Seeds – endospermous and non-endospermous

EMBRYOLOGY, SEED SCIENCE AND TECHNOLOGY

- Observation and study of T.S of young anther.
- Observation of ovule types (slides).
- Observation of embryo sac structure (chart).
- Dissection of dicot embryo - *Tridax* (any one stage).
- Study of endosperm types (slide).
- Testing of seed viability –Tetrazolium salt test.

TAXONOMY

- Taxonomic study of plants belonging to the families Magnoliaceae, Sterculiaceae, Rutaceae, Anacardiaceae, Myrtaceae, Cucurbitaceae and Apiaceae, Rubiaceae, Asteraceae, Apocynaceae, Solanaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae,

Orchidaceae, Liliaceae and Poaceae.

- Field visits: Botanical study tour for 3 or 4 days to be undertaken for covering various natural habitats and one or two single day collection trips in South India.
- Submission of 20 herbarium sheets (weeds) along with tour/trip report and field notebook.

ECONOMIC BOTANY:

- Study of the morphology and structure of useful parts of the plants mentioned in and herbarium sheets and collection of samples of plants.

ETHNOBOTANY: Listing of the medicinal practices of Irulas.

PHARMACOGNOSY: Crude drug analysis

Root	- Rauwolfia
Bark	- Cinnamomum
Leaf	- Aloe
Flower	- Rose
Fruit	- Emblica
Seed	- Cardamom

GENETICS & PLANT BREEDING:

- Chromosomal mapping
- Simple problems on the following aspects: Monohybrid cross, Test cross, Incomplete dominance and Dominant epistasis.
- Hybridization techniques using potted plants.

BIOSTATISTICS:

- Data analysis to determine Mean & Mode
- Finding out Standard Deviation by giving Data from plant sources
- Chi-square test

MUSHROOM CULTIVATION AND PLANT TISSUE CULTURE

- Sterilization procedure for Mushroom cultivation
- Spawn production
- Mushroom cultivation – bag – bed layering and seeding
- Sterilization techniques for plant tissue culture (Fumigation, Flame sterilization, Dry heat, Wet heat and Filter sterilization)
- Preparation of MS Medium
- Callus culture
- Nodal culture
- Synthetic seed production
- Field visit to TNAU, Coimbatore.

PEDAGOGY STRATEGIES

- ❖ Demonstrations
- ❖ Experimental setups
- ❖ Model making

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)							
	1	2	3	4	5	6	7	8
Disciplinary Knowledge	√	√	√	√				
Communication Skills		√	√				√	√
Critical Thinking		√			√	√	√	√
Research related skills	√	√				√	√	
Analytical reasoning				√	√		√	
Problem Solving	√				√		√	
Team Work								√
Moral and ethical awareness							√	√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 Onwards	VI	21BBO61C	CORE PAPER - X PLANT PHYSIOLOGY	6

COURSE LEARNING OUTCOMES:

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

1. Describe the concepts of physiological processes in plants and recognize the vital process of stomatal movement in plants.
2. Discuss the significance of photosynthesis and distinguish the various pathways of Carbon assimilation
3. Outline the process of cellular respiration and ATP synthesis
4. List the nutrient proportion of healthy plant growth
5. Illustrate the mechanism of biological nitrogen fixation
6. Relate the phenomenon of photoperiodism to plant movement and flowering.
7. Classify and manipulate the growth hormones based on the effects

UNIT - I

Plant – Water relations: Physical properties of water, Importance of water to plant life. Diffusion, osmosis, plasmolysis and imbibition; concept & components of Water potential. Absorption and transport of water and ascent of sap. Transpiration –Definition, types of transpiration, structure and opening and closing mechanism of stomata. Translocation of organic solutes: mechanism of phloem transport, source-sink relationships; factors affecting translocation.

UNIT -II

Photosynthesis: Definition and its significance; Properties of light and absorption of light by photosynthetic pigments. Concept of photosystems I and II. Emerson's effect; Photophosphorylation. Mechanism of Co₂ fixation in Calvin (C₃) cycle, C₄ cycle and CAM pathway and its regulation. Photorespiration.

UNIT - III

Respiration – Definition, aerobic and anaerobic respiration; Glycolysis, Krebs Cycle; electron transport mechanism; oxidative phosphorylation and ATP synthesis; Pentose Phosphate Pathway

UNIT - IV

Mineral Nutrition: Essential elements (macro and micronutrients) and their role in plant metabolism, deficiency symptoms. Mineral ion uptake (active and passive transport); Uptake of solutes and macromolecules from soil, Ion channels, ATPase carrier, Aquaporins. Nitrogen metabolism - biological nitrogen fixation in Rhizobium, mechanism of nitrogen fixation and assimilation of ammonia.

