BOARD OF STUDIES

IN

B.Sc BOTANY

2023-2024

DEPARTMENT OF BOTANY

SYLLABUS FOR B.Sc BOTANY Honours

&

B.Sc BOTANY

PITHAPUR RAJAH'S GOVERNMENT COLLEGE

Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, E G Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

Department of Botany

The Board of Studies meeting for **Botany** subject during the academic year 2023-2024 is conducted at the Department. of Botany on **AUGUST 2023** with Dr.Ch.JohnSamuel, Lecturer in-Charge in the chair along with the following members

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Name, Designation and Address **Signature**

1.Chair Person:
Dr. Ch.JOHN SAMEL
Lecturer in-charge
Dept. of BOTANY
P.R.G.C.(A), Kakinada

31/8/23

2.AdiKavi Nannaya University Nominee:
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Principal GDC Kovvur
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31/8/2023

3.Members Nominated by Executive Council of the College:

A.Subject Expert 1:
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Lecturer in Botany
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31/8/2023

B.Subject Expert 2:
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C.Member from Research Organization:
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31/8/23

Name, Designation and Address	Signature

Alumni Member:

Dr. D R SALOMI SUNEETHA
Professor & Head
Plant Physiology, Biochemistry &
Microbiology Dept.College of Horticulture
Dr YSR Horticultural University
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1.Members from the College:

A. Faculty member:

1.Dr. Ch.JOHN SAMUEL
Lecturerin Charge
Dept. of Botany
PRGC(A), Kakinada

31/8/23.

2.Dr. M.KRISHNA RAO
Lecturer in Botany
PRGC(A), Kakinada

31/8/23

B.STUDENT MEMBERS

1.P.ABHISHEK NAGESWARA RAO
II B.Sc B.Z.C EM II

2.D.SATYA
II B.Sc B.Z.C.EM I

D. Satya

PEDAGOGY

Commissionerate of Collegiate Education, AP, Vijayawada

Development of Unit-wise Pedagogy for Conventional Subjects under CBCS

Broad Guidelines and Models

Pedagogy is a set of diverse teaching or instructional strategies and methods used bythe teacher in an educational institution to facilitate effective learning by students. Diverse methods are used because learning is dependent on multiple ways but not on any one methodsuch as lecturing. There is no single, universal approach that suits all situations

Pedagogy is the art and science of teaching. Different strategies used in different combinations with different groupings of students will ensure learning outcomes. Some strategies for teaching certain skills and fields of knowledge are more appropriate than the others. Some approaches are better suited to certain student backgrounds, learning styles andabilities. Effective pedagogical practice promotes the wellbeing of students, teachers and the community - it improves students' and teachers' confidence and contributes to their sense ofpurpose for being at college.

Although it is the privilege of the teacher to choose or design his/her own pedagogicalmethods it is also his/her responsibility to ensure proper learning by all students in the class. A few pedagogical methods designed and implemented in the last several decades remain time-tested and popular across the world. The effectiveness of ICT and other educational technologies as a support to pedagogy in the recent years was found to be immense.

The following are some of the pedagogical methods commonly practiced. They are given Pedagogical Strategy or method (PS) Numbers for common use in academic and teaching plans.

I. **Common Strategies**: Common pedagogical strategies suggested to be used for preparing teaching plan (preferably in circles and matrices) for each unit of subject syllabus.

Sno	*PS*	*Pedagogic Strategy/Method*	*Practice*	*Advantages*
1	P_1	Lecture	Continuous teaching by a teacher to a large number of students for about one hour	Useful in transmitting organized knowledge in a systematic way
2	P_2	Demonstration	Showing a process with the help of real, dummy or simulated material	Applied for learning a practical aspect along withskills

3	P_3	Question &Answer	Teacher asks questionsbefore, during or after lecture or demo	Feedback on student level of understanding. Useful inassessing teacher's own progress.
4	P_4	Discussion, Debate or Collaborati on	Student activity after the lecture, video or other teacher activity. Small groups (Pair-learning: withtwo students) to large groups.	Spreads knowledge and ideas in students under group learning and consolidates basic learning. . Communication skills areinculcated.
5	P5	Audio & Video	Play ready-made or teacher made audio/video on the topic	Brings in external expertise and better understanding through visuals or animations
6	P6	Virtual or Online learning	Students work with computer simulated models and processes. Stored or online. Learning directly through internet utilizing standard resources	Well crafted three dimensional models and processes give inside information and real time feelings. Access to vast and highly qualitative learning resources on the internet. A computer skill is inculcated.
7	P7	Assignment or Case Study	Easy, medium and critical assignments include compiling of information from standard books to preparing creative solutions and models to problems	Independent learning, critical thinking, judging and creativity are promoted. Writing skills are enhanced.
8	P8	Study (Research) Project	Students undertake a local problem and make research study on it towards its solution or betterment	Inculcates habit of learning by research. Trains in traits such as identifying problem, survey, collecting compiling and analyzing of information, drawing conclusions, report writing etc.

				Spoken and written communication skills are enhanced.
9	P9	Hands on Study	Students work in a field, industry, organization or under a professional for covering especially a practical part of syllabus	Provides on real time experience to students. Gives professional training. Trained in job/work skills.
10	P10	Class Seminar	Student teaches a part of the unit as a supplement to the lecturer	Student independent learning will be consolidated and inculcates such traits as comprehension, teaching skills, interaction , public speaking etc. . Communication skills are enhanced.

II. **Test**: Teaching learning every Unit shall end with a test. This can be denoted as $\mathbf{P_T}$. Test can be used not only as an assessment and measurement tool but also as an effective learning strategy. Questions shall be designed in such a way that the student needs to learn in several dimensions from test to test to answer the questions.

III. **Additional Strategies**: Fifteen more Additional Strategies are given in Table -2. These may be employed by the individual Lecturer based on the subject, unit, classroom situation etc. The teacher may mark **Px** for any of these additional strategies in the teaching plans, cycles and matrices.

Sno	*Pedagogic Strategy/Method*	*Practice*	*Advantages*
1	Quiz	Small student teams competeto answer random questions from the quiz master	Best used for extractingprecise but dispersed information
2	Brainstorming	A small or large group of students gather their ideas onnew concepts or	Useful in preparing curious background for a new item of

		aspects	learning. . A soft skill isinculcated.
3	Role Play	Students take the role of actual persons in the field andenact the process	Creates a sense of understanding leading to responsible learning. . A softskill is inculcated.
4	Modeling	Students prepare models of the existing and futuristic situations, real and imaginary.Includes problem solving, physical models, maps, figures and virtual models	Useful in developing skills integrated with knowledge in practical situations. One of thebest ways of problem solving. Use of ICT will enhance the outcomes.
5	Peer review	A group of students reviewing the work of other students andalso that of authors	Trains in developing insights for better understanding andjudging
6	Games & Puzzles	Students solving subject related problems through available game models of designing their own models	Strengthens problem solvingtraits and invokes use of intelligence
7	Tutorial	Teacher interacting with smallgroups of students for reviewing the performance of both teacher and students	A good mechanism for obtaining feedback and midway corrections
8	News paper presentati on	Teacher or a student presenting the day's matters related to the subject and on-going chapter resulting a discussion for a while	Relates theory to practice, especially the latest practice, amuch needed regular intervention
9	Invited lecture	An expert or a faculty teaching a part of the unit in the classroom or at his/herplace	Covers the in-house shortagesand the students get the advantage of listening to anexpert on that topic
10	Panel discussion	Discussing a topic by a panel of teachers, experts orstudents.	A variety of angles and solutions emerge for a singleproblem broadening of the
			minds of students. . A soft skill is inculcated.

11	Bulletin board	Students pin the papers they worked out on curricular topics for sharing with others	Motivates students to express themselves, promotes comprehension, writing abilities and freedom of expression.
12	Open text book study	Students study, discuss or answer a test (specially designed) by openly using a standard text book in a session	Motivates a relationship between students and standard books, a life long benefit. Helps in preparing assignments
13	Student magazine	A student magazine is periodically published with academic articles contributed by students	The art of scientifically expressing is encouraged which has both present and future value. It enhances understanding of a standard book or research paper. . A soft skill is inculcated.
14	Report/Review writing	Students write reports or reviews on case studies, projects, books or material	Promotes critical writing and reporting among students. A soft skill is inculcated.
15	Others		

I. Outline Model Pedagogic Strategy Cycle:

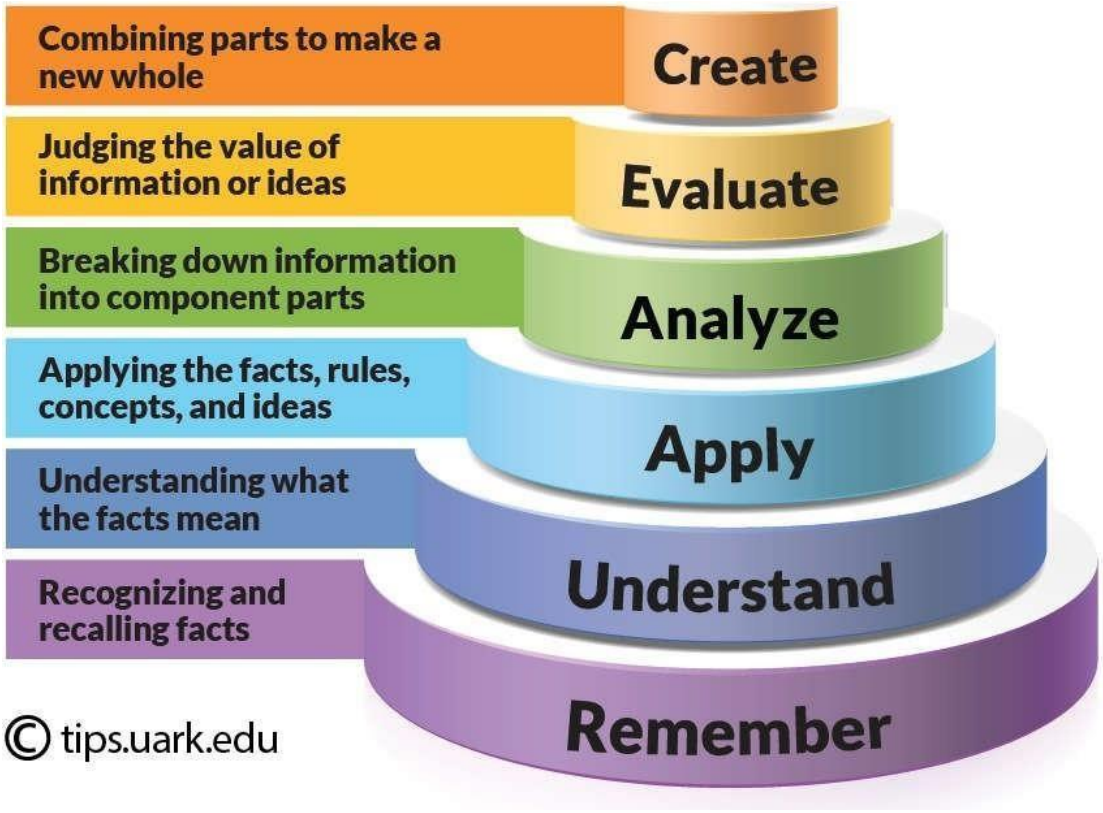
There may be one or more Pedagogic cycles for a single unit depending on thenumber and nature of the topics in it.

II. Other aspects:

1. The subject pedagogy development committee members shall examine each unit of each paper of their subject under CBCS and prepare pedagogic strategies for facilitating effective teaching and learning of the unit.
2. The pedagogic strategies can be adopted from the tables 1 & 2 above. If necessary, they may add more strategies suitable to their subject to table -2.
3. They shall prepare teaching plans for each unit and give explanation foot notes so that teachers across the state will understand the intentions of the committee members
4. A cycle of Pedagogic Strategies shall be given for each unit with relevant footnotes. A model cycle is given below.
5. A list of suggested suitable topics shall also be given for strategies like case study, assignments, models, project work, class seminar, videos and their open online sources (such as Swayam or NPTEL), websites for online learning etc.
6. It is intended to publish the subject-wise teaching plans and circulate them among colleges. Hence, the teaching plans with pedagogic strategies shall be prepared in thebest possible way.

BLOOMS REVISED TAXONOMY

A group of cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists



published in 2001 a revision of Bloom's Taxonomy with the title *A Taxonomy for Teaching, Learning, and Assessment*. This title draws attention away from the somewhat static notion of "educational objectives" (in Bloom's original title) and points to a more dynamic conception of classification.

The authors of the revised taxonomy underscore this dynamism, using verbs and gerunds to label their categories and subcategories (rather than the nouns of the original taxonomy).

