BOARD OF STUDIES

IN

B.Sc BOTANY

2024-2025

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
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 9: Anatomy and Embryology of Angiosperms

` **Credits -3**

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

1. To know about various types of tissues in plants and their organization.
2. To obtain awareness on anomalous secondary growth in plants and economic value of woods.
3. To acquire knowledge on development of male and female gametophytes in plants.
4. To probe into embryogenesis in angiosperms.

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

1. Categorize various tissues and evaluate their role in plants.
2. Explain anomalous secondary growth in some plants and justify the value of timber plants.
3. Summarize the events in micro-sporogenesis and development of male gametophyte.
4. Discuss the events in mega-sporogenesis and development of female gametophyte.
5. Propose the incidents in embryogenesis of an angiospermic plant species.
6. Compile the aspects of developmental and reproductive biology in plants.

III. Syllabus of Theory:

Unit – 1: Tissues in plants **8 Hrs.**

1. Meristematic tissues: Definition, classification, structure and functions.
2. Apical meristems: Generalised structure of shoot apex, theories on organization of Shoot Apical Meristem (SAM) - Apical cell theory, Tunica-Corpus theory and Histogen theory.
3. Permanent tissues (simple and complex).
4. A brief account of plant secretory tissues/cells.

Unit-2: Anomalous growth in plants **10Hrs.**

1. Tissue systems–Epidermal, ground and vascular.
2. Anomalous secondary growth in root of *Beta vulgaris*
3. Anomalous secondary growth in stems of *Boerhaavia* and *Dracaena*
4. Study of timbers of economic importance - Teak, Red-sanders and Rosewood.
5. Applications of anatomy in plant systematics, forensics and pharmacognosy.

Unit-3: Anther and pollen **10Hrs.**

1. Anther: Structure and functions of anther wall, micro-sporogenesis, callose deposition and its significance.
2. Pollen wall structure, MGU (male germ unit) structure, NPC system; a brief account of Palynology and its scope; development of male gametophyte.
3. Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: pseudomonads, polyads, massulae, pollinia.

Unit-4: Ovules, fertilization and endosperm **10Hrs.**

1. Structure and types of ovules, megasporogenesis; monosporic (*Polygonum*), bisporic (*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
2. Outlines of pollination; self-incompatibility- basic concepts; methods to overcome self-incompatibility (mixed pollination, bud pollination, stub pollination).
3. Double fertilization in angiosperms – process and consequences.
4. Perisperm; endosperm – types (free nuclear, cellular, helobial and ruminate) and biological importance.

Unit-5: Embryogeny and seeds **7Hrs.**

1. Embryogeny in dicot (*Capsella bursa-pastoris*)
2. Embryogeny in monocot (*Sagittariasagittifolia*).
3. Seed structure in monocot and dicot.
4. Importance of seed and seed dispersal mechanisms.
5. Polyembryony and apomixes: Introduction, classification, causes and applications.

IV. Text Books:

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

V. Reference Books:

1. Esau, K. (1971) Anatomy of Seed Plants. John Wiley and Son, USA.
2. Fahn, A. (1990) Plant Anatomy, Pergamon Press, Oxford.
3. Cutler, D.F., T. Botha & D. Wm. Stevenson (2008)Plant Anatomy: An Applied

Approach, Wiley, USA
4. Paula Rudall (1987) Anatomy of Flowering Plants: An Introduction to Structure and Development. Cambridge University Press, London
5. Bhojwani, S. S. and S. P. Bhatnagar (2000) The Embryology of Angiosperms (4th Ed.),Vikas Publishing House, Delhi.
6. Pandey, A. K. (2000) Introduction to Embryology of Angiosperms. CBS Publishers & Distributors Pvt. Ltd., New Delhi
7. Maheswari, P. (1971) An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
8. Johri, B.M. (2011) Embryology of Angiosperms. Springer-Verlag, Berlin

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Microscopic observations on different tissues in plants and recording characteristics.

Evaluation method: Judgement of the report/seminar on comparative and contrasting features of various tissues in plants.