UNIT - V

Different phases of growth and development; plant movements (tactic and tropic); the concept of photoperiodism. Physiology of flowering: florigen concept, vernalization, biological clocks: physiology of senescence, fruit ripening; Plant growth regulators and their mode of action: Auxins, Gibberellins, Cytokinins, Abscissic acid and Ethylene, role of phytohormones and biostimulants (Seaweed extract) in plant growth. Photomorphogenesis: Phytochromes and Cryptochrome.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lecture
- ✓ Powerpoint slide presentations
- ✓ Assignments
- ✓ Class Practical sessions
- ✓ Quizzes & Group discussion

TEXT BOOKS:

1. Verma, S.K. 1995. A Textbook of Plant Physiology and Biochemistry. S. Chand & Company Ltd., New Delhi.
2. Jain, V.K. 2000. Fundamentals of Plant Physiology, 5th edition. S. Chand & Co. Ltd., New Delhi.
3. Hopkins, W. G. and Hüner, N. P. A. 2008. Introduction to Plant Physiology, 4th edition. John Wiley & Sons, Inc., New York, USA.
4. Pandey, N. S. and Pandey, P. 2016. Textbook of Plant Physiology. Daya Publishing House, New Delhi.

REFERENCES:

1. Salisbury, F. B. and Ross, C.W. 1992. Plant Physiology, 4th edition. Wadsworth Publishing Co. California, USA.
2. Devlin, R. M. and Witham, F.H. 1999. Plant Physiology. 4th edition, CBS Publishers and Distributors, New Delhi.
3. Sinha, R.K. 2007. Modern Plant Physiology, Narosa Publishing House, New Delhi.
4. Noggle, G.R. and Fritz, G.J. 2010. Introductory Plant Physiology, 2nd edition. Prentice Hall of India, New Delhi.

ONLINE/E-RESOURCES:

<https://learn.careers360.com/biology/plant-physiology-chapter/>

https://swayam.gov.in/nd2_cec20_bt01/preview

<https://www.nature.com/subjects/plant-physiology>

<https://youtu.be/EycfjSri7Tc>

<https://youtu.be/OW2nOkf3f9w>

<https://www.youtube.com/watch?v=zwzDcxn05dA>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)						
	1	2	3	4	5	6	7
Disciplinary Knowledge	✓		✓		✓	✓	✓
Communication Skills	✓		✓			✓	✓
Critical Thinking		✓					✓
Research related skills			✓	✓		✓	
Analytical reasoning		✓					✓
Problem Solving	✓		✓	✓		✓	✓
Team Work	✓		✓	✓		✓	✓
Moral and ethical awareness				✓			✓

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2020 -2021 Onwards	VI	21BBO62C	CORE PAPER – XI PLANT BIOCHEMISTRY	5

COURSE LEARNING OUTCOMES:

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

1. Summarize the classification and structure of amino acids to infer various levels of protein structure.
2. Classify the Carbohydrates and Lipids and generalize their structure and importance.
3. Recognize the classes, nomenclature of enzymes and also illustrate the theories of mechanism of action of enzymes.
4. Demonstrate the biosynthesis and oxidation of fatty acids.
5. Extrapolate biological significance and pharmacological importance of various secondary metabolites.
6. Infer the principles of bioinstrumentation
7. Identify the required methodology for analysing the biological samples
8. Apply the techniques to estimate the components in the biological samples
9. Interpret the results of analysis and discuss the significance

UNIT- I

Carbohydrates: General structure and importance; Classification (brief outline), structure of glucose, fructose, sucrose, starch and cellulose. **Amino acid and Proteins:** Structure and classification of amino acids; peptide bond; structure of proteins – primary, secondary, tertiary and quaternary.

UNIT - II

Lipids: General structure and importance; Classification (brief outline), saturated and unsaturated fatty acids; β – oxidation of fatty acids (Palmitic acid).

Enzymes: General properties, nomenclature, Modern classification and mechanism of enzyme action, factors affecting enzyme activity (Brief outline)

UNIT – III

Secondary metabolites: An outline of secondary metabolism; biological significance and pharmacological importance of major types of secondary metabolites - alkaloids, terpenoids, and polyphenols. A schematic outline of alkaloid extraction.

UNIT – IV

Principles, Methodology, Techniques and uses of pH meter, Colorimeter, Microscopy (light Microscope), Spectrophotometer (UV and Visible), Centrifugation.

UNIT – V

Electrophoresis - Principle, Types and application of Agarose Gel and SDS- PAGE; Southern Blotting. Principle and applications of Chromatography (Paper, TLC and Column).

PEDAGOGY STRATEGIES:

- ✓ Board and Chalk method
- ✓ Powerpoint presentation
- ✓ Animated videos
- ✓ Laboratory experiments
- ✓ Quizzes
- ✓ Supplementary resources such as online videos, NPTEL videos, ^[1]_{SEP}e-courses, Virtual Laboratory.

TEXT BOOKS:

1. Das Gupta, S.K. 1977. Biochemistry, Vol.II. Macmillan & Co., New Delhi.
2. Renganatha Rao, K. 1986. Textbook of Biochemistry. Prentice-Hall of India (P) Ltd., New Delhi.
3. Saim, A. S., 1994. Textbook of Biochemistry. CBS Publishers, New Delhi.
4. Jain, J. L., 1999. Fundamentals of Biochemistry. S.Chand & Co. Ltd., New Delhi.
5. Lehninger, A. L. 2005. Biochemistry, 5th edition. Kalyani Publishers, Ludhiana.