			Critical Thinking		Evaluation
					Appraise
				Synthesis	Argue
				Arrange	Assess
			Analysis	Assemble	Choose
			Analyze	Categorize	Compare
		Application	Appraise	Collect	Conclude
		Apply	Arrange	Combine	Contrast
	Comprehension	Calculate	Associate	Compose	Convince
	Associate	Change	Breakdown	Construct	Criticize
Knowledge	Classify	Complete	Categorize	Create	Critique
Arrange	Compute	Conduct	Combine	Design	Decide
Cite	Convert	Construct	Connect	Develop	Defend
Collect	Discuss	Demonstrate	Debate	Devise	Determine
Count	Distinguish	Discover	Detect	Explain	Evaluate
Define	Estimate	Dramatize	Determine	Formulate	Grade
Delineate	Explain	Employ	Diagram	Generate	Judge
Describe	Express	Illustrate	Differentiate	Group	Justify
Duplicate	Extend	Interpret	Discriminate	Integrate	Measure
Identify	Extrapolate	Interpolate	Distinguish	Invent	Rank
Label	Generalize	Manipulate	Examine	Manage	Rate
List	Give examples	Modify	Experiment	Modify	Recommend
Match	Indicate	Operate	Infer	Order	Revise
Name	Infer	Predict	Inspect	Organize	Score
Order	Locate	Prepare	Inventory	Plan	Select
Outlines	Paraphrase	Practice	Order	Prescribe	Support
Point	Predict	Produce	Outline	Propose	Value
Quote	Restate	Relate	Point out	Rearrange	
Read	Review	Show	Question	Reconstruct	
Recall	Rewrite	Sketch	Relate	Reorganize	
Recite	Summarize	Solve	Select	Setup	
Recognize	Tell	Translate	Separate	Specify	
Record	Translate	Use	Subdivide	Substitute	
Relate			Test	Tell	
Repeat			Utilize	Transform	
Report					
Reproduce					
Select					
Specify					
State					
Tell					

These “action words” describe the cognitive processes by which thinkers encounter and work with knowledge:

- **Remember**
  - Recognizing
  - Recalling
- **Understand**
  - Interpreting
  - Exemplifying
  - Classifying
  - Summarizing
  - Inferring
  - Comparing
- **Apply**
  - Executing
  - Implementing

- **Analyze**
    - Differentiating
    - Organizing
    - Attributing
- **Evaluate**
    - Checking
    - Critiquing
- **Create**
    - Generating
    - Planning
    - Producing

In the revised taxonomy, knowledge is at the basis of these six cognitive processes, but its authors created a separate taxonomy of the types of knowledge used in cognition:

- Factual Knowledge
    - Knowledge of terminology
    - Knowledge of specific details and elements
- Conceptual Knowledge
    - Knowledge of classifications and categories
    - Knowledge of principles and generalizations
    - Knowledge of theories, models, and structures
- Procedural Knowledge
    - Knowledge of subject-specific skills and algorithms
    - Knowledge of subject-specific techniques and methods
    - Knowledge of criteria for determining when to use appropriate procedures
- Meta cognitive Knowledge
    - Strategic Knowledge
    - Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge
    - Self-knowledge

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PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

DEPARTMENT OF BOTANY

Programme: B.Sc Botany & B.Sc honours Botany

Objectives of the Programme of B.Sc Botany

1. To create Awareness on all cryptogams
2. To enhance the knowledge about diversity in all cryptogams
3. To create awareness on economic importance of Algae, Fungi, Bryophyta, Pteridophyta
4. To study about Structure and diseases and control methods of plant diseases caused by viruses, bacteria
5. To study about anatomy of plant tissues
6. To study about anomalous secondary growth in different plants
7. To create awareness on classification on flowering plants
8. To study about morphology and floral characters of some flowering plants
9. To know the importance of flowering plants around the habitat
10. To increase the ability of analysis of plant species with classification
11. To create awareness on economic importance of flowering plants
12. To study about the plant embryo formation and development
13. To study about development of plant from embryo
14. To study about the growth and development of plant
15. To Study and observation of absorption of water through roots
16. To enhance the knowledge by observation of osmosis, diffusion
17. To study of Metabolism like photosynthesis, respiration
18. To study about Ecology, population, Community
19. To study about cell biology, genetics
20. To study about geographical distribution of plants
21. To study about medicinal values of different plants

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF BOTANY

Program Outcomes (PO):

- PO1.**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
- PO2.**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- PO3. **Social Interaction**: Elicit views of others, mediate disagreements and help reach conclusions in group settings.
- PO4. **Ethics**: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
- PO5. **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.
- PO6. **Self-directed and Life-long Learning**: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes
- PO7.**SKILL DEVELOPMENT**: Acquire the knowledge of practical ability in handling apparatus and process of methodology

Program Specific Outcomes (PSO):-

- PSO1. Understand the nature and basic concepts of cell biology, Biochemistry, Taxonomy and ecology.
- PSO2. Analyze the relationships among animals, plants and microbes
- PSO3. Perform procedures as per laboratory standards in the areas of Physiology,genetics, Taxonomy, anatomy, embryology, Ecology, tissue culture & mushroom cultivation.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF BOTANY

COURSE OUTCOMES

SEMESTER - 1

CO1: Learn the principles of classification and preservation of biodiversity
CO2: Understand the plant anatomical,aphysilogical and reproductive process
CO3: knowledge created on classification of animals
CO4: outline the cell components, cell process like cell division, heredity and molecular process
CO5: Comprehed the chemical principles in shading and driving the macromolecules and life processes

SEMESTER – 2

CO1: Compile the general characteristics of Algae and their significance
CO2: Sumjmarize the characterisyics of fungi and their economic importance
CO3: Elaborate the features and significance of amphibians of plant kingdom
CO4: Explain the diversity among non vascular plants.
CO5:knowledge on diversity of microbes.

SEMESTER – 3

CO1: Organization of tissues and tissue systems in plants
CO2: Illustrate and interpret various aspects of embryology
CO3: Basics concepts of plant ecology
CO4: Corelate the importance of biodiversity and consequence due to its loss.
CO5:Enlist the endemic/endangered flora anf fauna.

SEMESTER – 4

CO1: knowledge about the metabolism of plant
CO2: awareness of absorption of water in plants
CO3: knowledge on cell and its components
CO4: knowledge on heredity, inheritance in genetics
CO5: knowledge on plant breeding techniques

SEMESTER – 5

CO1: Basic knowledge and applications of plant tissue culture
CO2: Identified various techniques to set up atissue culture lab
CO3: Understand the bioinformatics techniques for secondary metabolite production
CO4: knowledge on structure and life cycle of mushrooms.
CO5: Acquire critical knowlwdge on cultivation of edible mushrooms.

S. No.	Semester	Title of the Course(Paper)	Hours /week	Max. Marks (SEE)	Marks in CIA	Credits
1.	Sem.-I/ Course-1-major	Introduction to Classical Biology	04	50	50	04
2.	Sem.-II/ Course-3-major	Non Vascular Plants	04	50	50	02
	Course-3 practical	Non Vascular Plants	02	Max. Marks-50 Internal assessment at Semester end		02
	Sem.-II/ Course-4-major	Origin of life and diversity of microbes	04	50	50	02
	Course-4 practical	Origin of life and diversity of microbes	02	Max. Marks-50 Internal assessment at Semester end		02
	Sem.-II/ Course-5-major	Vascular Plants	04	60	40	02
	Course-5 practical	Vascular Plants	02	Max. Marks-50 Internal assessment at Semester end		02
3	Sem.-II/ Course-1-minor	Non Vascular Plants	04	50	50	02
	Course-1 minor practical	Non Vascular Plants	02	Max. Marks-50 Internal assessment at Semester end		02
4.	Sem.-III/ Course-3	Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity	04	50	50	02
	Course-3Practical	Anatomy and Embryology of Angiosperms,Plant Ecology and Biodiversity	02	Max. Marks-50 Internal assessment at Semester end		02
5.	Sem.-IV Course-4	Plant Physiology and Metabolism	04	50	50	02
	Course-4Practical	Plant Physiology and Metabolism	02	Max. Marks-50 Internal assessment at Semester end		02

6.	Sem.-IV Course-5	Cell Biology, Genetics and Plant Breeding	04	50	50	02
	Course-5 Practical	Cell Biology, Genetics and Plant Breeding	02	Max. Marks-50 Internal assessment at Semester end		02
7.	Sem.–V Course –6 &7	PAPER 6 – PLANT TISSUE CULTURE	04	50	50	02
		Plant tissue culture practical	02	Max.Marks-50 Internal assessment at Semester end		02
		PAPER 7- MUSHROOM CULTIVATION	04	50	50	02
		Mushroom cultivation practical	02	Max. Marks-50 Internal assessment at Semester end		02
		INTERNSHIP FOR 6 MONTHS in VI SEMESTER				
8	Sem-VII&VIII	-				

Plan of actions:

Introduced certificate course	Mushroom cultivation	45 Hrs
National seminar	Medicinal plants	
Botanical tour	Maredumilli Araku	October
Hands on training	Grafting techniques in Kakinada agriculture department	September
Best practices	Plant of the day Display a plant with discription in front of staff room	Every day
	Ornamental Garden	Every month
Waste to best practices	Models preparation using plastic wastes,e-wastes etc.., Reuse of plastic bottles for growing plants	DNA model

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF BOTANY

BOTANY COURSE STRUCTURE AND SYLLABUS

Botany Model Blue Print for the Question paper and choice for II & III Years (w.e.f. 2023-24 Academic Year)

S.No	Type of Questions	To be given in the Question paper			To be Answered		
		No. of Questions	Marks Allotted to each Question	Total marks	No. of Questions	Marks Allotted to each Question	Total marks
1	SECTION-A ESSAY QUESTIONS (EQ)	6	10	60	3	10	30
2	SECTION-B SHORT ANSWER QUESTIONS (SAQ)	7	5	35	4	5	20
Total Questions & Total Marks =		**13**	**-**	**95**	**7**	**-**	**50**

$$\textbf{Percentage of choice given} = \frac{95 - 50}{100} \times 100 = \frac{45}{100} \times 100 = 45$$

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Major / I Semester End (W.E.F. 2023-24)

INTRODUCTION TO CLASSICAL BIOLOGY

Hours/Week: 5 **Credits: 4**

Learning objectives

The student will be able to learn the diversity and classification of living organismsand understand their chemical, cytological, evolutionary and genetic principles.

Learning Outcomes

1. Learn the principles of classification and preservation of biodiversity
2. Understand the plant anatomical, physiological and reproductive processes.
3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
5. Comprehend the chemical principles in shaping and driving the macromolecules and life processes.

Unit 1: Introduction to systematics, taxonomy and ecology.

1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.
1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.
1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.
1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

2.1. The classification of plant kingdom.
2.2. Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

3.1. The classification of Kingdom Animalia and Chordata.

3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders

3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)

3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Unit 4: Cell biology, Genetics and Evolution

4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.

4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.

4.3. Central Dogma of Molecular Biology.

4.4. Origin of life

Unit 5: Essentials of chemistry

5.1. Definition and scope of chemistry, applications of chemistry in daily life.

5.2. Branches of chemistry

5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogen bonds.

5.4. Green chemistry

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3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
6. Satyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
8. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.
9. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.

ACTIVITIES:

1. Make a display chart of life cycle of nonflowering plants.
2. Make a display chart of life cycle of flowering plants.
3. Study of stomata
4. Activity to prove that chlorophyll is essential for photosynthesis
5. Study of pollen grains.
6. Observation of pollen germination.
7. Ikebana.
8. Differentiate between edible and poisonous mushrooms.
9. Visit a nearby mushroom cultivation unit and know the economics of mushroom cultivation.
10. Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell
11. Visit to Zoology Lab and observe different types of preservation of specimens
12. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter, Electronic Weighing Balance, Laminar Air Flow
13. Visit to Zoo / Sericulture / Apiculture / Aquaculture unit
14. List out different hormonal, genetic and physiological disorders from the society

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONURS BOTANY
Examinations at I Semester End
Botany Paper I: INTRODUCTION TO CLASSICAL BIOLOGY
(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

SECTION – A

3 × 10 =30 M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary

PART- I

1. Define taxonomy and its hirerachy
2. Detailed note on photosynthesis.
3. Explain hormones and its disorders

PART- II

4. Explain cell cycle in detail
5. Detailed note on Branches of chemistry
6. Write a note on Mushroom Cultivation

SECTION – B

Answer any **FOUR** of the following questions. Each question carries **5** marks **4 X 5 = 20 M**

7. Binomial Nomenclature
8. Rules of ICBN and ICZN
9. Structure of flower
10. Fertilization
11. Gametogenesis
12. Difference between prokaryotic and eukaryotic cell
13. Covalent bond

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Botany honours / I Semester End (W.E.F. 2023-24)
Course 1 :- Introduction to Classical Biology
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	I	Introduction to classical Biology	Introduction to systematics, taxonomy and ecology	Knowledge	Lecture & Field Visit	Skill
2	Botany	I	Introduction to classical Biology	Essentials of Botany	Knowledge	Shall be shown by Photographs & models	Skill
3	Botany	I	Introduction to classical Biology	Cell Biology, Genetics & Evolution	Knowledge	Shall be shown by Photographs & models	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester I B.Sc. Honours (I Semester)			
Course1	**TITLE OF THE COURSE Introduction to Classical Biology**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	4

CourseObjectives:

1. The student will be able to learn the diversity and classification of living organismsand understand their chemical, cytological, evolutionary and genetic principles.

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Learn the principles of classification and preservation of biodiversity
CO2	Understand the plant anatomical, physiological and reproductive processes.
CO3	Knowledge on animal classification, physiology, embryonic development and theireconomic importance.
CO4	Outline the cell components, cell processes like cell division, heredity and molecularprocesses.
CO5	1. Comprehend the chemical principles in shaping and driving the macromolecules and lifeprocesses.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	3	3	3	3
CO2	3	2	2	2	2	3	2	3	3	3
CO3	2	3	3	3	2	2	2	3	3	3
CO4	3	2	2	3	3	3	2	3	3	3
CO5	2	2	2	2	2	2	2	1	1	1

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Major / II Semester End (W.E.F. 2023-24)

Course 3: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)

Credits -2

I. Learning Objectives: By the end of this course the learner has:

1. To realize the characteristics and diversity of non-vascular plants.
2. To recognize the ecological and economic value of algae, fungi, lichens and bryophytes.
3. To inquire the habit, habitat, morphological features and life cycles of selected genera of non-vascular plants.