Unit-2: Activity: Visits to timber depots and furniture shops and making a report on various woods.

Evaluation method: Assessment of report submitted with data, photographs and summary.

Unit-3: Activity: Study of pollen structure, germination and viability in some local plant species.

Evaluation method: Evaluating the report/seminar presentation with collected data.

Unit-4: Activity: Group discussion/quiz on endosperm types and functions.

Evaluation method: Assessment of the best performing group.

Unit-5: Activity: Drawings of embryogeny in some angiosperms and making comparative report.

Evaluation method: Evaluating the best drawings and comparative report.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 9: Anatomy and Embryology of Angiosperms

Credits -1

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

1. Conduct dissections of various plant organs and study the internal structures by staining.
2. Look into the embryological characteristics from sex organs to seeds in angiosperms.

Laboratory/field exercises:

1. Observation of meristems in dicot and monocot plants.
2. Tissue organization in shoot apices using permanent slides.
3. Anomalous secondary growth in root of *Beta vulgaris*
4. Anomalous secondary growth in stems of *Boerhaavia* and *Dracaena.*
5. Study of anther and ovule s using permanent slides/photographs.
6. Study of pollen germination and pollen viability.
7. Dissection and observation of embryo sac haustoria in *Santalum* or *Argemone*.
8. Structure of endosperm (nuclear and cellular) using permanent slides/photographs.
9. Dissection and observation of Endosperm haustoria in *Crotalaria* or *Coccinia.*
10. Developmental stages of dicot and monocot embryos using permanent slides /photographs.

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

Course 9: Anatomy and Embryology of Angiosperms
(2024-25)

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

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1. **(A)** Anamalous Secondary growth in Boerhavaia **12m**

2. **(B)** Dissection and observation of Endosperm haustoria in *Crotalaria* **10m**

3.(C). Study of pollen germination and pollen viability **8m**

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

C- Tissue organization in shoot apices

D- dicot / monocot embryos

E- Types of ovules

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 9: Anatomy and Embryology of Angiosperms

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	IV	Anatomy and Embryology of Angiosperms	Tissues in plants	Knowledge & Application	Lecture, Observation of anatomical structures	Skill, Employability
2	Botany	IV	Anatomy and Embryology of Angiosperms	Anomalous growth in plants	Knowledge & Application	Lecture, Observation of anatomical structures	Skill, Employability
3	Botany	IV	Anatomy and Embryology of Angiosperms	Anther and pollen	Knowledge & Application	Lecture, Observation of anatomical structures	Skill, Employability
4	Botany	IV	Anatomy and Embryology of Angiosperms	Ovules, fertilization and endosperm	Knowledge & Application	Lecture, Observation of anatomical structures	Skill, Employability
5	Botany	IV	Anatomy and Embryology of Angiosperms	Embryogeny and seeds	Knowledge, Application & Innovation	Lecture, Observation of anatomical structures	Skill, Employability

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. Honours (IV Semester)			
Course9	**TITLE OF THE COURSE** **Anatomy and Embryology of Angiosperms**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	3

Course Objectives

1. To know about various types of tissues in plants and their organization.
2. To obtain awareness on anomalous secondary growth in plants and economic value of woods.
3. To acquire knowledge on development of male and female gametophytes in plants.
4. To probe into embryogenesis in angiosperms.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	Categorize various tissues and evaluate their role in plants.
CO2	Explain anomalous secondary growth in some plants and justify the value of timber plants.
CO3	Summarize the events in micro-sporogenesis and development of male gametophyte.
CO4	Discuss the events in mega-sporogenesis and development of female gametophyte.
CO5	Propose the incidents in embryogenesis of an angiospermic plant species.

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	2	3	2	2	3	3	2	2	3
CO2	3	2	2	3	3	2	2	2	3	3
CO3	2	3	2	3	2	2	2	3	3	3
CO4	2	3	2	2	2	3	2	2	2	3
CO5	3	2	3	2	2	3	2	3	3	2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 10: Plant Ecology, Biodiversity and Phytogeography

Credits -3

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

1. To figure-out the components of ecosystem and energy flow among different trophic levels.
2. To apprise the characteristics of autecology and synecology.
3. To understand the climatic change and associated impacts on biotic components.
4. To discern the value of biodiversity, threats and conservation strategies.
5. To know the distribution of various plant groups in different geographical areas.