REFERENCES:

1. Conn, E. and Stumpf, P.K., 1979. Outline of Biochemistry, Wiley Eastern Ltd., New Delhi.
2. Stryer, L. 1995. Biochemistry, Fourth edition. W.H. Free Man & Company, New York.
3. Voet, D. and Voet, J. H. 1995. Biochemistry. John Wiley and Sons, New York.
4. Zubay, G. L., Pason, W. W. and Vane, D. E. 1995. Principles of Biochemistry W.W.C Brown Publishers, Oxford.
5. Nelson, D. L. and Cox, M. M. 2000. Lehninger – Principles of Biochemistry. Worth Publishers, New York.
6. Wilson, K. and Walker, J. 2000. Practical Biochem- Principles and Techniques. Cambridge Uni. Press, Cambridge, U.K.
7. Lea, P. J. and Leegood, R. C. 2001. Plant Biochemistry and Molecular Biology, 2nd edition. John Wiley and Sons Ltd. England.
8. Weil, J. H. 1997. General Biochemistry. New Age International Ltd., New Delhi.
9. Elliott, W. H. & Elliott, D. C. 2005. Biochemistry and Molecular Biology, 3rd edition. Oxford University, Oxford.
10. Berg, J. M., Tymoczko, J. L. and Stryer, L. 2006. Biochemistry, 6th edition, W.H. Freeman and Company, New York.
11. Devlin, T. M. (ed.), 2006. Textbook of Biochemistry, 6th edition. A John Wiley & Sons, Inc. Publication, New York.
12. Mary.K.Campbell. Shawn O. Fawell. 2007. Biochemistry. 6th edition. Thompson. Brooks/cole.USA.
13. Reginald. H.G., and Grisham, M. C. 2010. Biochemistry. Mary Finch Publisher, USA.

ONLINE/E-RESOURCES:

[Introduction to Biochemistry – Biochemistry | Lecturio](http://www.digimat.in/nptel/courses/video/104105076/L27.html)
<http://www.digimat.in/nptel/courses/video/104105076/L27.html>
<https://www.youtube.com/watch?v=DhwAp6yQHQI>
<http://nptel.ac.in/courses/104/105/104105076/>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)								
	1	2	3	4	5	6	7	8	9
Disciplinary Knowledge	√	√		√	√			√	√
Communication Skills		√		√					√
Critical Thinking			√		√		√	√	√
Research related skills			√						√
Analytical reasoning		√	√			√		√	
Problem Solving	√		√				√		
Team Work				√					√
Moral and ethical awareness			√				√		√

Year	Sem.	Subject Code	Title of the paper	Hours/ Week
2021 -2022 Onwards	VI	21BBO63C	CORE PAPER XII BIOTECHNOLOGY AND BIOINFORMATICS	5

COURSE LEARNING OUTCOMES:

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

1. Explain the branches of biotechnology and illustrate the tools and techniques of genetic engineering.
2. Justify various successful examples of genetic engineering with their merits and demerits as well as alternate technology of direct gene transfer methods.
3. Infer the success of industrial biotechnology and the need for IPR and Patent filing.
4. Explain hardware and software components of computers and develop it as a tool of bioinformatics.
5. Associate biological information resource and DNA sequence databases to examine their utilities.
6. Discuss various specialized protein databases and illustrate their applications.
7. Interpret the applications of bioinformatics by doing experiments with appropriate skills.

UNIT - I

Biotechnology - A brief introduction to branches of Biotechnology. Genetic Engineering: Tools and Techniques- Bacterial Plasmids, Bacteriophage, Yeast Vectors, Cosmids and Enzymes. Screening of recombinants: Blue-white selection, DNA probes and Colony hybridization, PCR Technique and Blotting techniques, Western and Southern blotting.

UNIT - II

Genetic Engineering in plants: aim and scope for developing transgenic plants *Agrobacterium* mediated gene transfer technique: Development of stress tolerant plants, pest resistant plants – Bt cotton and food quality – Golden rice, Antisense RNA technology – Flavr Savr Tomato an Early Example. Direct gene transfer methods. Merits and demerits of rDNA technology.

UNIT - III

Industrial biotechnology: Pharmaceutically important compounds. Antibiotics-Penicillin and Streptomycin. Proteins- Insulin and Vaccines. Biodegradable plastics, Strain improvement of microorganisms and Design of fermenter (STR). Biosafety and Bioethics. Intellectual Property Rights (IPR): Patent filing and patent rights.

UNIT - IV

Bioinformatics: Fundamentals of computer hardware components, software types- operating system software (Windows and LINUX) and programme software (BioPEARL), Internet browser, HTML, Databases and Data mining. Computer viruses and Antivirus software. Cyber security.

UNIT - V

Genomics: NCBI- Biotechnological information Resource: DNA sequence databases and Sequence file formats-GenBank and DDBJ, Sequence alignment – local and global -Pair wise and multiple, BLAST implications.