II. Learning Outcomes: On completion of this course students will be able to:

1. Compile the general characteristics of algae and their significance in nature.
2. Compare and contrast the characteristics of different groups of algae.
3. Summarise the important features of fungi and their economic value.
4. Distinguish the characteristics of different groups of fungi.
5. Elaborate the features and significance of amphibians of plant kingdom
6. Explain the diversity among non-vascular plants.

III. Syllabus of Theory:

Unit-1: Introduction to Algae **8Hrs.**

1. General Characteristics of algae: Occurrence and distribution, cell structure, pigments, flagella and reserve food material.
2. Classification of algae: F.E.Fritsch (1935) and Lee (2008)
3. Thallus organization and life cycles in algae.
4. Ecological and economic importance of algae.

Unit-2: Biology of selected Algae **10Hrs.**

1. Occurrence, structure, reproduction and life cycle of:
   (a) Chlorophyceae: *Spirogyra* (b) Phaeophyceae: *Ectocarpus*
   (c) Xanthophyceae: *Vaucheria* (d) Rhodophyceae:*Polysiphonia*
2. A brief account of Bacillariophyceae
3. Culture and cultivation of *Chlorella*

Unit-3: Introduction to Fungi **8Hrs.**

1. General characteristics of fungi and Ainsworth (1973) classification.
2. Thallus organization and nutrition in fungi.
3. Reproduction in fungi (asexual and sexual); Heterothallism and parasexuality.
4. Ecological and economic importance of fungi.

Unit-4: Biology of selected Fungi **10Hrs.**

1. Occurrence, structure, reproduction and life cycle of:
   (a) Mastigomycotina: *Phytophthora* (b) Zygomycotina: *Rhizopus*
   (c) Ascomycotina: *Penicillium* (d) Basidiomycotina: *Puccinia*
2. Occurrence, structure and reproduction of lichens; ecological and economic importance of lichens.

Unit-5: Biology of Bryophytes **9Hrs.**

1. General characteristics of Bryophytes; Rothmaler (1951) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of
   (a) Hepaticopsida: *Marchantia* (b) Anthoceratopsida: *Anthoceros*
   (c) Bryopsida: *Funaria*

3. General account on evolution of sporophytes in Bryophyta.

IV. Text Books:

1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi
2. Hait,G., K.Bhattacharya & A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata

V. Reference Books:

1. Fritsch, F.E. (1945) The Structure¬& Reproduction of Algae (Vol. I & Vol. II) Cambridge University Press Cambridge, U.K.
2. Bold, H.C.& M. J. Wynne (1984) Introduction to the Algae, Prentice-Hall Inc., New Jersey
3. Robert Edward Lee (2008) Phycology. Cambridge University Press, New York
4. Van Den Hoek, C., D.G.Mann & H.M.Jahns (1996)Algae : An Introduction to Phycology. Cambridge University Press, New York.
5. Alexopoulos, C.J., C.W.Mims & M.Blackwell (2007) Introductory Mycology, Wiley& Sons, Inc., New York
6. Mehrotra, R.S.& K. R. Aneja (1990) An Introduction to Mycology. New Age International Publishers, New Delhi.
7. Kevin Kavanagh (2005) Fungi; Biology and Applications John Wiley& Sons, Ltd., West Sussex, England.

8. John Webster & R. W. S. Weber (2007) Introduction to Fungi, Cambridge University Press, New York.
9. Shaw, A.J.& B.Goffinet (2000) Bryophyte Biology .Cambridge University Press, New York.

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Algae specimen collection from any water bodies in their locality, recording the characteristics, identification and classifying them according to Fritsch system.

Evaluation method: Evaluating the presentation or report summarizing findings.

Unit-2: Activity: Microscopic observations and recording distinguishing characters of any six algal forms excluding the genera in the syllabus.

Evaluation method: Conducting a Quiz or an exam/ evaluating the chart or drawings or summarized data on similarities and differences.

Unit-3: Activity: Collection or laboratory culture of fungi and reporting the important features.

Evaluation method: Evaluating the report/conducting JAM/Quiz/Group discussion.

Unit-4: Activity: Microscopic observations and summarizing the salient features of the fungal genera and lichen forms in the syllabus**.**

Evaluation method: Conducting a Quiz or an exam/ evaluating the chart or drawings or concise data on similarities and differences.

Unit-5: Collection, characterization, identification and classification of any four bryophytes from their native locality or college campus.

Evaluation method: Assessment of observations and documentation accuracy/presentation or report summarizing findings based on a rubric.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONOURS BOTANY
Examinations at II Semester End
Course-3: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)
(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

SECTION – A

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary **3 X 10 = 30M**

PART- I

1. Thallus Organization and life cycle in algae
2. Life cycle of Ectocarpus
3. ExplainAinsworth classification

PART- II

4. Life cycle of Phytophthora
5. General account on evolution of Sporophyte in Bryophyta
6. Detailed note on Fritsch Classification.

SECTION – B **4 × 5=20 M**

Answer Any **FOUR** Of The Following Questions, Draw Neat And Labeled Diagrams Wherever Necessary

7. Economic importance of Algae
8. Reproduction in Polysiphonia
9. Asexual reproduction in Fungi
10. Ecological inmportance of Fungi
11. Morphology of Rhizopus
12. Reproduction in lichens
13. Marchantia thallus structure

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Major / II Semester End (W.E.F. 2023-24)

Course 3: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)

PRACTICAL SYLLABUS

Credits -2

I. Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Identify some algal and fungal species based on the structure of thalli and reproductive organs.
2. Decipher the lichens and Bryophytes based on morphological, anatomical and reproductive features.

II. Laboratory/field exercises:

Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts:

1. **Algae:** *Spirogyra, Ectocarpus, Vaucheria and Polysiphonia;* a centric and a pennate diatom.
2. Demonstration of culture and cultivation of *Chlorella*
3. Identification of some algal products available in local market.
4. **Fungi:** *Phytophthora, Rhizopus, Penicillium* and *Puccinia*
5. Identification of some fungal products available in the local market.
6. **Lichens:** Crustose, foliose and fruiticose
7. **Bryophyta:** *Marchantia, Anthoceros* and *Funaria.*

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONURS BOTANY
Practical Examinations at II Semester End
Model Paper
Course-3: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)
(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

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1. Identify the givenAlga material l **A.** Make a temporary slide and justify the characters

10m

2. Identify the given Fungal material **B.** Make a temporary slide and justify the characters

10m

3. Identify the given Bryophyta material **C.** Make a temporary slide and justify the characters

10m

4. Identify the given Spotters and justify the characters. **3 X 4 = 12 m**

D- Algae

E-Fungi

F-lichen

5.Record + Viva voce **5+3 = 8m**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc., -Botany honours / II Semester End (W.E.F. 2023-24)
Course 3 :- Non- Vascular Plants (Algae, Fungi, Lichens and Bryophytes)
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	II	Non–Vascular Plants	Introduction to Algae	knowledge	Shall be shown by Microscope & Photographs	Skill
2	Botany	II	Non–Vascular Plants	Biology of selected Algae	knowledge	Shall be shown by Microscope & Photographs	Skill
3	Botany	II	Non–Vascular Plants	Introduction to Fungi	knowledge	Shall be shown by Microscope & Photographs	Skill
4	Botany	II	Non–Vascular Plants	Biology of Selected Fungi	knowledge	Shall be shown by Microscope & Photographs	Skill
5	Botany	II	Non–Vascular Plants	Biology of Bryophytes	knowledge	Shall be shown by Microscope & Photographs	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester I B.Sc. Honours (II Semester)			
Course3	**TITLE OF THE COURSE** **Non-Vascular Plants(Algae, Fungi, Lichens & Bryophytes)**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseObjectives:

1. To realize the characteristics and diversity of non-vascular plants.
2. To recognize the ecological and economic value of algae, fungi, lichens and bryophytes.
3. To inquire the habit, habitat, morphological features and life cycles of selected genera ofnon-vascular plants.

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Compile the general characteristics of algae and their significance in nature.
CO2	Compare and contrast the characteristics of different groups of algae.
CO3	Summarise the important features of fungi and their economic value.
CO4	Distinguish the characteristics of different groups of fungi.
CO5	Elaborate the features and significance of amphibians of plant kingdom

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	3	2	3	3	3
CO2	2	2	2	3	3	3	3	3	3	3
CO3	1	1	2	1	3	3	3	3	3	3
CO4	1	1	2	1	3	3	3	3	3	3
CO5	2	2	2	2	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Major / II Semester End (W.E.F. 2023-24)

Course 4: Origin of Life and Diversity of Microbes

Credits -2

I. Learning Objectives: By the end of this course the learner has:

1. To get awareness on origin and evolution of life.
2. To understand the diversity of microbial organisms.
3. To get awareness on importance of microbes in nature and agriculture.

II. Learning Outcomes: On completion of this course students will be able to:

1. Illustrate diversity of viruses, multiplication and economic value.
2. Discuss the general characteristics, classification and economic importance of special groups of bacteria.
3. Explain the structure, nutrition, reproduction and significance of eubacteria.
4. Evaluate the interactions among soil microbes.
5. Compile the value and applications of microbes in agriculture.

III. Syllabus of Theory:

Unit-1: Origin of life and Viruses **10 Hrs.**

1. Origin of life, concept of primary Abiogenesis; Miller and Urey experiment.; discovery of microorganisms, Pasteur experiments, germ theory of diseases.
2. Five kingdom classification of R.H. Whittaker
3. Shape and symmetry of viruses; structure of TMV and Gemini virus.
4. Multiplication of TMV; A brief account of prions, viroids and virusoids; Transmission of plant viruses and their control.
5. Significance of viruses in vaccine production, bio-pesticides and as cloning vectors.

Unit-2: Special groups of Bacteria **7 Hrs.**

1. General characteristics, outline classification and economic importance of following special groups of bacteria:

   a) Archaebacteria b) Chlamydiae c) Actinomycetes

   d) Mycoplasma e) Phytoplasma f) Cyanobacteria

2. Culture and cultivation of *Spirulina*

Unit-3: Eubacteria **8 Hrs.**

1. Occurrence, distribution and cell structure of eubacteria.
2. Classification of Eubacteria based on nutrition.

3. Reproduction- Asexual (Binary fission and endospores) and bacterial recombination (Conjugation, Transformation, Transduction).
4. Economic importance of Eu-bacteria with reference to their role in Agriculture and industry (fermentation and medicine).

Unit-4: Soil microbes – interactions **10Hrs.**

1. Distribution of soil microorganisms in soil.
2. Factors influencing the soil microflora - Role of microorganisms in soil fertility.
3. Interactions among microorganisms, mutualism, comensalism, competition, amensalism, parasitism, predation.
4. Microorganisms of rhizosphere, phyllosphere and spermophere; microbial interactions and their effect on plant growth.

Unit-5: Microbes in agriculture **10 Hrs.**

1. Mass production, mode of applications, advantages and limitations of bacterial inoculants (*Rhizobium, Azotobacter, Azospirillum,* Cyanobacteria).
2. Role of Frankia and VAM in soil fertility.
3. Microbial biopesticides: mode of action, factors influencing, target pests; microbial herbicides.

IV. Text Books:

1. Bhattacharjee, R.N., (2017) Introduction to Microbiology and Microbial Diversity, Kalyani Publishers, New Delhi.
2. Dubey, R.C. & D. K. Maheswari (2013) A Text Book of Microbiology, S.Chand & Company Ltd., New Delhi
3. Toshniwal, R.L. (2007) Agricultural Microbiology, Agrobios (India), Jodhpur

V. Reference Books:

1. Pelczar Jr., M.J., E.C.N. Chan & N. R. Krieg (2001) Microbiology, Tata McGraw- Hill Co, New Delhi
2. Presscott, L. Harley, J. and Klein, D. (2005) Microbiology, Tata McGraw –Hill Co. New Delhi.
3. Gyaneshwar, A.D., G.J. Parekh, and V.S. Reddy (2004) Agricultural Microbiology: Plant-Soil Interactions, Research Signpost, Kerala, India
4. Zaki A. Shuler and Zainul Abid (2014) Agricultural Microbiology: Principles and

Applications, CRC Press, Boca Raton, Florida, USA

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Collecting scientific literature on historical developments in microbiology.

Evaluation method: Evaluating the report based on a rubric.

Unit-2: Activity: Group discussion on various groups of special bacteria.

Evaluation method: Assessment of active participation, soft skills, communication skills, collaborative skills, time management etc., of a group or a student based on a rubric.

Unit-3: Activity: Presentation or poster summarizing the classification of Eu-bacteria based on nutrition.

Evaluation method: Assessment based on accuracy and understanding.

Unit-4: Activity: Microscopic observation of bacterial samples from soil/ phylloplane in their native place/ college campus.

Evaluation method: Evaluating the report on characteristics and classification of eubacteria.

Unit-5: Activity: Culture and mass production of bioinoculants.

Evaluation method: Skills performed in establishing the culture and mass production.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONURS BOTANY
Examinations at II Semester End
Model Paper

Course 4: Origin of Life and Diversity of Microbes

(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

SECTION – A **3 × 10 =30 M**

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary

PART - I

1. Detailed note on Five kingdom Classification
2. General characters and economic importance of Mycoplasma
3. Explain Interactions among microorganism

PART - II

4. Detailed note on role of Frankia and VAM in soil fertility
5. Detailed note on mode of action and factors influencing the microorganisms of rhizosphere
6. Briefb account on Significance of viruses in vaccine production.