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

1. Explain the interactions among the biotic and abiotic components in an ecosystem.
2. Summarize the characteristics of a population and a community.
3. Anticipate the environmental problems arising due to climate change.
4. Assess the value of biodiversity and choose appropriate conservation strategy.
5. Make a survey on the distribution of various plant groups in a specified geographical area.

III. Syllabus of Theory:

Unit-1: Basic concepts in ecology **10 Hrs.**

1. Ecology: definition, branches and significance; relation with other sciences.
2. Structure and functions of ecosystems- abiotic and biotic components; flow of energy.
3. Cycling of materials: water, carbon, nitrogen and phosphorus; trophic pyramids, food chains and food webs.
4. Plants and environment: Climatic (light and temperature) and edaphic.
5. Interactions among plants; interactions between plants and animals.

Unit-2: Population and community ecology **10Hrs.**

1. Population ecology: definition, characteristics -natality, mortality, growth curves, ecotypes, ecads.
2. Community ecology: characteristics -frequency, density, cover, life forms, competition, biological spectrum.

3. Ecological succession: Hydrosere and Xerosere.
4. Concepts of productivity: GPP, NPP and Community Respiration
5. Secondary production, P/R ratio and Ecosystems.

Unit-3: Climate change-impacts **8Hrs.**

1. Soil degradation – causes, consequences and management strategies.
2. Deforestation, forest fires – causes, consequences and management strategies.
3. Global warming, ozone layer depletion, acid rains, ocean acidification – causes and effects.
4. Carbon foot prints and carbon credits; The Montreal and the Kyoto protocol.
5. Plant indicators and their role in environmental monitoring.

Unit-4: Concepts of Biodiversity **10Hrs**

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: North Eastern Himalayas and Western Ghats.
4. Principles of conservation: IUCN threat-categories, RED data book
5. Role of NBPGR and NBA in the conservation of Biodiversity.

Unit-5: Phytogeography **7 Hrs.**

1. Principles of Phytogeography, Distribution (wides, endemic, discontinuous species)
2. Endemism – types and causes.
3. Phytogeographic regions of World.
4. Phytogeographic regions of India.
5. Vegetation types in Andhra Pradesh.

IV. Text Books:

1. Pandey, B.P. (2013) College Botany, Volumes- II & III, S. Chand Publishing, New Delhi
2. Bhattacharya, K., G. Hait & Ghosh, A. K., (2011) A Text Book of Botany, VolumeII, New Central Book Agency Pvt. Ltd., Kolkata
3. N.S.Subrahmanyam& A.V.S.S. Sambamurty (2008) Ecology Narosa Publishing House, New Delhi
4. Sharma, P.D. (2012) Ecology and Environment. Rastogi Publications, Meerut, India.
5. U. Kumar (2007) Biodiversity: Principles & Conservation, Agrobios (India),

Jodhpur
6. Mani, M.S (1974) Ecology & Biogeography of India Dr. W. Junk Publishers, The Hague

V. Reference Books:

1. Kormondy, Edward J. (1996) Concepts of Ecology,Prentice-Hall of India Private Limited, New Delhi
2. Begon, M., J.L. Harper & C.R. Townsend (2003) Ecology, Blackwell Science Ltd., U.S.A.
3. Eugene P. Odum (1996) Fundamentals of Ecology, Natraj Publishers, Dehradun
4. Kumar, H.D. (1992) Modern Concepts of Ecology (7th Edn.,)Vikas Publishing Co.,New Delhi.
5. Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
6. Chapman, J.L&M.J. Reiss (1992): Ecology - Principles & Applications. Cambridge University Press, U.K.
7. Kumar H.D. (2000) Biodiversity & Sustainable Conservation Oxford & IBH Publishing Co Ltd. New Delhi.
8. Cain, S.A . (1944) Foundations of Plant Geography Harper & Brothers, N.Y.
9. Good, R. (1997) The Geography of flowering Plants (2nd Edn.) Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Field visit to local ecosystems and making a report on biotic and abiotic components and their interactions.