Proteomics: Protein sequence and Structure databases (SWISS PROT and PDB), Scoring Matrices (PAM and BLOSUM). Protein structure visualization tool (Swiss pdb Viewer) - Protein structure prediction - Homology modelling of protein (SWISSMODEL). Multiple Sequence Analysis and Phylogenetic Tree Construction,

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lecture
- ✓ Powerpoint slide presentations
- ✓ Seminar
- ✓ Assignments
- ✓ Online and Offline Class Practicals
- ✓ Quizzes
- ✓ Group discussion

TEXT BOOKS:

1. Attwood, T.K. and Parrysmith, D.J. 2001. Introduction to Bioinformatics. Pearson Education, New Delhi.
2. Bernard R. Glick and Jack J. Pasternak, 2002. Molecular Biotechnology: Principles and Applications of Recombinant DNA, American Society for Microbiology, USA.
3. Mani, K. and Vijayaraj, N. 2002. Bioinformatics for beginners. Kalaikathir Achagam, Coimbatore.
4. Slater A, Scott N, Fowler M. 2003. Plant Biotechnology: The Genetic Manipulation of Plants Oxford: Oxford University Press.
5. Arthur, M.L. 2005. Introduction to Bioinformatics, 2nd Ed. Oxford University Press, New York.
6. Gupta, P. K. 2005, Elements of Biotechnology. Rastogi publications, Meerut.
7. Ghosh, Z. and Mallick, B. 2008. Bioinformatics: Principles and applications. OxfordUniversity Press, New Delhi.
8. Rastogi, S. C., Mendiratta. N. and Rastogi, P. 2013. Bioinformatics: Methods and applications. PHI, New Delhi.
9. Dubey, R. C. 2014. A Textbook of Biotechnology, Fifth Edition . S Chand and Co., New Delhi.
10. Satyanarayana, U. 2020. Biotechnology. NCB, Calcutta.

REFERENCE:

1. David W. Mount. 2001. Bioinformatics sequence and Genome analysis, Cold spring Harbor Laboratory press, USA.
2. Bosu, O. and Thukral, S. K. 2007. Bioinformatics: Experiments, Tools, Databases, and Algorithms. Oxford University Press, UK.
3. Andreas D. Baxevanis and Francis Ouellette, B. F. 2009. Bioinformatics, Third edition. Wiley, UK.
4. Pavel Pevzner and Ron. 2011. Bioinformatics for Biologists, Illustrated edition. Cambridge University Press, UK.
5. Das, H. K. 2017. Textbook of Biotechnology, Fifth edition. Wiley, India.

ONLINE / E-RESOURCES:

<https://www.digimat.in/nptel/courses/video/102105058/L01.html>

<https://nptel.ac.in/courses/102/103/102103013/>

<https://www.ncbi.nlm.nih.gov/genbank/>.

<https://www.expasy.org/resources/uniprotkb-swiss-prot>

<https://www.ddbj.nig.ac.jp/index-e.html>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)						
	1	2	3	4	5	6	7
Disciplinary Knowledge	√	√			√		
Communication Skills	√			√		√	
Critical Thinking			√		√		
Research related skills				√			√
Analytical reasoning		√					√
Problem Solving		√					√
Team Work				√		√	
Moral and ethical awareness		√					

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	VI	21BBO66S	SKILL BASED SUBJECT – IV POST HARVEST TECHNOLOGY OF CROPS	3

COURSE LEARNING OUTCOMES:

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

1. Demonstrate the post-harvest technology for different crops
2. Produce fruit products like Jam, Jelly, Squash, Syrup etc.,
3. Commercially produce of vegetable products
4. Extract edible and non-edible oil yielding crops
5. Extract essential oils from spice crops.
6. Produce herbal cosmetics from medicinal and aromatic plant

UNIT – I (Harvesting, Grading and Packing)

Post – Harvest protection – pest control management. Storage – cultural and mechanical methods, cold storage, controlled atmosphere storage (CAS), FSSAI certification

UNIT – II (Products from fruit crops)

Fruits and fruit products - methods of storage of fruits – preservation of fruits – commercial preparation of fruits juices, syrup, jam, jelly & squash. Natural and chemical preservatives.

UNIT - III (Products from vegetable crops)

Vegetable products – storage of vegetables – onion & tomato – commercial preparation of pickles, tomato ketchup, canned peas, ginger and garlic paste – amla product – pickles and juice.

UNIT - IV (Product from oil yielding plants)

Extraction procedure and uses of – Edible oil – coconut oil & gingelly oil & rice bran oil. Non-edible oil – lemon and lemongrass oil and Eucalyptus oil.

UNIT - V (Products from Flowers, Aromatic and Medicinal Plants)

Perfumes - extraction procedure of jasmine perfume, Preparation of kulkandhu and room freshener. Extraction procedure and uses of Pelargonium, Pyrethrum, Chrysanthemum, Vitex, Indian Tulip and Aloe vera.

PEDAGOGY STRATEGIES

- ✓ Board and Chalk lectures
- ✓ Powerpoint slide presentations
- ✓ Assignments
- ✓ MCQ assessments
- ✓ Laboratory practical's
- ✓ Field/Case studies
- ✓ Industrial Visit

TEXTBOOKS:

1. Hill F. Albert. 1979. Economic Botany, Tata McGraw- Hill Publishing Co. Ltd., New Delhi.
2. Kumar, N. Introduction to Horticulture. Oxford & IBH Publishing Co., New Delhi.
3. Desrosier N.W. and Desrosier, J.N. 1987. The Technology of Food Preservation, 4th Edition. CBS Publishers & Distributors, New Delhi.
4. Singh, N.P. 2007. Fruit and vegetable preservations. Oxford Book Company, Jaipur.
5. Sudheer, K. P. and Indira, V. 2007. Postharvest Technology of Horticultural Crops, New India Publishing, Delhi.
6. Viridi, M.S. and Malviya, S. 2007. Aromatic Plants and essential oils, Associated Publishing Company, New Delhi.