Answer any **FOUR** of the following questions. Each question carries **5** marks 4 X 5 = 20 M

7. Germ theory of Diseases
8. Structure of TMV
9. Archaebacteria
10. Actinomycetes
11. Asexual reproduction in Bacteria
12. Role of micro organisms in soil fertility
13. Microorganisms of Rhizosphere

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Major / II Semester End (W.E.F. 2023-24)

Course 4: Origin of Life and Diversity of Microbes

PRACTICAL SYLLABUS

Credits -2

I. Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Take all necessary precautions in the microbiology laboratory.
2. Handle the instruments and prepare media for laboratory work.
3. Identify various microbes through microscopic observations

II. Laboratory/Field exercises:

1. Microbiology good laboratory practices and biosafety.
2. Study the principle and applications of important instruments (autoclave, hot air oven, incubator, Inoculation loop, Inoculation needle, membrane filter, laminar air flow system, colony counter. biological safety cabinets, BOD incubator, pH meter) used in the microbiology laboratory.
3. Study of Viruses (Gemini and TMV) using electron micrographs/ models.
4. Gram staining technique of Bacteria.
5. Microscopic study of Cyanobacteria using temporary/permanent slides.
6. Microscopic study of Eubacteria using temporary/permanent slides.
7. Study of Archaebacteria and Actinomycetes using permanent slides/ electron micrographs/diagrams.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONURS BOTANY
Practical Examinations at II Semester End
Model Paper

Course 4: Origin of Life and Diversity of Microbes

(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

1.Demonstrate the gram staining technique in bacteria **10m**

2.Identify the given material A (Cyanobacteria) and draw the diagram, justify the characters **10m**

3. Identify the given material B (Eubacteria) and draw the diagram, justify the characters **10m**

4. Identify the given Spotters and justify the characters **3 X 4 = 12m**

C-Laboratory equipment

D-virus (Gemini/TMV)

E-special type of bacteria (Archaebacteria / Actinomycetes)

5.Record + Viva Voce **5 + 3 = 8m**

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester I B.Sc. Honours (IISemester)			
Course4	**TITLE OF THE COURSE Origin of Life and Diversity of Microbes**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseObjectives:

1. To get awareness on origin and evolution of life.
2. To understand the diversity of microbial organisms.
3. To get awareness on importance of microbes in nature and agriculture.

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Illustrate diversity of viruses, multiplication and economic value.
CO2	Discuss the general characteristics, classification and economic importance of special groupsof bacteria
CO3	Explain the structure, nutrition, reproduction and significance of eubacteria.
CO4	Evaluate the interactions among soil microbes.
CO5	Compile the value and applications of microbes in agriculture.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	3	3	3	3	3
CO2	2	3	2	3	3	3	3	3	3	3
CO3	2	3	2	3	3	3	2	3	3	3
CO4	2	2	3	2	3	3	3	3	3	3
CO5	3	2	3	2	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Minor / II Semester End (W.E.F. 2023-24)

Course 1: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)

Credits -2

I. Learning Objectives: By the end of this course the learner has:

1. To realize the characteristics and diversity of non-vascular plants.
2. To recognize the ecological and economic value of algae, fungi, lichens and bryophytes.
3. To inquire the habit, habitat, morphological features and life cycles of selected genera of non-vascular plants.

II. Learning Outcomes: On completion of this course students will be able to:

1. Compile the general characteristics of algae and their significance in nature.
2. Compare and contrast the characteristics of different groups of algae.
3. Summarise the important features of fungi and their economic value.
4. Distinguish the characteristics of different groups of fungi.
5. Elaborate the features and significance of amphibians of plant kingdom
6. Explain the diversity among non-vascular plants.

III. Syllabus of Theory:

Unit-1: Introduction to Algae **8Hrs.**

1. General Characteristics of algae: Occurrence and distribution, cell structure, pigments, flagella and reserve food material.
2. Classification of algae: F.E.Fritsch (1935) and Lee (2008)
3. Thallus organization and life cycles in algae.
4. Ecological and economic importance of algae.

Unit-2: Biology of selected Algae **10Hrs.**

1. Occurrence, structure, reproduction and life cycle of:
   (a) Chlorophyceae: *Spirogyra* (b) Phaeophyceae: *Ectocarpus*
   (c) Xanthophyceae: *Vaucheria* (d) Rhodophyceae:*Polysiphonia*
2. A brief account of Bacillariophyceae
3. Culture and cultivation of *Chlorella*

Unit-3: Introduction to Fungi **8Hrs.**

1. General characteristics of fungi and Ainsworth (1973) classification.
2. Thallus organization and nutrition in fungi.

3. Reproduction in fungi (asexual and sexual); Heterothallism and parasexuality.
4. Ecological and economic importance of fungi.

Unit-4: Biology of selected Fungi 10Hrs.

1. Occurrence, structure, reproduction and life cycle of:
   (a) Mastigomycotina: *Phytophthora* (b) Zygomycotina: *Rhizopus*
   (c) Ascomycotina: *Penicillium* (d) Basidiomycotina: *Puccinia*
2. Occurrence, structure and reproduction of lichens; ecological and economic importance of lichens.

Unit-5: Biology of Bryophytes 9Hrs.

1. General characteristics of Bryophytes; Rothmaler (1951) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of
   (a) Hepaticopsida: *Marchantia* (b) Anthoceratopsida: *Anthoceros*
   (c) Bryopsida: *Funaria*

3. General account on evolution of sporophytes in Bryophyta.

IV. Text Books:

1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi
2. Hait,G., K.Bhattacharya & A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata

V. Reference Books:

1. Fritsch, F.E. (1945) The Structure¬& Reproduction of Algae (Vol. I & Vol. II) Cambridge University Press Cambridge, U.K.
2. Bold, H.C.& M. J. Wynne (1984) Introduction to the Algae, Prentice-Hall Inc., New Jersey
3. Robert Edward Lee (2008) Phycology. Cambridge University Press, New York
4. Van Den Hoek, C., D.G.Mann & H.M.Jahns (1996)Algae : An Introduction to Phycology. Cambridge University Press, New York.
5. Alexopoulos, C.J., C.W.Mims & M.Blackwell (2007) Introductory Mycology, Wiley&Sons, Inc., New York
6. Mehrotra, R.S.& K. R. Aneja (1990) An Introduction to Mycology. New Age International Publishers, New Delhi.

7. Kevin Kavanagh (2005) Fungi; Biology and Applications John Wiley& Sons, Ltd., West Sussex, England.
8. John Webster & R. W. S. Weber (2007) Introduction to Fungi, Cambridge UniversityPress, New York.
9. Shaw, A.J.& B.Goffinet (2000) Bryophyte Biology .Cambridge University Press, NewYork.

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Algae specimen collection from any water bodies in their locality, recording the characteristics, identification and classifying them according to Fritsch system.

Evaluation method: Evaluating the presentation or report summarizing findings.

Unit-2: Activity: Microscopic observations and recording distinguishing characters of any six algal forms excluding the genera in the syllabus.

Evaluation method: Conducting a Quiz or an exam/ evaluating the chart or drawings or summarized data on similarities and differences.

Unit-3: Activity: Collection or laboratory culture of fungi and reporting the important features.

Evaluation method: Evaluating the report/conducting JAM/Quiz/Group discussion.

Unit-4: Activity: Microscopic observations and summarizing the salient features of the fungal genera and lichen forms in the syllabus**.**

Evaluation method: Conducting a Quiz or an exam/ evaluating the chart or drawings or concise data on similarities and differences.

Unit-5: Collection, characterization, identification and classification of any four bryophytes from their native locality or college campus.

Evaluation method: Assessment of observations and documentation accuracy/presentation or report summarizing findings based on a rubric.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONURS (Minor)
Examinations at II Semester End
Course-1: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)
(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

SECTION – A

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary **3 X 10 = 30M**

PART- I

1. Thallus Organization and life cycle in algae
2. Life cycle of Ectocarpus
3. ExplainAinsworth classification

PART- II

4. Life cycle of Phytophthora
5. General account on evolution of Sporophyte in Bryophyta
6. Detailed note on Fritsch Classification.

SECTION – B **4 × 5=20 M**

Answer Any **FOUR** Of The Following Questions, Draw Neat And Labeled Diagrams Wherever Necessary

7. Economic importance of Algae
8. Reproduction in Polysiphonia
9. Asexual reproduction in Fungi
10. Ecological inmportance of Fungi
11. Morphology of Rhizopus
12. Reproduction in lichens
13. Marchantia thallus structure

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc.Honours -Botany-Minor / II Semester End (W.E.F. 2023-24)

Course 1: Non-vascular Plants (Algae, Fungi, Lichens, and Bryophytes)

PRACTICAL SYLLABUS

Credits -2

I. Course Outcomes: On successful completion of this practical course, student shall be able to:

1. Identify some algal and fungal species based on the structure of thalli and reproductiveorgans.
2. Decipher the lichens and Bryophytes based on morphological, anatomical and reproductive features.

II. Laboratory/field exercises:

Study/ microscopic observation of vegetative, sectional/anatomical and reproductive structures of the following using temporary or permanent slides/ specimens/ mounts:

1. **Algae:** *Spirogyra, Ectocarpus, Vaucheria and Polysiphonia;* a centric and a pennatediatom.
2. Demonstration of culture and cultivation of *Chlorella*
3. Identification of some algal products available in local market.
4. **Fungi:** *Phytophthora, Rhizopus, Penicillium* and *Puccinia*
5. Identification of some fungal products available in the local market.
6. **Lichens:** Crustose, foliose and fruiticose
7. **Bryophyta:** *Marchantia, Anthoceros* and *Funaria.*

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I Year B.Sc. HONURS (minor)
Practical Examinations at II Semester End
Model Paper
Course-1: Non-Vascular Plants (Algae, Fungi, Lichens and Bryophytes)
(2023-24)

Time: 2 Hrs. **Max. Marks: 50**

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1. Identify the givenAlga material l **A.** Make a temporary slide and justify the characters

10m

2. Identify the given Fungal material **B.** Make a temporary slide and justify the characters

10m

3. Identify the given Bryophyta material **C.** Make a temporary slide and justify the characters

10m

4. Identify the given Spotters and justify the characters. **3 X 4 = 12 m**

D- Algae

E-Fungi

F-lichen

5.Record + Viva voce **5+3 = 8m**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
I B.Sc., -Botany minor / II Semester End (W.E.F. 2023-24)
Course 1 :- Non- Vascular Plants (Algae, Fungi, Lichens and Bryophytes)
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	II	Non–Vascular Plants	Introduction to Algae	knowledge	Shall be shown by Microscope & Photographs	Skill
2	Botany	II	Non–Vascular Plants	Biology of selected Algae	knowledge	Shall be shown by Microscope & Photographs	Skill
3	Botany	II	Non–Vascular Plants	Introduction to Fungi	knowledge	Shall be shown by Microscope & Photographs	Skill
4	Botany	II	Non–Vascular Plants	Biology of Selected Fungi	knowledge	Shall be shown by Microscope & Photographs	Skill
5	Botany	II	Non–Vascular Plants	Biology of Bryophytes	knowledge	Shall be shown by Microscope & Photographs	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester I B.Sc. Honours (II Semester)			
Course3	**TITLE OF THE COURSE Non-Vascular Plants(Algae, Fungi, Lichens & Bryophytes)**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseObjectives:

4. To realize the characteristics and diversity of non-vascular plants.
5. To recognize the ecological and economic value of algae, fungi, lichens and bryophytes.
6. To inquire the habit, habitat, morphological features and life cycles of selected genera ofnon-vascular plants.

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Compile the general characteristics of algae and their significance in nature.
CO2	Compare and contrast the characteristics of different groups of algae.
CO3	Summarise the important features of fungi and their economic value.
CO4	Distinguish the characteristics of different groups of fungi.
CO5	Elaborate the features and significance of amphibians of plant kingdom

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	2	3	3	2	3	3	3
CO2	2	2	2	3	3	3	3	3	3	3
CO3	1	1	2	1	3	3	3	3	3	3
CO4	1	1	2	1	3	3	3	3	3	3
CO5	2	2	2	2	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-III / III Semester End (W.E.F. 2023-24)

Anatomy, Embryology of Angiosperms, Plant Ecology and Biodiversity

Total hours of Teaching 60hrs @ 4 hrs/week Total Credits:02

Learning outcomes:

- On successful completion of this course, the students will be able to;
- Understand on the organization of tissues and tissue systems in plants.
- Illustrate and interpret various aspects of embryology.
- Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and biotic factors on plant communities.
- Appraise various qualitative and quantitative parameters to study the population and community ecology.
- Correlate the importance of biodiversity and consequences due to its loss.
- Enlist the endemic/endangered flora and fauna from two biodiversity hot spots in India and assess strategies for their conservation.

Unit – 1: Anatomy of Angiosperms 12 Hrs.

1. Organization of apical meristems: Tunica-carpus theory and Histogen theory.
2. Tissue systems–Epidermal, ground and vascular,Special tissue.
3. Anomalous secondary growth in *Boerhaavia*, *Dracaena*
4. Study of timbers of economic importance - Teak, Red sanders and Rosewood.

Unit – 2: Embryology of Angiosperms 12 Hrs.

1. Structure of anther, anther wall, types of tapetum. Microsporogenesis and development of male gametophyte.
2. Structure of ovule, Megaspoorogenesis; types of embryo sacs- monosporic, bisporic and tetrasporic .
3. Outlines of pollination, polyembryony and fertilization.
4. Endosperm - Types and biological importance - Free nuclear, cellular,helobialand ruminate.
5. Development of Dicot (*Capsella bursa-pastoris*) Embryo, development of monocot embryo

Unit – 3: Basics of Ecology 12 Hrs.