Evaluation method: Valuation of record of attendance and report submission with conclusions

Unit- 2: Activity: Case studies on population and community ecologies and making a comprehensive report

Evaluation method: Assessing the report and awarding grade

Unit -3: Activity: Case studies on global and local climatic changes and their impacts, preparing a comprehensive report.

Evaluation method: Assessing the report and awarding grade.

Unit- 4: Activity: Making a survey in their locality to identify endangered and threatening species.

Evaluation method: Assessing the survey report and assigning a grade based on a rubric.

Unit-5: Activity: Collection of data on flora of their locality and preparing a project report.

Evaluation method: Assessing the project report and awarding a grade.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 10: Plant Ecology, Biodiversity and Phytogeography

Credits -1

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

1. Handle instruments used in ecological studies.
2. Perform experiments and collect data on autecology and synecology.
3. Identify various plant groups based on their morphological and anatomical adaptations.
4. Collect data on biodiversity and phytogeography.

II. Laboratory/field exercises:

1. Study of instruments used to measure microclimatic variables;
    a. Soil thermometer,
    b. Maximum and minimum thermometer,
    c. Anemometer,
    d. Rain gauze
    e. Lux meter.
2. 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.
3. Study of morphological and anatomical adaptations of any two hydrophytes.
4. Study of morphological and anatomical adaptations of any two xerophytes.
5. Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance
6. Identification of vegetation/various plants in college campus and comparison with Raunkiaer's frequency distribution law.
7. Find out the alpha-diversity of plants in an area
8. Mapping of biodiversity hotspots of the world and India.
9. Mapping of phytogeographical regions of the globe and India.

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

Course 10: Plant Ecology, Biodiversity and Phytogeography
(2024-25)

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

1. 1. **(A)** Quantitative analysis of herbaceous vegetation in the college campus for frequency, density and abundance. **12m**

2. **(B)** Study of morphological and anatomical adaptations of given hydrophytes **10m**

3.(C). Mapping of phytogeographical regions of the globe and India. **5m**

3. Identify the given Spotters and justify the characters. **3X 5= 15m**

D- Ecology instruments

E- Biodiversity hotspots in india(Map)

F- xerophytes

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 10: Plant Ecology, Biodiversity and Phytogeography

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 /entreprenurship)
1	Botany	IV	Plant Ecology, Biodiversity and Phytogeography	Basic concepts in ecology	Knowledge & Application	Lecture, Case Study, Field Visits	Skill, Employability
2	Botany	IV	Plant Ecology, Biodiversity and Phytogeography	Population and community ecology	Knowledge & Application	Lecture, Case Study, Field Visits	Skill, Employability
3	Botany	IV	Plant Ecology, Biodiversity and Phytogeography	Climate change-impacts	Knowledge & Application	Lecture, Case Study, Field Visits	Skill, Employability
4	Botany	IV	Plant Ecology, Biodiversity and Phytogeography	Concepts of Biodiversity	Knowledge & Application	Lecture, Case Study, Field Visits	Skill, Employability
5	Botany	IV	Plant Ecology, Biodiversity and Phytogeography	Phytogeography	Knowledge, Application & Innovation	Lecture, Case Study, Field Visits	Skill, Employability

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester: II B.Sc. Honours (IV Semester)			
Course 10	**TITLE OF THE COURSE** **Plant Ecology, Biodiversity and Phytogeography**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	3

Course Objectives:

1. To figure-out the components of ecosystem and energy flow among different trophic levels.
2. To apprise the characteristics of autecology and synecology.
3. To understand the climatic change and associated impacts on biotic components.
4. To discern the value of biodiversity, threats and conservation strategies.
5. To know the distribution of various plant groups in different geographical areas.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Explain the interactions among the biotic and abiotic components in an ecosystem.
CO2	Summarize the characteristics of a population and a community.
CO3	Anticipate the environmental problems arising due to climate change.
CO4	Assess the value of biodiversity and choose appropriate conservation strategy.
CO5	Make a survey on the distribution of various plant groups in a specified geographical area.