REFERENCES:

1. Verma, L. R. and Joshi, V. K. 2000. Postharvest Technology of Fruits and Vegetables, Indus Publishing House, Delhi.
2. Cruess, W.V. 2011. Commercial fruit and vegetable products. Agrobios (India), Jodhpur.
3. Board N.P.C.S. 2012. Handbook on fruits, vegetables & food processing with canning and preservation, Asia Pacific Business Press inc, Delhi.
4. Ponnuswami, V., Muthukumar, S., Padmadevi, K. and Hemapraba, K. 2013. Post Harvest Biotechnology of Horticultural Crops. Bio-Green Books, New Delhi.
5. Shankaraswamy. 2015. Comprehensive Post Harvest Technology of Flowers, Medicinal & Aromatic Plants, Jeya Publishing House, New Delhi.

Online/E-Resources:

<https://nptel.ac.in/courses/126/105/126105015/>

https://onlinecourses.swayam2.ac.in/cec20_ag02/preview

<http://ecoursesonline.iasri.res.in/course/view.php?id=164>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√		√		√	√
Communication Skills	√		√			√
Critical Thinking		√				√
Research related skills			√	√		
Analytical reasoning		√				√
Problem Solving	√		√	√		√
Team Work	√		√	√		√
Moral and ethical awareness				√		√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	VI	21BBO64P	CORE PRACTICAL - IV (Plant Physiology, Plant Biochemistry, Biotechnology and Bioinformatics and Post Harvest technology of Crops)	4

COURSE LEARNING OUTCOMES

Upon completion of this course, the student will be able to:

1. Demonstrate the vital physiological processes of plants
2. Measure the rate of Physiological process in plants
3. Estimate the biochemical parameters
4. Isolate DNA, RNA and Protein from Plant samples
5. Detect DNA and Protein sequences using various programming
6. Perform sequence searches

PLANT PHYSIOLOGY

1. Determination of osmotic pressure.
2. Factors affecting permeability of membrane.
3. Determination of rate of transpiration,
4. Separation of chloroplast pigments by paper chromatography.
5. Determination of rate of photosynthesis under variable CO₂ concentrations.
6. Determination of rate of photosynthesis under various light intensities.
7. Measurement of respiration (Ganong's respiroscope).
8. Determination of water absorption/transpiration ratio.

PLANT BIOCHEMISTRY

1. Preparation of buffers – phosphate and citrate buffer
2. Determination of pH of any two soil samples
3. Determination of pH of lemon and watermelon
4. Qualitative test for carbohydrates, amino acid and proteins.
5. Estimation of carbohydrate by colorimetric method (Anthrone reagent method)
6. Estimation of total free amino acids by Ninhydrin reagent method
7. Estimation of total protein by Lowry's method.
8. Qualitative test for alkaloids, terpenoids and polyphenols

BIOTECHNOLOGY AND BIOINFORMATICS

1. Mechanical solution of protoplast from leaf tissue
2. Isolation of DNA from plant tissue (Demonstration)
3. Amplification of DNA through PCR(Demonstration)
4. Identification of Parts of Computer
5. Familiarize with Computer operating system such as Windows and LINUX
6. Content and file structure study of GenBank, DDBJ, SWISSPROT, PDB.

7. Perform BLAST search with protein and DNasequences.
8. Multiple sequence analysis using Clustal X and phylogenetic treeconstruction.
9. Protein Structure Analysis using Molecular visualization tool-Swiss pdf viewer

PEDAGOGY STRATEGIES

- ✓ Demonstrations
- ✓ Group experimentation
- ✓ Experimental Setup

Program Level Outcomes (PLO)	Course Level Outcome (CLO)					
	1	2	3	4	5	6
Disciplinary Knowledge	√	√	√	√		
Communication Skills		√			√	
Critical Thinking		√	√		√	√
Research related skills				√	√	√
Analytical reasoning		√	√		√	
Problem Solving			√			√
Team Work		√		√		
Moral and ethical awareness						√

Year	Sem.	Subject Code	Title of the paper	Hours/Week
2021 -2022 onwards	VI	21BBO6EL	NON MAJOR ELECTIVE PAPER - II PLANTS AND HUMAN WELFARE- II	3

COURSE LEARNING OUTCOME

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

1. List out the important horticultural crops of India
2. Demonstrate the nutritional needs for each crop
3. Establish a nursery facility
4. Propagate different types of plants commercially
5. Choose a tree of commercial importance to propagate and cultivate
6. Transform as an entrepreneur based on the knowledge gained
7. Create awareness on sustainable Eco-Friendly techniques

UNIT - I

Horticulture- Importance and scope of Horticulture, commercially important horticultural crops in India – Vegetative Propagation methods – Budding, techniques of division-stolons, pseudobulbs, offsets, runners, cutting, layering, grafting, formation of graft union

UNIT - II

Seed Propagation - Establishment, Maintenance and Management of Nursery – raising seedlings and Transplantation, Green Houses, shade house cultivation.