1. Ecology: definition, branches and significance of ecology.
2. Ecosystem: Concept and components, energy flow, food chain, food web, ecological pyramids.
3. Eotypes, Ecotone and Ecads.
4. Plants and environment: Climatic (light and temperature), edaphic and biotic factors.
5. Ecological succession: Hydro sere and Xerosere.

Unit – 4: Population, Community and Production Ecology 12 Hrs.

1. Population ecology: Natality, Mortality, growth curves, ecotypes, ecads
2. Community ecology: Frequency, density, cover, life forms, biological spectrum
3. Concepts of productivity: GPP, NPP and Community Respiration
4. Secondary production, P/R ratio and Ecosystems.

Unit – 5: Basics of Biodiversity 12 Hrs.

1. Biodiversity: Basic concepts, Convention on Biodiversity - Earth Summit.
2. Value of Biodiversity; types and levels of biodiversity and Threats to biodiversity

3. Biodiversity Hot spots in India. Biodiversity in North Eastern Himalayas and Western Ghats.
4. Principles of conservation: IUCN threat-categories, RED data book, WWF, UNEP, UNESCO.
5. Role of NBPGR and NBA in the conservation of Biodiversity.
6. Role of Biodiversity board to protect Biodiversity of A.P

Text books :

- Botany – III (Vrukshasastram-I): Telugu Academy, Hyderabad Botany – IV (Vrukshasastram-II): Telugu Academy, Hyderabad
- Pandey, B.P. (2013) *College Botany, Volume-II,* S. Chand Publishing, New Delhi Pandey, B.P. (2013) *College Botany, Volume-III,* S. Chand Publishing, New Delhi
- Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) *A Text Book of Botany, Volume- II,* New Central Book Agency Pvt. Ltd., Kolkata

Books for Reference:

- Esau, K. (1971) *Anatomy of Seed Plants.* John Wiley and Son, USA.
- Fahn, A. (1990) *Plant Anatomy,* Pergamon Press, Oxford.
- Cutler, D.F., T. Botha & D. Wm. Stevenson (2008) *Plant Anatomy: An Applied Approach,* Wiley, USA.
- Paula Rudall (1987) *Anatomy of Flowering Plants: An Introduction to Structure and Development.* Cambridge University Press, London
- Bhojwani, S. S. and S. P. Bhatnagar (2000) *The Embryology of Angiosperms (4th Ed.),*Vikas Publishing House, Delhi.
- Pandey, A. K. (2000) *Introduction to Embryology of Angiosperms*. CBS Publishers & Distributors Pvt. Ltd., New Delhi
- Maheswari, P. (1971) *An Introduction to Embryology of Angiosperms*. McGraw Hill Book Co., London.
- Johri, B.M. (2011) *Embryology of Angiosperms.* Springer-Verlag, Berlin
- Pandey, B.P. (2013) *College Botany, Volume-III,* S. Chand Publishing, New Delhi
- Bhattacharya, K., A. K. Ghosh, & G. Hait (2011) *A Text Book of Botany, Volume- IV,* New Central Book Agency Pvt. Ltd., Kolkata
- Kormondy, Edward J. (1996) *Concepts of Ecology,* Prentice-Hall of India Private Limited, New Delhi
- Begon, M., J.L. Harper & C.R. Townsend (2003) *Ecology*, Blackwell Science Ltd., U.S.A.
- Eugene P. Odum (1996) *Fundamentals of Ecology,* Natraj Publishers, Dehradun
- Sharma, P.D. (2012) *Ecology and Environment*. Rastogi Publications, Meerut, India.
- N.S. Subrahmanyam & A.V.S.S. Sambamurty (2008) *Ecology Narosa* Publishing House, New Delhi
- K. Agrawal& P.P. Deo (2010) *Plant Ecology,* Agrobios (India), Jodhpur
- Kumar, H.D. (1992) *Modern Concepts of Ecology (7th Edn.,)* Vikas Publishing Co.,
- New Delhi.
- Newman, E.I. (2000): *Applied Ecology*Blackwell Scientific Publisher, U.K.
- Chapman, J.L&M.J. Reiss (1992): *Ecology - Principles & Applications.*Cambridge
- University Press, U.K.
- Kumar H.D. (2000) *Biodiversity & Sustainable Conservation* Oxford & IBH Publishing Co Ltd. New Delhi.
- U. Kumar (2007) *Biodiversity: Principles & Conservation,* Agrobios (India), Jodhpur

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II Year B.Sc., Degree Examinations at III Semester End
Botany Paper III: ANATOMY AND EMBYOLOGY OF ANGIOSPERMS, PLANT ECOLOGY AND BIODIVERSITY
(Course: BO4207 Model Paper w.e.f. 2023-24)

Time: 2 Hrs. **Max. Marks: 50**

SECTION – A

3 × 10 =30 M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary

PART –I

1. Give an essay on shoot Meristems?
2. Describe the tetrasporic Embryosac and their development.
3. Give a note on Ecosystem? Describe the different components of an Ecosystem?

PART – II

4 . General account on Community Ecology?
5.Give a detailed note on Biodiversity Hotspots in India
6 write an essay on Xylem tissue

SECTION – B

4 × 5=20 M

Answer Any **FOUR** Of The Following Questions, Draw Neat And Labeled Diagrams Wherever Necessary

7. Histogen theory

8.Latisiferous tissue

9.Polyembryony

10.Types of tapetum

11.Food chain

12.Life forms

13.Red Data Book

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Practical syllabus of Botany Core Course – 3 /Semester – III

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

(Total hours of laboratory exercises 30 Hrs. @ 02 Hrs./Week)

Practical Syllabus

1. Tissue organization in root and shoot apices using permanent slides.
2. Anomalous secondary growth in stems of *Boerhavia* and *Dracaena*.
3. Study of anther and ovule using permanent slides/photographs.
4. Study of pollen germination and pollen viability.
5. Dissection and observation of Embryo sac haustoria in *Santalum*..
6. Structure of endosperm (nuclear and cellular) using permanent slides / Photographs.
7. Dissection and observation of Endosperm haustoria in *Crotalaria* or *Coccinia*.
8. Developmental stages of dicot and monocot embryos using permanent slides / photographs.
9. Study of instruments used to measure microclimatic variables; soil thermometer, maximum and minimum thermometer, anemometer, rain gauze, and lux meter. (visit to the nearest/local meteorology station where the data is being collected regularly and record the field visit summary for the submission in the practical).
10. Study of morphological and anatomical adaptations of hydrophytes and xerophytes (02 each).
11. Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance.
12. Identification of vegetation/various plants in college campus and comparison with Raunkiaer's frequency distribution law.
13. Mapping of biodiversity hotspots of the world and India.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Botany Practical Examinations at the End of Semester-III

Anatomy and Embryology of Angiosperms, Plant Ecology and Biodiversity

Botany Practical Model Paper-III (w.e.f 2023-24)

Time: 2 hours **Max. Marks: 50**

1. Analyze the T.S. of the material 'A' (Anatomy),

prepare a temporary slide and justify the identification with specific comments. 1 X 10 = 10 M

2. Illustrate the procedure for the experiment 'B' (Embryology)and demonstrate the same

1 X 10 = 10 M

3. Analyze the T.S. of the material 'C',

prepare a temporary slide and justify the identification with specific comments. 1 X 10 = 10 M

4. Identify the following with specific comments. 4 x 3 = 12 M

D. Anatomy/Embryology

E. Ecology instrument

F. Mapping of Biodiversity hot spot

G. Endemic/endangered plant/animal

5. Record + Viva-voce 5 + 3 = 8 M

50 M

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany/ III Semester End (W.E.F. 2023-24)
Anatomy, Embryology of Angiosperms, Plant Ecology and Biodiversity
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	III	Anatomy, Embryology of Angiosperms, Plant Ecology & Biodiversity	Anatomy of Angiosperms	Knowledge	Shall be shown by microscope & Photographs	Skill
2	Botany	III	Anatomy, Embryology of Angiosperms, Plant Ecology & Biodiversity	Embryology of Angiosperms	Knowledge	Shall be shown by microscope & Photographs	Skill
3	Botany	III	Anatomy, Embryology of Angiosperms, Plant Ecology & Biodiversity	Basics of Ecology	Knowledge	Lecture	Skill
4	Botany	III	Anatomy, Embryology of Angiosperms, Plant Ecology & Biodiversity	Population, Community and production Ecology	Knowledge	Lecture	Skill
5	Botany	III	Anatomy, Embryology of Angiosperms, Plant Ecology & Biodiversity	Basics of Biodiversity	Knowledge	Lecture	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (III Semester)			
Course3	**TITLE OF THE COURSE Anatomy, Embryology of Angiosperms, Plant Ecology & Biodiversity**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Understand on the organization of tissues and tissue systems in plants.
CO2	Illustrate and interpret various aspects of embryology.
CO3	Discuss the basic concepts of plant ecology, and evaluate the effects of environmental and biotic factors on plant communities.
CO4	Appraise various qualitative and quantitative parameters to study the population and community ecology.
CO5	Correlate the importance of biodiversity and consequences due to its loss.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	3	3	3	3	3
CO2	1	2	2	2	3	3	2	3	3	3
CO3	1	2	3	3	3	3	2	3	3	3
CO4	1	2	3	3	1	2	2	3	3	3
CO5	2	2	3	2	2	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-IV/ IV Semester End (W.E.F. 2023-24)
PLANT PHYSIOLOGY AND METABOLISM

Total hours of Teaching 60hrs @ 4 hrs/week Total Credits:02

UNIT – 1: PLANT-WATER RELATIONS (10 Hrs)

1. Importance of water to plant life, diffusion, imbibition, osmosis. water potential, osmotic potential, pressure potential.
2. Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements (K+ ion flux).
4. Mechanism of phloem transport; source-sink relationships.

UNIT – II: Mineral Nutrition, Enzymes And Respiration (14 Hrs.)

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation.

UNIT – III: Photosynthesis and Photorespiration (12 Hrs)

1. Photosynthesis: Photosynthetic pigments; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation
3. Carbon assimilation pathways (C3,C4 and CAM);
4. Photorespiration - C2 pathway

UNIT – IV: Nitrogen and lipid metabolism (12 Hrs.)

1. Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms.Structure & Role of Rhizobium bacteria in nodule formation.
2. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
3. Anabolism of triglycerides, β-oxidation of fatty acids, Glyoxylate cycle.

Unit – V: Plant growth - development and stress physiology (12 Hrs)

1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins, cytokinins, ABA, ethylene.
3. Physiology of flowering:Photoperiodism, role of phytochrome in flowering.
4. Seed germination and senescence; physiological changes.

Text books:

- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) College Botany, Volume-III, S. Chand Publishing, New Delhi ¬
- Ghosh, A. K., K. Bhattacharya &G. Hait (2011)
- A Text Book of Botany, VolumeIII, New Central Book Agency Pvt. Ltd.
- , Kolkata Books for Reference: ¬ Aravind Kumar & S.S. Purohit (1998)
- Plant Physiology – Fundamentals and Applications,AgroBotanica,
- Bikaner ¬ Datta, S.C. (2007) Plant Physiology,New Age International (P) Ltd.,
- Publishers, New Delhi ¬ Hans Mohr & P. Schopfer (2006)Plant Physiology, Springer (India) Pvt. Ltd., New Delhi ¬ Hans-Walter heldt (2005) Plant Biochemistry,Academic Press, U.S.A. ¬ Hopkins, W.G. & N.P.A. Huner (2014)Introduction to Plant Physiology,
- Wiley India Pvt. Ltd., New Delhi ¬ Noggle Ray & J. Fritz (2013)Introductory Plant Physiology,
- Prentice Hall (India), New Delhi ¬ Pandey, S.M. &B.K.Sinha (2006)Plant Physiology, Vikas Publishing House, New Delhi ¬ Salisbury, Frank B. & Cleon W. Ross (2007)Plant Physiology,
- Thomsen & Wadsworth, Austalia&U.S.A ¬ Sinha, R.K. (2014) Modern Plant Physiology,
- Narosa Publishing House,New Delhi ¬ Taiz, L.&E. Zeiger (2003)Plant Physiology, Panima Publishers, New Delhi ¬ Verma,
- V.(2007)Text Book of Plant Physiology,Ane Books India, New Delhi

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II Year B.Sc., Degree Examinations at IV Semester End

Botany Paper IV: PLANT PHYSIOLOGY & METABOLISM

(Course: BO4207 Model Paper w.e.f. 2023-24)

Time: 2Hrs. **Max. Marks: 50**

SECTION – A **3 × 10 =30 M**

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary

PART –I

1. Illustrate Transpiration? Describe the mechanism of opening and closing of stomata.
2. Give a detailed note on biological nitrogen fixation in Rhizobium
3. Describe the mechanism of C3 Pathway.

