S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

B.Sc., Honors in BOTANY: MAJOR

w.e.f AY 2025-26 onwards

COURSE STRUCTURE

Year	Semester	Course	Title	No. of Hrs/ Week	No. of Credits
I	I	1	Diversity of Microbes	3	3
			Diversity of Microbes -Practical	2	1
		2	Diversity of Thallophytes	3	3
			Diversity of Thallophytes -Practical	2	1
	II	3	Diversity of Archegoniates	3	3
			Diversity of Archegoniates -Practical	2	1
		4	Anatomy and Embryology of Angiosperms	3	3
			Anatomy and Embryology of Angiosperms – Practical	2	1
II	III	5	Morphology and Taxonomy of Angiosperms	3	3
			Morphology and Taxonomy of Angiosperms – Practical	2	1
		6	Plant resources and Utilization	3	3
			Plant resources and Utilization -Practical	2	1
		7	Plant Ecology, Biodiversity and Phytogeography	3	3
			Plant Ecology, Biodiversity and Phytogeography -Practical	2	1
	IV	8	Cell and Molecular biology	3	3
			Cell and Molecular biology -Practical	2	1
		9	Genetics and Plant breeding	3	3
			Genetics and Plant breeding -Practical	2	1
		10	Plant Physiology and Metabolism	3	3
			Plant Physiology and Metabolism -Practical	2	1
III	V	11	Plant Biotechnology	3	3
			Plant Biotechnology -Practical	2	1
		12A	Ethnobotany and Phytomedicines	3	3
			Ethnobotany and Phytomedicines	2	1
		OR			
		12B	Bioinstrumentation Techniques	3	3
			Bioinstrumentation Techniques -Practical	2	1
		OR			
		12C	Concepts of Horticulture	3	3
			Concepts of Horticulture-Practical	2	1
		13A	Traditional Systems of Medicine	3	3
			Traditional Systems of Medicine -Practical	2	1
		OR			
		13B	Plant Genetic Engineering	3	3
			Plant Genetic Engineering-Practical	2	1
		OR			
		13C	Gardening and Landscaping	3	3
			Gardening and Landscaping-Practical	2	1

Year	Semester	Course	Title	No. of Hrs/ Week	No. of Credits
III	VI	14A	Herbal Technology	3	3
			Herbal Technology-Practical	2	1
			OR		
		14B	Bioinformatics and Computational Biology	3	3
			Bioinformatics and Computational BiologyPractical	2	1
			OR		
		14C	Plant Propagation Techniques	3	3
			Plant Propagation Techniques-Practical	2	1
		15A	Pharmacognosy and Phytochemistry	3	3
			Pharmacognosy and Phytochemistry-Practical	2	1
			OR		
		15B	Omics in Plant Sciences	3	3
			Omics in Plant Sciences-Practical	2	1
			OR		
		15C	Ornamental Horticulture and Commercial Floriculture	3	3
			Ornamental Horticulture and Commercial Floriculture - Practical	2	1

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the Three specified domains. For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A. To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.

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S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

I -Semester Botany Major Paper 1 Syllabus

Course1: DIVERSITY OF MICROBES (25BOT11)

(w.e.f. 2025-26 AB)

Hrs: 45 **Credits -3**

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

1. Gain awareness on hypotheses about the origin of life on Earth, and structure and multiplication of viruses.
2. Identify and describe the unique characteristics and significance of special types of bacteria.
3. Describe the structure, classification, and reproductive methods of eubacteria.
4. Tell the types of soil microorganisms and explain their interactions with each other, plants, and soil components.
5. Identify and differentiate between beneficial and harmful activities microbes in different fields. II.

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

1. Illustrate the origin of life on Earth and diversity, multiplication and economic value of viruses.
2. Deliberate the general characteristics, and economic importance of special groups of bacteria.
3. Explain the structure, nutrition, reproduction and significance of eubacteria.
4. Evaluate the interactions of soil microbes among themselves and with plants.
5. Compile the value and applications of microbes in various fields.