UNIT -III

Medicinal plants – Common medicinal plants; parts used, method of collection, processing and mode of administration. Uses of medicinal plants in daily life

UNIT - IV

Floriculture - Commercial scale cultivation of rose and jasmine flowers; Olericulture – cultivation of Brinjal and cucumber. Cultivation of important fruit trees – Mango and Banana. Value added Products

UNIT -V

Importance of forestry, their utilization and commercial aspects a) Avenue trees, b) ornamental Trees – Native Trees, exotic species and advantages and disadvantages c) Wood Yielding trees; Forest by-products – Honey, Gum and Resins, Bark, Leaves, Firewood.

PEDAGOGY STRATEGIES:

- ✓ Board and Chalk Lecture
- ✓ Powerpoint Presentation
- ✓ Seminar
- ✓ Assignments
- ✓ Group Discussions
- ✓ Demonstrations

TEXT BOOKS:

1. Lex Lauries & Victor H. Rice. 1950. Floriculture – fundamentals and practices. McGraw Hill Publishers, New York.
2. Bose, T.K. & Mukherjee, D. 1972. Gardening in India Oxford & IBHPublishing Co., Kolkata, Mumbai, New Delhi.
3. Sandhu, M.K. 1989. Plant Propagation. Wiley Eastern Ltd., New Delhi.
4. Kumar, N. 1997. Introduction to Horticulture. Rajalakshmi Publications, Nagercoil, India.
5. Naik. 2002. South Indian Fruits and their culture. Varadhachary & Co, Madras.

REFERENCES:

1. Christopher E P. 1958. Introductory Horticulture. McGraw-Hill Inc., USA.
2. Randhawa, G. S. 1973. Ornamental Horticulture in India, Today & Tomorrow Publishers, New Delhi
3. Edmond Musser & Andres, 1999. Fundamentals of Horticulture. McGraw Hill Book Co., New Delhi.
4. George Acquaah. 2009. Horticulture: Principles and Practices. Prentice Hall India Learning Private Limited, New Delhi.

ONLINE/E-RESOURCES:

<https://www.youtube.com/watch?v=FCy249PO8wU>
<https://www.youtube.com/watch?v=kXj5vYt9dDw>
<https://www.youtube.com/watch?v=XNp8PXCOAIE>
<https://www.youtube.com/watch?v=i6MwsmmYql8>

COURSE LEVEL MAPPING WITH PROGRAMME LEVEL OUTCOME:

Program Level Outcomes (PLO)	Course Level Outcome (CLO)						
	1	2	3	4	5	6	7
Disciplinary Knowledge	√	√			√		
Communication Skills			√		√	√	√
Critical Thinking				√	√		
Research related skills		√		√	√		
Analytical reasoning	√					√	√
Problem Solving							√
Team Work	√		√			√	√
Moral and ethical awareness						√	√

7. TEACHING LEARNING METHODOLOGIES

The learning outcomes-based course curriculum framework of botany is designed to persuade the subject specific knowledge as well as relevant understanding of the course. The academic and professional skills required for botany-based professions and jobs are also offered by same course in an extraordinary way. In addition, the learning experiences gained from this course should be designed and implemented for cognitive development in every student. The practical associated with this course helps to develop an important aspect of the teaching-learning process. Various types of teaching and learning processes will need to be adopted to achieve the same. The important relevant teaching and learning processes involved in this course are;

- ✓ Class lectures Seminars
- ✓ Assignment
- ✓ Tutorials
- ✓ Field Trips
- ✓ Group discussions and Workshops
- ✓ Peer teaching and learning
- ✓ Question preparation
- ✓ Subjective type
- ✓ Long answer
- ✓ Short answer
- ✓ Objective type
- ✓ Multiple choice questions
- ✓ One answer/two answer type questions
- ✓ Assertion and reasoning
- ✓ Practicals and project-based learning

8. ASSESSMENT AND OUTCOMEMEASUREMENT

Academic performance in various courses i.e., core, discipline electives, generic electives and skill enhancement courses are to be considered as parameters for assessing the achievement of students in botany. A number of appropriate assessment methods of botany will be used to determine the extent to which students demonstrate desired learning outcomes. Following assessment methodology should be adopted;

- ✓ The oral and written examinations (Scheduled and surprise tests), Closed-book and open-book tests,
- ✓ Problem-solving exercises,
- ✓ Practical assignments and laboratory reports, Observation of practical skills,
- ✓ Individual and group project reports,
- ✓ Efficient delivery using seminar presentations,
- ✓ Viva voce interviews are majorly adopted assessment methods for this curriculum.
- ✓ The computerized adaptive testing, literature surveys and evaluations, peers and self-assessment, outputs form individual and collaborative work are also other important approaches for assessment purposes.

MODEL QUESTION PAPER

Government Arts College (Autonomous), Coimbatore -18

Internal Assessment Test I - January -2021

I B.Sc. BOTANY

Microbiology and Plant pathology - 21BBO13C

Total Marks: 50

Time: 2 Hours

Part-A

5 x 1 = 5

I. Answer all the Questions

1. Pila organ in bacterial structure is for

- a. Exchange of Nutrient, b. Exchange of genetic materials, c. Cell division, d. Cell endospore formation

பாக்டீரியாவின் உயிர் தாண்டி உணவு உறுப்புகள் —
 (a) உணவுப் பரிமாற்றம் (b) மரபணுப் பரிமாற்றம் (c) செல் வரிசை
 (d) செல் என்டோஸ்போர்.