PART – II

4. Give an account on Electron transport system
5. Give a Detailed note on Photoperiodism
6. Give a detailed note on Photorespiration

SECTION – B **4 × 5=20 M**

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary

7. Apoplast and simplest
8. Absorption of mineral ions
9. Red drop effect
10. Difference between C4 and CAM
11. Classification of lipids
12. Vernalisation
13. Brassinosteroids

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., BOTANY PRACTICAL PAPER – IV PRACTICAL SYLLABUS

PLANT PHYSIOLOGY AND METABOLISM

Total hours of laboratory Exercises 30 hrs @ 2 per week Total credits:02

Suggested Laboratory Exercises:

1. Demonstration of osmosis through Egg Membrane by Thistle Funnel Experiment.
2. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of *Rhoeo.*
3. Structure of stomata (dicot & monocot)
4. Determination of rate of transpiration using cobalt chloride method
5. Demonstration of ascent of sap/Transpiration pull by using *Impatiens balsamina*.
6. Effect of Temperature on membrane permeability by colorimetric method.
7. Study of mineral deficiency symptoms using plant material/photographs.
8. Separation of chloroplast pigments using paper chromatography technique.
9. Rate of photosynthesis under varying Co_2 concentrations.
10. Effect of light intensity on oxygen evolution in photosynthesis using Wilmott' bubbler
11. Respiration – Aerobic/Anaerobic.
12. Difference between C3 and C4 Plants by leaf Anatomy.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Botany Practical Examinations at the End of Semester-IV

(PLANT PHYSIOLOGY AND METABOLISM)

Botany Practical Model Paper-IV (w.e.f 2023-24)

Time: 2 hours **Max. Marks: 50**

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1. Experiment '**A**' Major experiment from Plant-Water relations / Plant metabolism **15M**

Scheme of valuation:

Aim, Principle and Procedure	-	5M
Conduct of Experiment	-	6M
Report of result and inference	-	4M

2. Experiment 'B' Minor Experiment **7M**

Scheme of valuation:

Aim, Principle and Procedure	-	5M
Report of result and inference	-	2M

3. Scientific observation and data analysis 4×5=**20M**

D. Plant-Water relations
E. Mineral nutrition and Enzymes
F. Plant metabolism
G. Plant growth and development

Scheme of valuation:

Identification	-	1M
Diagram	-	1M
Reasons/analysis	-	1M

4. Record & Viva-voce 5+3=**08M**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-IV/ IV Semester End (W.E.F. 2023-24)
Plant Physiology & Metabolism
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	V	Plant Physiology & Metabolism	Plant – Water relations	Knowledge	Lecture	Skill
2	Botany	V	Plant Physiology & Metabolism	Mineral nutrition, Enzymes And Respiration	Knowledge	Shall be show by Photograph	Skill
3	Botany	V	Plant Physiology & Metabolism	Photosynthesis & Photorespiration	Knowledge	Shall be shown by Photographs & Models	Skill
4	Botany	V	Plant Physiology & Metabolism	Nitrogen and lipid metabolism	Knowledge	lecture	Skill
5	Botany	V	Plant Physiology & Metabolism	Plant growth – development and stress physiology	Knowledge	Lecture5	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Semester)			
Course4	**TITLE OF THE COURSE Plant Physiology & Metabolism**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the role of water in plant life
CO2	Aquire knowledge on various deficiency diseases
CO3	Understand the system of photosynthesis in plants
CO4	Knowledge on plant metabolism
CO5	Knowledge on different factors responsible for stress in Plants

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	3	3	3	3	3
CO2	1	2	2	2	3	3	2	3	3	3
CO3	1	3	2	2	3	3	2	3	3	3
CO4	1	2	2	2	3	3	3	3	3	3
CO5	1	2	2	2	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., -Botany- IV Semester End (W.E.F. 2023-24)

CELL BIOLOGY, GENETICS AND PLANT BREEDING

Total hours of Teaching 40hrs Total Credits:02

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

- Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
- Explain the organization of a eukaryotic chromosome and the structure of genetic material.
- Demonstrate techniques to observe the cell and its components under a microscope.
- Discuss the basics of Mendelian genetics, its variations and interpret of characters.
- Elucidate the role of extra-chromosomal genetic material for inhrtitance of characters.
- Evaluate the structure and functions, regulation of genetic material.
- Understand the application of principles and modern techniques in plant breeding
- Explain the procedures of selection and hybridization for improvement of crops.

UNIT – I: THE CELL (12h)

1. Cell theory; prokaryotic vs eukaryotic cell; animal vs plant cell; a brief account on ultra structure of a plant cell.
2. Ultra structure of cell wall
3. Ultra structure of Plasma membrane and various theories on its organization
4. Polymorphic cell organelles (Plastids); ultra structure of chloroplast. Plastid DNA.

UNIT – II: CHROMOSOMES (12h)

1. Prokaryotic vs Eukaryotic chromosomes. Morphology of a eukaryotic chromosomes.
2. Euchromatin and Heterochromatin; Karyotype and ideogram
3. Brief account of chromosomal aberrations – structural and numerical changes.
4. Organization of DNA in a chromosome (Solenoid and Nucleosome models)
5. Special types of chromosomes – Polythene, Lampbrush, β chromosomes.

UNIT – III: MENDELIAN AND NON-MENDELIAN GENETICS (12h)

1. Mendel's laws of Inheritance. Incomplete dominance and co-dominance; Multiple allelism.
2. Complementary, supplementary and duplicating gene interactions (Plant based examples are to be dealt).
3. A brief account on linkage and crossing over; Chromosomal mapping-2 point test cross and 3 point test cross.

4. Concept of maternal inheritance (Corren's experiment on Mirabilis jalapa); Mitochondrial DNA

UNIT – IV: STRUCTURE AND FUNCTIONS OF DNA (12h)

1. Watson and crick model of DNA. Brief account on DNA replication (Semi conservative method).
2. Brief account on Transcription,types and functions of RNA. Gene concept and genetic code translation.
3. Regulation of gene expression in prokaryotes – Lac operon

UNIT – V:Plant Breeding (12h)

1. Plant Breeding and its scope; Genetics basis for plant breeding.Plant introduction and acclimatization.
2. Definition, Procedure; applications and uses; advantages and limitations of : (a) Mass selection, (b) Pure line selection and (c) Clonal selection.
3. Hybridization – scheme, and technique; Heterosis(hybrid vigour).
4. Brief account on Molecular breeding – DNA markers in plant breeding. RAPD, RFLP.

Suggested activity: Seminar, Debate, Quiz, observation of live cells and nucleus in Onion peels, observation of Meiotic nuclei in Maize pollen. Solving Genetics problems.

TEXT BOOKS :

1. Botany – III (Vrukshasastram-I) : Telugu Akademi, Hyderabad
2. Pandey, B.P. (2013) *College Botany, Volume-III,* S. Chand Publishing, New Delhi
3. Ghosh, A.K., K.Bhattacharya&G. Hait (2011) *A Text Book of Botany, Volume-III,* New CentralBook Agency Pvt. Ltd., Kolkata
4. Chaudhary, R. C. (1996) *Introduction to Plant Breeding,* Oxford & IBH Publishing Co. Pvt. Ltd.,New Delhi

REFERENCE BOOKS:

1. S. C. Rastogi (2008)*Cell Biology*,New Age International (P) Ltd. Publishers, New Delhi
2. P. K. Gupta (2002)*Cell and Molecular biology*,Rastogi Publications, New Delhi
3. B. D. Singh (2008) *Genetics*,Kalyani Publishers, Ludhiana
4. A.V.S.S. Sambamurty (2007) *Molecular Genetics*,Narosa Publishing House,New Delhi
5. Cooper, G.M. & R.E. Hausman (2009)*The Cell – A Molecular Approach*, A.S.M. Press,Washington
6. Becker, W.M., L.J. Kleinsmith& J. Hardin (2007)*The World of Cell*, Pearson Education, Inc., NewYork
7. De Robertis, E.D.P. & E.M.F. De Robertis Jr. (2002)*Cell and Molecular Biology*, LippincottWilliams & Wilkins Publ.,

Philadelphia

8. Robert H. Tamarin (2002)*Principles of Genetics,*Tata McGraw –Hill Publishing Company Limited,New Delhi.
9. Gardner, E.J., M. J. Simmons & D.P. Snustad (2004)*Principles of Genetics,* John Wiley & SonsInc., New York
10. Micklos, D.A., G.A. Freyer& D.A. Cotty (2005) *DNA Science: A First Course,* I.K. International Pvt. Ltd., New Delhi
11. Chaudhari, H.K.(1983)*Elementary Principles of Plant Breeding*, TMHpublishers Co., New Delhi
12. Sharma, J.R. (1994)*Principles and Practice of Plant Breeding*, Tata McGraw- Hill Publishers, NewDelhi
13. Singh,B.D. (2001)*Plant Breeding : Principles and Methods* ,Kalyani Publishers, Ludhiana
14. Pundhan Singh (2015) *Plant Breeding for Undergraduate*
15. upta, S.K. (2010)*Plant Breeding : Theory and Techniques*,

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II Year B.Sc., Degree Examinations at IV Semester End

Botany Paper V: CELL BIOLOGY GENETICS AND PLANT BREEDING

(Model Paper w.e.f. 2023-24)

Time: 2Hrs. **Max. Marks: 50**

SECTION – A 3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. Give an account on Ultra structure and functions of cell membrane
2. Give a note on Replication of DNA especially Semiconservative model
3. Linkage concept and significance

PART – II

4. write about Methods of crop improvement
5. Explain the Role of Soma clonal variations
6. Describe the ultra structure and functions of cell wall

SECTION – B 4×5=20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary.

7.Difference between Prokaryotic and Eukaryotic cell

8.Euchromatin, Heterochromatin

9.m-RNA Structure and Functions

10.Test Cross

11.Selection in Plant breeding

12.RFLP

13.Hybridization in Plant breeding

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., BOTANY PRACTICAL PAPER – V PRACTICAL SYLLABUS

CELL BIOLOGY, GENETICS AND PLANT BREEDING

Total hours of laboratory Exercises 45 hrs @ 2hrs/week Total credits:02

Course outcomes: After successful completion of this practical course the student will be able to:

- Show the understading of techniques of demonstration Mitosis and meiosis in the laboratory and identify different stages of cell division.
- Identify and explain with diagram the cellular parts of a cell from a model or picture and prepare models.
- Solve the problems related to crosses and gene interactions.
- Demonstration plant breeding techniques such as emasculation and bagging.

PAPER – V PRACTICAL SYLLABUS

Suggested Laboratory Exercises:

1. Study of the structure of cell organelles through photomicrographs.
2. Study of structure of plant cell through temporary mounts.
3. Study of various stages of mitosis using cytological preparation of Onion root tips.
4. Study of effect of organic solvent on permeability of cell membrane.
5. Numerical problems solving Mendel' Laws of inheritance
6. Chromosome mapping using 3-point test cross data.
7. Hybridization techniques – emasculation, bagging (for demonstration only).
8. Field visit to a plant breeding research station.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., Botany Practical Examinations at the End of Semester-IV

(CELL BIOLOGY, GENETICS AND PLANT BREEDING)

Botany Practical Model Paper-V (w.e.f 2023-24)

Time: 2 hours **Max. Marks: 50**

1. Make a cytological preparation of given material 'A' (mitosis or meiosis in Onion) by squashtechnique, report any two stages, draw labeled diagrams and write the reasons. 15 M
2. Solve the given Genetic problem (Dihybrid cross/ Interaction of genes/ 3-point test cross) 'B'and write the conclusions. 15 M
3. Identify the following and justify with apt reasons. 3 x 4 = 12 M
   A. Cell Biology (Cell organelle)

   B. Genetics (DNA/RNA)

   C. Plant Breeding
4. Record + Viva-voce 5 + 3 = 8 M

Suggested co-curricular activities for Botany Core Course- 5 in Semester-IV :

A. Measurable :

a. Student seminars :

1. Light microscopy : bright field and dark field microscopy.
2. Scanning Electron Microscopy (SEM).
3. Transmission Electron Microscopy (TEM).
4. Mitosis and Meiosis
5. Cell cycle and its regulation.
6. Cell organelles bounded by single membrane.
7. Prokaryotic chromosomes
8. Special types of chromosomes :Polytene, Lampbrush and B-chromosomes.
9. Different forms of DNA.
10. Gene mutations.
11. DNA damage and repair mechanisms.
12. Reverse transcription.
13. Protein structure.
14. Modes of reproduction in plants.
15. Modes of pollination in plants

b. Student Study Projects :

1. Study of mitoticcell cycle in roots of*Aliumcepa*
2. tudy of mitoticcell cycle in roots of*Aloe vera*
3. Observation of chromosomal aberrations in *Allium cepa* root cells exposed toindustrialeffluent(s).
4. Observation of chromosomal aberrations in *Allium cepa* root cells exposed toheavymetal(s).
5. Observation of polyembryony in *Citrus* spp.and *Mangiferaindica.*

c. Assignments: Written assignment at home / during '0' hour at college; preparation of chartswith drawings, making models etc., on topics

included in syllabus.

B. General :

- Field visit to Agriculture/Horticulture University/ Research station to observe Plant breedingmethods.
- Group Discussion (GD)/ Quiz/ Just A Minute (JAM) on different modules in syllabus of thecourse.

RECOMMENDED ASSESSMENT OF STUDENTS:

Recommended continuous assessment methods for all courses:

Some of the following suggested assessment methodologies could be adopted. Formal assessment for awarding marks for Internal Assessment in theory.

(a) Formal:

1. The oral and written examinations (Scheduled and surprise tests),
2. Simple, medium and Critical Assignments and Problem-solving exercises,
3. Practical assignments and laboratory reports,
4. Assessment of practical skills,
5. Individual and group project reports,
6. Seminar presentations,
7. Viva voce interviews.