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	3	2	3	2	3	1	2	3
CO2	3	3	3	2	3	3	2	2	2	2
CO3	2	2	2	3	2	2	3	3	3	3
CO4	3	3	3	2	3	3	2	2	2	2
CO5	2	2	2	3	3	3	3	3	3	2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 11: Plant Resources and Utilization

Credits -3

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

1. To know different plants domesticated by humans and utility of their products.
2. To gain knowledge on commercial and timber products obtained from plants.
3. To know the facts on economic value of plants products in relation to human welfare.

II. Learning Outcomes: Students at the successful completion of the course will be able to:

1. Explain the significance of plants in human nutrition.
2. List out different plant products used by human beings.
3. Evaluate the commercial plant products and their utilization
4. Discuss the uses of medicinal and aromatic plants for human health care.
5. Appraise the importance of timber and non-timber products for value added products.

III. Syllabus of Theory:

UNIT-1: Food plants **10 Hrs.**

1. Centres of diversity of plants, origin of crop plants.
2. Domestication and introduction of crop plants; concepts of sustainable development.
3. Cultivation, production, and uses of cereals (rice and wheat), major (jowar and bajra) and minor millets (finger millet, fox tail millet), pulse crops (red gram and black gram) and sugarcane.

UNIT-2: Other economic plant products **8 Hrs.**

1. A general account of oil seed crops and vegetable oils.
2. A general account of fruit and vegetable yielding plants.
3. Plant sources and economic importance of rubber, latex, gums, resins, dyes, alkaloids and tannins.
4. A general account of major fibre crops in India; textile production from plant fibres.

UNIT-3: Commercial plant products **8 Hrs.**

1. A general account and economic potential of spices and condiments.
2. Plant sources and economic importance of flavouring products, beverages, fumitories and masticatories and narcotics.
3. Utilization of some important ornamentals, flowering plants and orchids.

UNIT-4: Medicinal and aromatic plant products **10 Hrs.**

1. Traditional and modern uses of some medicinal plants of India.
2. Active compounds in medicinal plants and their pharmacological effects.
3. Essential oils and their uses; aromatic plants in perfumery and cosmetics.
4. Phytochemicals and their potential health benefits.

UNIT-5: Timber products and energy crops **9 Hrs.**

1. Important timber yielding plants of India; wood as a construction and manufacturing material.
2. Other uses of wood products, such as paper and fuel.
3. Energy crops, biofuels and bioplastics.
4. Bamboos, *Eucalyptus, Casuarina* - generation of paper industry raw material.

IV. Textbooks:

1. S. K. Jain and R. A. Jain, (2015) Handbook of Plant Resources, Springer, New York.
2. H. Panda and A. K. Padhi, (2017) Medicinal Plants and Their Utilization, Springer, Singapore.
3. G.E. Wickens (1998) Economic Botany: Principles and Practices, Chapman & Hall, London.
4. S.L. Kochhar (1990) The Economic Botany of the Tropics, Macmillan, London.

V. Reference Books:

1. K. V. Peter, (2004) Handbook of Herbs and Spices, CRC Press, Boca Raton.
2. J. E. Simon, J. A. Duke, and E. A. L. Bobilya, (1990) Handbook of Edible Weeds, CRC Press, Boca Raton.
3. J. Smartt and N. Haq, (2016) Handbook of Industrial Crops, Springer, New York.
4. P. N. Ravindran, (2017) The Encyclopaedia of Herbs and Spices, CABI, Wallingford.
5. Beryl B. Simpson (2010) Economic Botany: Plants in Our World, Academic Press, London.

6. Michael J. Balick and Paul Alan Cox (1996) Plants, People, and Culture: The Science of Ethnobotany, Scientific American Library, New York.
7. Ben-Erik van Wyk (2016) Food Plants of the World: An Illustrated Guide, Timber Press, Portland.
8. Jo Homan (2012) Plants That Changed History, Chartwell Books, New York.
9. Gary J. Martin (2004) Ethnobotany: A Methods Manual, Earthscan Publications, London.