2. The optimal temperature for Bacteria and Fungi is

- a. 40°C & 30°C, b. 39°C & 29°C, c. 37°C & 24°C, d. 30°C & 20°C

பாக்டீரியாவிற்கும் பூஞ்சைகளுக்கும் ஏற்ற உயிர் உட்கட்டம் —
 (a) 40°C & 30°C, (b) 39°C & 29°C, (c) 37°C & 24°C, (d) 30°C & 20°C

3. Chemolithotrophic microorganisms are

- a. Nutrient source from inorganic compounds, b. Nutrient source from organic compounds
 c. Nutrient source from decomposed compounds, d. Nutrient source from live cells

கீமலித்தோட்ரோபிக் நுண்ணுயிர்கள் என்னால் —
 (a) கனிமங்களிலிருந்து உணவுப் பூற்று (b) கரிம உணவுப் பூற்று
 (c) சிதைந்த உணவுப் பூற்று (d) உயிர்முனை செவ்வாய்க்கால உணவு.

4. White rust disease is caused by the fungus

- a. Puccinia, b. Albugo, c. Pencillium, d. Aspergillus

உயிர்நீர்நிலை நோயை ஏற்படுத்தும் பூஞ்சை என்னால் ஏற்படுகிறது?
 (a) பக்டீரியா (b) அலியூகோ (c) பென்சிலியம் (d) அஸ்பெர்ஜிலஸ்

5. Which fungus is called as Black mold and Weed of Laboratory.....

- a. Aspergillus, b. Colletotrichum, c. Peziza, d. Albugo

Aspergillus fungus is called as Black mold and Weed of Laboratory. It is a common fungus found in the laboratory.

- (a) Aspergillus (b) Colletotrichum (c) Peziza (d) Albugo

II. Answer any three questions

3x2=6

6. What are photo organotrophic microbes

Photo organotrophic microbes are those which use light as a source of energy for their growth.

7. List out the factors more essential for the growth of micro organisms

The factors essential for the growth of micro organisms are temperature, moisture, oxygen, and nutrients.

8. How the Endospores are formed?

Endospores are formed by the process of binary fission in Bacillus and Clostridium.

9. Write about the Binary fission in Saccharomyces

Binary fission in Saccharomyces is a process where the parent cell divides into two daughter cells.

10. What is Plasmogamy?

Plasmogamy is the fusion of two vegetative cells to form a zygote.

Part- B

5x3=15

III. Answer all the questions - Short answers not exceeding 100 words each

11 a. Briefly Explain mode of Nutrition in microorganisms (or)

b. Write Bacterial classification based on mode of nutrition.

- (a) Bacteria are classified into three types based on mode of nutrition: autotrophic, heterotrophic, and saprophytic.
- (b) Bacteria are classified into three types based on mode of nutrition: autotrophic, heterotrophic, and saprophytic.

12 a. Draw Ultra structure of Bacteria and Label it (Or)

b. Briefly outline the Bacterial cell organ's function.

- (a) Bacterial cell structure includes cell wall, cell membrane, cytoplasm, ribosomes, and flagella.
- (b) The cell wall provides structural support and protection. The cell membrane regulates the entry and exit of substances. Ribosomes are involved in protein synthesis. Flagella are used for locomotion.

13 a. Explain the Bacterial cell membrane chemical composition (or)

b. Explain fluid mosaic dynamic model of Bacterial cell membrane

பாக்டீரியாவின் செல்மெம்பிரேன் கெமிக்கல் அமைப்பை விவரிக்கவும்
(10)

பாக்டீரியாவின் செல்மெம்பிரேன், டிபுளக்ஸ் .4 ஆயுடிக் கொண்டு மாதிரியை விவரிக்க வேண்டும்.

14 a. Write notes on Haplo-diplobiontic life cycle in Saccaromyces (or)

b. Give a brief note on Basidiospore stage in Puccinia

பாக்டீரியாவின் செல்மெம்பிரேன் கெமிக்கல் அமைப்பை விவரிக்கவும்
செல்மெம்பிரேன் கெமிக்கல் அமைப்பை விவரிக்கவும்

பென்சிலேனியா டைபுளக்ஸ் .4 ஆயுடிக் கொண்டு மாதிரியை விவரிக்க வேண்டும்.