(b) Informal:

1. Computerized adaptive testing, literature surveys and evaluations,
2. Peers and self-assessment, outputs form individual and collaborative work
3. Closed-book and open-book tests,

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-V/ IV Semester End (W.E.F. 2023-24)
Cell Biology, Genetics & Plant Breeding
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	V	Cell Biology, Genetics & Plant Breeding	Cell Biology	Knowledge	Shall be shown by microscope & models	Skill
2	Botany	V	Cell Biology, Genetics & Plant Breeding	Genetic Material	Knowledge	Shall be shown by microscope & Photographs	Skill
3	Botany	V	Cell Biology, Genetics & Plant Breeding	Mendelian Inheritance	Knowledge	Problem Solving	Skill
4	Botany	V	Cell Biology, Genetics & Plant Breeding	Plant Breeding	Knowledge	Visiting Plant Breeding Station	Skill
5	Botany	V	Cell Biology, Genetics & Plant Breeding	Breeding, Crop Improvement and Biotechnology	Knowledge	Visiting Plant Breeding Station	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. (IV Semester)			
Course5	**TITLE OF THE COURSE Cell Biology, Genetics & Plant Breeding**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Distinguish prokaryotic and eukaryotic cells and design the model of a cell.
CO2	Explain the organization of a eukaryotic chromosome and the structure of genetic material.
CO3	Demonstrate techniques to observe the cell and its components under a microscope
CO4	Discuss the basics of Mendelian genetics, its variations and interpret of characters.
CO5	Elucidate the role of extra-chromosomal genetic material for inhertitance of characters.

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	3	3	3	3	3
CO2	1	2	2	2	3	3	2	3	3	3
CO3	1	3	2	2	3	3	2	3	3	3
CO4	1	2	2	2	3	3	3	3	3	3
CO5	1	2	2	2	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc., -Botany-VI / V Semester End (W.E.F. 2023-24)

PLANT TISSUE CULTUE

Total hours of Teaching 40hrs @ 4 hrs/week Total Credits:02

Learning outcomes

Students at the successful completion of the course will be able to :

1. Comprehend the basic knowledge and applications of plant tissue culture.
2. Identified the various facilities required to set up a plant tissue culture laboratory.
3. Acquire a critical knowledge on Sterilization techniqques related to plant tissue culture.
4. Demonstration skills of callus culture through hands on experience.
5. Understand the biotransformation technique for production of secondary metabolites.

Unit - 1: Basic concepts of plant tissue culture (10h)

1. Plant tissue culture: Definition, history, scope and significance.
2. Totipotency, differentiation, dedifferentiation, and redifferentiation; Organ culture types of cultures.
3. Infrastructure and equipment required to establish a tissue culture laboratory.

Unit - 2: Sterilization techniques and culture media(10h)

1. Aseptic conditions – Fumigation, wet and dry sterilization, UV sterilization, ultrafiltration.
2. Nutrient media: Composition of commonly used nutrient culture media with respect to their contents like inorganic chemicals, organic constituents, vitamins, amino acids etc.
3. Composition and preparation of Murashige and Skoog culture medium.

Unit - 3: Callus culture technique (10h)

1. Explant: Definition, different explants for tissue culture: shoot tip, axillary buds, leaf discs, cotyledons, inflorescence and floral organs, their isolation and surface sterilization; inoculation methods.
2. Callus culture: Definition, various steps in callus culture.
3. Initiation and maintenance of callus - Growth measurements and subculture; soma clonal variations.

Unit – 4: Micropropagation (10h)

1. Direct and indirect morphogenesis, organogenesis, role of PGRs; somatic embryogenesis and synthetic seeds.
2. Greenhouse hardening unit operation and management; acclimatization and hardening of plantlets - need, process, packaging, exports.

Unit – 5: Applications of plant tissue culture (10h)

1. Germplasm conservation: cryopreservation methods, slow growth, applications and limitations; cryoprotectants.
2. Plant transformation techniques and bioreactors; production of secondary metabolites-optimization of yield, commercial aspects, applications, limitations.
3. Transgenic plants- gene transfer methods; Bt-cotton, Flavr Savr tomato, Golden rice.

I. References:

1. Kalyan Kumar De (2001) An Introduction to Plant Tissue Culture, New Central Book Agency (P) Ltd., Calcutta
2. Razdan, M.K. (2005) Introduction to Plant Tissue Culture, Oxford & IBH Publishers, Delhi
3. Bhojwani, S.S. (1990) Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers, New York, USA.
4. Vasil, I.K. and Thorpe, T.A. (1994) Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands.
5. Web resources suggested by the teacher concerned and the college librarian including reading material.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III Year B.Sc., Degree Examinations at V Semester End

Botany Paper VI: PLANT TISSUE CULTURE

(Model Paper w.e.f. 2023-24)

Time: 2Hrs. **Max. Marks: 50**

SECTION – A **3×10 =30M**

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. write about Organ culture in tissue culture
2. Write about sterilization method
3. Give a detailed note on Somaclonal variations

PART –II

4. Write an essay on Somatic embryogenesis.
5. Applications of plant tissue culture
6. General account on Germplasm Conservation & its significance.

SECTION – B **4×5 =20M**

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary.

7. Totipotency
8. Role of hormones in plant tissue culture
9. Shoot tip Culture
10. Organogenesis
11. Cryopreservation
12. Synthetic seeds
13. Bt-cotton

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., BOTANY PRACTICAL

PAPER – VI PRACTICAL SYLLABUS
PLANT TISSUE CULTURE

Total hours of laboratory Exercises 45 hrs @ 2hrs/week Total credits:02

I. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. List out, identify and handle various equipment in plant tissue culture lab.
2. Learn the procedures of preparation of media.
3. Demonstrate skills on inoculation, establishing callus culture and Micro propagation.
4. Acquire skills in observing and measuring callus growth.
5. Perform some techniques related to plant transformation for secondary Metabolite production.

II. Practical (Laboratory) Syllabus: (30 hrs)

1. Principles and applications of- Autoclave, Laminar Airflow, Hot Air Oven.
2. Sterilization techniques for glass ware, tools etc.,
3. MS medium - Preparation of different stock solutions; media preparation
4. Explant preparation, inoculation and initiation of callus from carrot.
5. Callus formation, growth measurements.
6. Induction of somatic embryos, preparation of synthetic seeds.
7. Multiplication of callus and organogenesis.
8. Hardening and acclimatization in green house.

II. Lab References:

1. Reinert, J. and M.M. Yeoman, 1982. Plant Cell and Tissue Culture - A Laboratory Manual, Springer-Verlag Berlin Heidelberg
2. Robert N. Trigiano and Dennis J. Gray, 1999. Plant Tissue Culture Concepts and Laboratory Exercises. CRC Press, Florida
3. Ashok Kumar, 2018. Practical Manual for Biotechnology, College of Horticulture & Forestry, Jhalawar, AU, Kota
4. Chawla, H.S., 2003. Plant Biotechnology: A Practical Approach, Nova Science Publishers, New York
5. Web sources suggested by the teacher concerned.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc., Botany Practical Examinations at the End of Semester-V

(PLANT TISSUE CULTURE)

Botany Practical Model Paper-VI (w.e.f 2022-24)

Time: 2 hours **Max. Marks: 50**

1.	Demonstration of a sterilization technique 'A'	8
2.	Preparation of MS medium 'B'	10
3.	Demonstration of callus culture technique/growth measurements 'C'	12
4.	Scientific observation and data analysis	4 x 3 = 12
	D. Tissue culture equipment /photograph	
	E. Morphogenesis or organogenesis - photograph	
	F. Bioreactor/Secondary metabolite	
	G. Transgenic plant/photograph	
5.	Record + Viva-voce	5+3=8

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VI/ V Semester End (W.E.F. 2023-24)
Plant Tissue Culture
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	V	Plant Tissue culture	Basic concepts of plant tissue culture	Knowledge	Visiting tissue culture laboratory	Skill
2	Botany	V	Plant Tissue culture	Sterilization techniques and culture media	Application	Demonstration	Skill
3	Botany	V	Plant Tissue culture	Callus culture techniques	Application	Demonstration	Skill
4	Botany	V	Plant Tissue culture	Micropropagation	Application	Demonstration	Skill
5	Botany	V	Plant Tissue culture	Applications of Plant tissue culture	Application	Demonstration	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester III B.Sc. (V Semester)			
Course6	**TITLE OF THE COURSE Plant Tissue Culture**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Comprehend the basic knowledge and applications of plant tissue culture
CO2	Identified the various facilities required to set up a plant tissue culture laboratory.
CO3	Acquire a critical knowledge on Sterilization techniqques related to plant tissue culture.
CO4	Demonstration skills of callus culture through hands on experience
CO5	Understand the biotransformation technique for production of secondary metabolites

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	3	3	3	3	3	2	2	2
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	2	3	2	2	3	3	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	3	2	3	3	2	2	2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII/ V Semester End (W.E.F. 2023-24)
MUSHROOM CULTIVATION

Total hours of Teaching 40hrs @ 4hrs/week Total Credits:02

Learning outcomes

Students at the successful completion of the course will be able to :

1.Understand the structure and life of a mushroom and discriminate edible and poisonous mushroom.
2.Identify the basic infrastructure to establish a mushroom culture unit.
3.Demonstrate the skills preparation of compost and spawn.
4.Acquire a critical knowledge on cultivation of some edible mushrooms.
5.Explain the methods of storage, preparation of value added products and marketing.

Unit – 1: Introduction and value of mushrooms (10h)

1. Mushrooms: Definition, structure of a mushroom and a brief account of life cycle; historical account and scope of mushroom cultivation; difference between edible and poisonous mushrooms.
2. Morphological features of any four edible mushrooms, Button mushroom (*Agaric us Bosporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor-caju*) and Paddy straw mushroom (*Volvariella volvacea*).
3. Nutraceutical value of mushrooms; medicinal mushrooms in South India - *Ganoderma lucidum, Phellinus rimosus, Pleurotus florida and Pleurotus pulmonaris* – their therapeutic value; Poisonous mushrooms - harmful effects.
4. Structure of *Amantia sps.*

Unit – 2: Basic requirements of cultivation system (10h)

1. Small village unit and larger commercial unit; layout of a mushroom farm - location of building plot, design of farm, bulk chamber, composting, equipment and facilities, pasteurization room and growing rooms.
2. Compost and composting: Definition, machinery required for compost making, materials for compost preparation.
3. Methods of composting- long method of composting and short method of composting.

Unit – 3: Spawning and casing (10h)

1. Spawn and spawning: Definition, facilities required for spawn preparation; preparation of spawn substrate.
2. Preparation of pure culture, media used in raising pure culture; culture maintenance, storage of spawn.
3. Casing: Definition, Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.

Unit – 4: Mushroom cultivation (10h)

Raw material, compost, spawning, casing, cropping, and problems in cultivation (diseases, pests and nematodes, weed molds and their management strategies), picking and packing for any Four of the following mushrooms:

(a) Button mushroom (b) Oyster mushroom (c) Milky mushroom and (d) Paddy straw mushroom

Unit – 5: Post harvest technology (10h)

1. Shelf life of mushrooms; preservation of mushrooms - freezing, dry freezing, drying and canning.
2. Quality assurance and entrepreneurship - economics of different types of mushrooms; value added products of mushrooms.
3. Management of spent substrates and waste disposal of various mushrooms.

I. References:

1. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
2. Pandey R.K, S. K Ghosh, (1996). A Hand Book on Mushroom Cultivation. Emkey Publications
3. Nita Bhal. (2000). Handbook on Mushrooms (Vol. I and II). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
6. Pathak V.N., Nagendra Yadav and Maneesha Gaur (2000), Mushroom Production and Processing Technology Vedams Ebooks Pvt. Ltd., New Delhi
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III Year B.Sc., Degree Examinations at V Semester End

Botany Paper VII: MUSHROOM CULTIVATION

(Model Paper w.e.f. 2023-24)

Time: 2 Hrs. **Max. Marks: 50**

SECTION – A 3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. Brief account on life cycle of Mushroom
2. Write an essay on layout of mushroom farm.
3. Define spawn and explain the facilities required for spawning

PART –II

4. Essay on cultivation of Milk mushroom & paddy straw mushroom
5. What is shelf life of a mushroom ? What are the conditions required to improve shelf life of a mushroom
6. Brief account on life cycle of Mushrooms

SECTION – B 4×5 =20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary.

7. Importance of mushroom cultivation
8. Factors effecting composting
9. Preparation of pure culture
10. Post harvest handling of fresh oyster mushrooms
11. Value added products of mushrooms
12. Bulk chamber
13. Storage of spawn

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc., BOTANY PRACTICAL PAPER – VII PRACTICAL SYLLABUS

MUSHROOM CULTIVATION

Total hours of laboratory Exercises 45 hrs @ 2hrs/week Total credits:02

Learning Outcomes:

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

1. Identify and discriminate different mushrooms based on morphology.
2. Understand facilities required for mushroom cultivation.
3. Demonstrate skills on preparation of spawn, compost and casing material.
4. Exhibit skills on various cultivation practices for an edible mushroom.

II. Practical (Laboratory) Syllabus: (30 hrs)

1. Identification of different types of mushrooms.
2. Preparation of pure culture of an edible mushroom.
3. Preparation of mother spawn.
4. Production of planting spawn and storage.
5. Preparation of compost and casing mixture.
6. Demonstration of spawning and casing.
7. Hands on experience on cropping and harvesting.
8. Demonstration of storage methods.
9. Preparation of value-added products.