VI. Suggested activities and evaluation methods:

Unit-1: Activity: A critical assignment on origin of crop plants.

Evaluation method: Evaluate the extent and quality of data collected to support the assignment's arguments.

Unit-2: Activity: Group discussion on various plant products and their source plants.

Evaluation method: Assess the logical flow and coherence of the group's discussion based on a grading scale.

Unit-3: Activity: A survey report on commercial plant products available in local markets.

Evaluation method: Evaluate the clarity and comprehensibility of the survey questions.

Unit-4: Activity: A case study report on phytomedicines used in human health care.

Evaluation method: Examine the depth and coherence of the discussion and interpretation based on a rubric.

Unit-5: Activity: A field trip to timber depots and silviculture plantations in their locality.

Evaluation method: Evaluate the level of student engagement and active participation during the trip based on a grading scale.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 11: Plant Resources and Utilization

Credits -1

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

1. Characterize various plant products based on morphological and microscopic observations.
2. Identify economically valuable plants and their products.
3. Categorize distinct plant products utilized by humans.

II. Laboratory/field exercises:

1. Study of morphology and micro-chemical test for stored material of any 3 food crops.
2. Study of morphology and microscopic study anatomy of some plant fibres (cotton, jute, hemp, ramie, sisal).
3. Study of morphology, medicinal and aromatic plants and their useful parts.
4. Study of some oil yielding crops and properties of their oils.
5. Study of some gum, resin, tannin, dye yielding plants.
6. Study of firewood, biofuel and timber yielding plants.

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

Course 11: Plant Resources and Utilization
(2024-25)

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

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1. 1. **(A)** Study of morphology and micro-chemical test for stored material of given food crops. **10m**

2. **(B)** Study of morphology and microscopic study anatomy of given plant fibres **10m**

3.(C). Study of given oil yielding crops and properties of their oils. **5m**

3. Identify the given Spotters and justify the characters. **5X 4= 20m**

D- dye yielding plants

E- resin yielding plants

E- tannin yielding plants

F- biofuel yielding plants

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

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc.Honours -Botany-Major / IV Semester (W.E.F. 2024-25)

Course 11: Plant Resources and Utilization

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	IV	Plant Resources and Utilization	Food plants	Knowledge & Application	Lecture, Field Visits	Skill, Employability
2	Botany	IV	Plant Resources and Utilization	Other economic plant products	Knowledge & Application	Lecture, Field Visits	Skill, Employability
3	Botany	IV	Plant Resources and Utilization	Commercial plant products	Knowledge & Application	Lecture, Field Visits	Skill, Employability
4	Botany	IV	Plant Resources and Utilization	Medicinal and aromatic plant products	Knowledge & Application	Lecture, Field Visits	Skill, Employability
5	Botany	IV	Plant Resources and Utilization	Timber products and energy crops	Knowledge, Application & Innovation	Lecture, Field Visits	Skill, Employability

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester II B.Sc. Honours (IV Semester)			
Course 11	**TITLE OF THE COURSE** **Plant Resources and Utilization**				
Teaching	Hours Allocated: 60 (**Theory**)	L	T	P	C
Pre-requisites:		3	1	2	3

Course Objectives:

1. To know different plants domesticated by humans and utility of their products.
2. To gain knowledge on commercial and timber products obtained from plants.
3. To know the facts on economic value of plants products in relation to human welfare.

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Explain the significance of plants in human nutrition.
CO2	List out different plant products used by human beings.
CO3	Evaluate the commercial plant products and their utilization
CO4	Discuss the uses of medicinal and aromatic plants for human health care.
CO5	Appraise the importance of timber and non-timber products for value added products.

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	2	2	3	3	2
CO2	2	2	3	2	2	3	3	2	2	3
CO3	3	2	3	3	3	2	2	3	3	2
CO4	2	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	2	2	2	2	2	3