15 a. Describe the structure of Aspergillus (or)

b. Explain the Classification of fungi by Alexopolous and Mims

அஸ்பெர்ஜில்லஸ் கட்டிடக்கலை விவரிக்கவும்
(10)

அஸ்பெர்ஜில்லஸ் கட்டிடக்கலை விவரிக்கவும்
அஸ்பெர்ஜில்லஸ் கட்டிடக்கலை விவரிக்கவும்

Part C

IV Answer any Three questions not exceeding 1000 words each 3x8=24

16. Explain in Detail about different sterilization techniques

16) பூயிசெய்வதற்கான பல்வேறு முறைகளை பற்றி விவரிக்க வேண்டும். (10)

17. Narrate "Whittaker's classification

உயிர்வகைப்பாட்டை விவரிக்கவும் பற்றி விவரிக்கவும்

18. Write notes of Pure culture techniques

சுத்தமான கல்தொகுப்பு முறைகளை விவரிக்கவும் பற்றி விவரிக்கவும்

19. Give an account on the shape of the Virus

வீரஸ்களின் வடிவத்தை பற்றி குறிப்பிடுக

20. Write notes on – Uredospore stage and Teieutospore stage in Puccinia

பென்சிலேனியாவில், யுரிடோஸ்போர் மற்றும் டெயுடோஸ்போர் கட்டிடக்கலை பற்றி குறிப்பிடுக

Government Arts College(Autonomous),Coimbatore-18
 II Internal Examination- January2022
 Allied Botany Paper I for I B. Sc Zoology Students
 Sub Code:21BBO15A Title: General Botany- Plant Diversity

Time:2 hrs

Max.Marks:30

Part-A (5x1=5 Marks)

I. Choose the Best Answer

1. Amphibian plants **இரு ஊழ்வகைகள் -**
 - a. Algae b. Fungi c. Bryophytes d. Pteridophytes
 - அ. திவ்வகை b. பூஞ்சை c. பிண்டியோகை d. பிடரிமேகை
2. Capsule is present in **கேப்பிசூல் எந்தக் குடும்பத்தில் காணப்படுகிறது?**
 - a. Marchantia b. Yeast c. Albugo d. Polytrichum
 - அ. மார்ச்சாண்டியா b. யீஸ்ட் c. அல்புகோ d. பலித்ரிசுமம்
3. In ____ Inflorescence older flowers are located in the centre along with adjacent younger flowers ____ **மஞ்சளியல் முதிர்ந்த மலர்கள் மத்தியிலும் பக்கவாட்டில் புதிய மலர்களும் உள்ளன.**
 - a. Racemeose b. Cymose c. verticillaster d. cyathium
 - அ. ரேசிமோஸ் b. சைமோஸ் c. விசுல்லாஸ்டர் d. சைதியம்
4. The process of seed germination that occurs when it is still present in the parent is called
 - a. Epigeal b. Hypogeal c. Vivipary d. Hydrochory
 - உயர் தாதுரத்திலேயே உதை முளைத்தலின் முறை -
5. Tendrils are seen in **அ. தரை மீழ் b) தரை கீழ் c) உயர்பேரி d) தரைமட்டத்திலே காணப்படுகிறது?**
 - a. Cucurbitaceae b. Annonaceae c. Acanthaceae d. Lamiaceae
 - கூங்குரிமீட்டெரி அனோனாகி அகாந்தேரி லாமிசேரி

Part - B (5x2=10 Marks)

6. a. Draw a diagram of a flower and label its parts **மலரின் படத்தை (Or) உரைத்து பாகங்களை எழுதுக.**
- b. Explain the different types of leaf shapes **இவை அடிப்படையில் அககளை எழுதுக**
7. a. List out the different types of stem? **குண்டலின் அககளை பட்டியலிடுக.**
(or) **குண்டலின் அககளை பட்டியலிடுக.**
- b. What is meant by Vivipary? **உயர்ப்பேரி என்றால் என்ன?**
8. a. Explain the structure of flower seen in the Family Annonaceae **அனோனாகியல் (Or) குண்டும்பும் மலரின் அமைப்பை விவரிக்க**
- b. Comment on the special type of inflorescence seen in Lamiaceae **லாமிசேரியல் உள்ள சிறப்பு மஞ்சளி அககளை பற்றி எழுதுக.**

9. Describe the habitat of Bryophyta
(Or) பிறையோமைப்பதின் வாழிடத்தின் விவரிக்க.

Discuss the salient features of Bryophyta பிறையோமைப்பதின் சிறப்பு பண்புகளை

10. Explain the method of asexual reproduction in Marchantia பற்றி விவரிக்க.
மார்ச்சாண்டியாவில் பாலிஸ்டிரா இனப்பெருக்க முறைகளை விவரிக்க.

11. Describe the internal structure of Polytrichum leaf

பாலிபுலிரைக்கம் இனையின் உள் அமைப்புகளை விவரிக்க.

Part -C(3x5=15 Marks)

Answer any three questions

12. Explain the sexual reproduction in Marchantia with suitable example

மார்ச்சாண்டியாவில் பாலினப்பெருக்கத்தின் தக்க எ.காவுடன் விவரிக்க.

13. Explain about the types of fruits studied by you.

கூறியவற்றின் விவரத்தை விவரிக்க.

14. Describe the Epigeal mode of Seed Germination with diagram

சூதா உடல் அந்த முளைத்தல் பற்றி படங்களுடன் விவரிக்க.

15. Discuss the Floral Characters of the Family Cucurbitaceae

குங்கப்பெட்டி தாவர குடும்பத்தின் மலர் பண்புகளை விவரிக்க.

16. Enumerate the general Characters of the Family Lamiaceae

வாமிசியை குடும்பத்தின் பொது பண்புகளை பட்டியலிடுக.