III. Lab References:

1. Sushma Sharma Sapna Thakur Ajar Nath Yadav, 2018. Mushroom Cultivation: A Laboratory Manual, Eternal University, Sirmour, H.P.
2. Kadhila-Muandingi, N.P., F. S. Mubiana and K. L. Halueendo, 2012. Mushroom Cultivation: A Beginners Guide, The University of Namibia
3. Gajendra Jagatap and Utpal Dey, 2012. Mushroom Cultivation:Practical Manual, LAMBERT Academic Publishing, Saarbrücken, Germany
4. Deepak Som, 2021. A Practical Manual on Mushroom Cultivation, P.K.Publishers & Distributors, Delhi
5. Web sources suggested by the teacher concerned.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

III B.Sc., Botany Practical Examinations at the End of Semester-VI

MUSHROOM CULTIVATION

Botany Practical Model Paper-VII (w.e.f 2023-24)

Time:2 hrs **max marks: 50**

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1. Demonstration of preparing pure culture/mother spawn 'A' 8
2. Preparation method for planting spawn and storage/compost and casing material 'B' 10
3. Demonstration of spawning and casing/storage and making a value-added product 'C' 12
4. Scientific observation and data analysis 4 x 3 = 12
   D. Edible/poisonous mushroom specimen/photograph
   E. Infrastructure/tool used in mushroom cultivation
   F. Material for compost/casing
   G. Storage practice/ a value-added product
5. Record + Viva-voce 5+3 = 8

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII/ V Semester End (W.E.F. 2023-24)
MUSHROOM CULTIVATION
Mapping as per Blooms Taxonomy

S. NO	Subject	Semester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employability/entrepreneurship)
1	Botany	V	Mushroom Cultivation	Introduction and value of mushroom	Knowledge	Shall be shown photographs & Models	Skill
2	Botany	V	Mushroom Cultivation	Basic Requirements of cultivation system	Application	Visiting mushroom cultivation units	Entrepreneurship
3	Botany	V	Mushroom Cultivation	Spawing and Casing	Application	Practicing techniques	Skill & Entrepreneurship
4	Botany	V	Mushroom Cultivation	Mushroom Cultivation	Application	Practicing techniques	Skill & Entrepreneurship
5	Botany	V	Mushroom Cultivation	Post harvest technology	Application	Practicing techniques	Skill & Entrepreneurship

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester III B.Sc. (V Semester)			
Course7	**TITLE OF THE COURSE Mushroom Cultivation**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	2

CourseOutcomes:

On Completion of the course, the students will be able to-	
CO1	Understand the structure and life of a mushroom and discriminate edible and poisonous mushroom.
CO2	Identify the basic infrastructure to establish a mushroom culture unit.
CO3	Demonstrate the skills preparation of compost and spawn.
CO4	Acquire a critical knowledge on cultivation of some edible mushrooms.
CO5	Explain the methods of storage, preparation of value added products and marketing.

CO-PO Mapping :

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	2	2	3	3	3	3	3	3
CO2	2	2	2	2	3	3	3	3	3	3
CO3	2	3	3	2	3	3	3	3	3	3
CO4	2	2	2	2	3	3	3	3	3	3
CO5	2	2	2	3	3	3	3	3	3	3

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
CERTIFICATE COURSE FOR BOTANY
TITLE : Mushroom Cultivation
2023-24
B.Sc, BZC, MBC, HBC For ,II , III Years & I B.Sc Honor's
Total Hours :45 Hours **Credits :2**

Department of Botany will be going to conduct 45 days certificate course in the academic year 2023-24 . Certificate issued after completion of the course (assessment necessary for certificate)

Purpose of the course or course out comes ; Self employement ,To encourage the small scale industry, To Earn additional income

1) **Qualifications** : Degree on going
2) **Course** : MUSHROOM CULTIVATION
3) **Medium** : English
4) **Course duration** : 45 hrs.
5) **Instructional hrs. (teaching)** : 1hr per day
6) **Instructional hrs timings** : 4pm to 5pm
7) **Mode of instructins** : off line and online
8) **Final assessment** : offline or online exam, exam date announced later
9) **Instructors** : Dr.Ch.John Samuel
   Dr M.Krishna Rao.
10) **Fee** : Exam fee Rs 200/-

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF BOTANY

Total hours of instructions and practicals-45

CERTIFICATE COURSE

MUSHROOM CULTIVATION

syllabus

UNIT –I (9 hrs)

Introduction- history- scope of edible mushroom cultivation Types of mushrooms available in India Poisonous mushrooms.

UNIT-2 (9 hrs)

Spawn preparation- sterilization, multiplication

UNIT-3 (9 hrs)

Cultivation- locally available vessels, -compost preparation inoculation, culture rack – water sprayer, tray, -mushroom bed preparation –factors –harvesting.

UNIT-4 (9 hrs)

Storage-short term storage (Refrigeration – up to 24 hrs) – long term storage (canning, pickels, papads), drying, storage in salt solutions

HANDS ON TRAINING & PRACTICALS **(9 hrs)**

Field visit (with your own expenses) **1 day**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
DEPARTMENT OF BOTANY

Total hours of instructions and practicals-45

CERTIFICATE COURSE

MUSHROOM CULTIVATION

syllabus

Question paper – (2 questions from each section, answer any one) (Each section carries 10 marks)	**40 marks**
Project work -	**20 marks**
Assignments	**10 Marks**
Practical -	**30 marks**
Total	**100 marks**

PRINCIPLES OF BIOLOGICAL SCIENCES

MULTI DISCIPLINARY COURSE IN I SEMESTER

SYLLABUS

Credits : 2 2 hrs/week

Learning Objectives: By the end of this course the learner can:

1. Acquire logic to evaluate fundamental biological concepts at various levels of biological organisation including the molecular, cellular, organismal and systems levels.
2. Communicate fundamental biological knowledge between tiers of biological organisation.
3. Apply common biological principles across all levels of biological organization.

Learning Outcomes: On completion of this course students will be able to:

1. Understand the relationship between structure and function at all levels.
2. Recognise the mechanisms underlying biological evolution, its patterns, and its significance as biology's overarching unifying principle.
3. Understand the contributions of biology to the resolution of medical, ethical, social, and environmental concerns in human affairs.

UNIT-I Diversity of Life

1.1 Introduction to Biology, Branches of Biology, Basic Principles of Biology
1.2 Biological Classification-Two kingdom and Five kingdom classification, Viruses, Viroid's and Lichens
1.3 Diversity in the living world, Taxonomic categories, Taxonomic aids
1.4 Plant organization-The form, structure and function of plant vegetative and reproductive organs, Classification of Plant Kingdom,
1.5 Basis of Animal Classification, Classification of Animal Kingdom

UNIT-II Biomolecules and metabolisim

2.1 Ultra structure of cell and Cell organelles (Structure and Functions), Plant cell vs Animal cell
2.2 Plant Physiology: Photosynthesis, Respiration, Transportation, Mechanisms of Nitrogen fixation.
2.3 Plant growth and development, physiology of flowering.
2.4 Human Physiology: Digestion, Respiration, Circulation
2.5 Male and female reproductive organs, gametogenesis, fertilization.

UNIT-III Principles of Biology

3.1 Genetics: Mendel's laws of inheritance, Genetic disorders- Colour blindness, Sickle cell anaemia.
3.2 Evolution: Geological time scale for evolution of plants and vertebrates, Origin and evolution of plants and man

3.3 Common Human Diseases: causing organism, prevention and treatment- malaria, dengue, AIDS, cancer, corona.

3.4 Common Plant Diseases: causing organism, prevention and treatment- Black spot, Leaf spots, Powdery mildew, Blight, Canker.

3.5 Biotechnology: Tools and process of recombinant DNA technology, Applications of biotechnology in agriculture, food industry, medicine and transgenic animals.

Text Books

1. Pandey, B.P. (2013) College Botany, Volume-I, S. Chand Publishing, New Delhi.
2. Kotpal, R.L.2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut).
3. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.

Reference Books

1. Sreekrishna V. 2005. Biotechnology –I, Cell Biology and Genetics. New Age International Publ. New Delhi, India.
2. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.

Model question paper for theory examination at the end of I Semester
Multidisciplinary Course

Principles of Biological Science

Max. Time : 2 Hrs. **Max. Marks: 50**

Max. Marks: 50 Time: 1 1/2 hrs (90 Minutes

Section -A (Total: 4x5=20 Marks)

(Answer any **four questions**. Each answer carries **5 marks**

(Total 8 questions. At least 1 question should be given from each Unit)

1.
2.
3.
4.
5.
6.
7.
8.

Section- B (Total: 3x10 = 30 Marks)

(Answer any **three questions**. Each answer carries **10 marks**

(Total five questions. At least 1 question should be given from each Unit)

1.
2.
3.
4.
5.

Note: Questions may be set in such a way to test the outcomes instead of recalling of information.

ENVIRONMENTAL EDUCATION

Under life skill course in IV semester

(Total hours of Teaching – 30 Hrs. @ 02 Hrs. per Week)

Course objective: A Generic Course intended to create awareness that the life of human beings is an integral part of environment and to inculcate the skills required to protect environment fromall sides.

Learning outcomes: On completion of this course the students will be able to …..

1. Understand the nature, components of an ecosystem and that humans are an integral part of nature.
2. Realize the importance of environment, the goods and services of a healthy biodiversity, dependence of humans on environment.
3. Evaluate the ways and ill effects of destruction of environment, population explosion on ecosystems and global problems consequent to anthropogenic activities.
4. Discuss the laws/ acts made by government to prevent pollution, to protect biodiversity and environment as a whole.
5. Acquaint with international agreements and national movements, and realize citizen's role in protecting environment and nature.

Unit 1: Environment and Natural Resources 06 Hrs.

1. Multidisciplinary nature of environmental education; scope and importance.
2. Man as an integral product and part of the Nature.
3. A brief account of land, forest and water resources in India and their importance.
4. Biodiversity : Definition; importance of Biodiversity - ecological, consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels of Biodiversity: genetic, species and ecosystem diversity.

Unit-2: Environmental degradation and impacts 10Hrs

1. Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.
2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflicts over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.

4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house effect - global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

Unit 3: Conservation of Environment 10 Hrs

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
5. Environment Laws: Environment Protection Act; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois of Rajasthan, Chipko, Silent valley.

Suggested activities to learner: (4 hours)

1. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems-forest, tank, pond, lake, mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

Suggested text book :

- Erach Barucha (2004) *Text book of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commmission) Universities Press.
- Purnima Smarath (2018) *Environmental studies* Kalyani Publishers, Ludhiana

Reference books :

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) *Fundamentals of Ecology*. Philadelphia: Saunders.

- Pepper, I.L., Gerba, C.P. &Brusseau, M.L. (2011). *Environmental and Pollution Science*. Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) *Environment. 8th edition*. John Wiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) *Ecology, Environmental Science and Conservation.* S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) Ecology and economics: An approach to sustainable development. OUP.
- Wilson, E. O. (2006) *The Creation: An appeal to save life on earth.* New York: Norton.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) *Principles of Conservation Biology.* Sunderland: Sinauer Associates,

Model question paper for theory examination at the end of IV Semester

Life Skill Course

ENVIRONMENTAL SCIENCE

Max. Time : 2 Hrs. **Max. Marks: 50**

Max. Marks: 50 Time: 1 1/2 hrs (90 Minutes)

Section -A (Total: 4x5=20 Marks)

(Answer any **four questions**. Each answer carries **5 marks**

(Total 8 questions. At least 1 question should be given from each Unit)

1.
2.
3.
4.
5.
6.
7.
8.

Section- B (Total: 3x10 = 30 Marks)

(Answer any **three questions**. Each answer carries **10 marks**

(Total five questions. At least 1 question should be given from each Unit)

1.
2.
3.
4.
5.

Note: Questions may be set in such a way to test the outcomes instead of recalling of information.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

The **Board of Studies in B.Sc BOTANY** for the academic year 2022-2023 held in November 2022 in Dept. of Botany.

AGENDA:

The board of studies of a department in the college shall

1. Adapting APSCHE syllabus for all Semesters
2. Introducing Honours degree with single major
3. Introducing new papers in I semester for honours
4. Adapting 50- External evaluation and 50- Internal evaluation for II, III, IV &V Semesters, 200 for VIth Semesters for complete Internship
5. Conduct of Semester End Practical examinations for I, II, & III Years
6. Approval of conversion of teaching method for some practical oriented topics through audio & video visuals
7. Approval of student online courses including faculty for the year 2023-24.
8. Approval of 1st year I & II semesters syllabus with theory will be finalized by following APSCHE.
9. Approval of NPTEL courses to all Botany students
10. Approval of Hands on training programs on mushroom cultivation to B.Sc Botany final year students.
11. Approval to introduce VII & VIII semesters of honours degree with 3 major system
12. Approval of changes made upto 20%

The members of B.O.S in Botany discussed all the issues kept in agenda at length and taken following resolutions.

RESOLUTIONS:

1. The Chairperson submitted the syllabus for Botany which was adopted from the Adikavi Nannaya University from the Academic year 2023-24
2. Four years honours degree programme was being introduced from this academic year.
3. Resolved Ist Year I & II Semesters syllabus with theory will be finalized by following APSCHE guidelines in coming one or two months.
4. Resolved to adopt 50 External, 50 Internal evaluations for all II & III Years students , 200 for VI semester, Internship
5. Resolved to conduct practical for all semesters.
6. Resolved to introduce Certificate Course to all Students with 2 Credits.
7. Resolved to conduct offline exam for Certificate course and certificates will be provided to their respective mails.
8. Resolved to introduce Moocs courses in NPTEL Platform useful for their future career and higher studies as well.
9. Resolved to introduce VII & VIII semester honours degree with three majors.
10. Resolved to change the syllabus upto 20%.

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Lecturer in-Charge

2.Dr.M.KRISHNA RAO
Regular Faculty in Botany

Student Members

1.MR. P. ABHISHEK NAGESWARA RAO

II B.Z.C.SEC-II

2. Miss.D.SATYA

II B.Z.C. SEC-I