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; three domain – six kingdom classification of Carl Woese.
2. Shape and symmetry of viruses; structure of TMV and Gemini virus.
3. Lytic and lysogenic cycles of T-even phages; a brief account of prions, viroids and virusoids.
4. Transmission of plant viruses and their control; significance of viruses in production of vaccines and bio-pesticides.

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

1. General characteristics, and economic importance of following special groups of bacteria: a) Archaebacteria b) Actinomycetes c) Phytoplasma d) Cyanobacteria
2. Culture and cultivation of Spirulina

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

1. Occurrence, distribution and cell structure of eubacteria; classification of Eubacteria based on nutrition
2. Reproduction- asexual (binary fission and endospores) and bacterial recombination (conjugation, transformation, and transduction).
3. 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 microorganisms in soil; factors influencing the soil microflora; role of microorganisms in soil fertility.
2. Microbial interactions: symbiosis, neutralism, commensalism, competition, antagonism, synergism, parasitism and predation.
3. Microorganisms of rhizosphere, phyllosphere and spermosphere; microbial interactions and their effect on plant growth.

Unit-5: Beneficial and harmful microbes **10 Hrs.**

1. A brief account of symptoms of viral diseases in plants; Tungro disease in paddy.
2. A summary of symptoms of bacterial diseases in plants; Citrus canker.
3. Microorganisms as food; probiotics and prebiotics; products from microorganisms, Metabolites, enzymes, and antibiotics.
4. Bacterial and Cyanobacterial biofertilizers – their applications; Bacterial biopesticides and their applications.

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 McGrawHill 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: Visit to Agriculture/Horticulture universities to learn about biofertilizers and biopesticides.

Evaluation method: Evaluating the report submitted by the student based a rubric.

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S.V.K.P. & Dr. K.S. Raju Arts & Science College (Autonomous), Penugonda

I -Semester Botany Major Paper 1

Course1: DIVERSITY OF MICROBES (25BOT11)

(w.e.f. 2025-26 AB)

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Section-A: Answer any three questions out of five questions.
Each question carries 6 marks. 3x6=18 marks

Section-B: Answer any three questions out of five questions.
Each question carries 4 marks. 3x4=12 marks

Mid Term Examination – I					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit I	2	2	5	5	40
Unit II	2	2			
Unit III	1	1			
Total	5(3X6=18M)	5(3X4=12M)			

Mid Term Examination – II					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit III	1	1	5	5	40
Unit IV	2	2			
Unit V	2	2			
Total	5(3X6=18M)	5(3X4=12M)			

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Part-1: Answer any five questions choosing atleast two from each section A & B.
Each question carries 8 marks. 5x8=40 marks

Part-2 : Answer any five questions. Each question carries 4 marks. 5x4=20 marks

Unit	Part-1		Part-2	Total Marks
	Section-A	Section-B		
Unit I	2		2	24
Unit II	2		1	20
Unit III	1	1	2	24
Unit IV		2	1	20
Unit V		2	2	24
	5	5	8	112

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I -Semester Botany Major Paper 1

Course1: DIVERSITY OF MICROBES (25BOT11)

(w.e.f. 2025-26 AB)

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks :60 M**

This question paper contains Two Parts

Part -I

Answer any five questions choosing at least two from each section A and section B
Each question carries 8 Marks **5X8=40 M**

SECTION – A

1. Give detailed account on origin of life.
2. Explain about Six kingdom classification of Carl Woese.
3. Explain about Achaeabacteria.
4. Give detailed account on culture and cultivation of spirulina.
5. Write the occurrence, distribution and cell structure of Eubacteria.

SECTION - B

6. Explain about asexual and sexual reproduction of Eubacteria.
7. Write an essay about factors influencing the soil Micro flora.
8. Write note on
   a) Symbiosis b) Parasitism c) Predation.
9. Give brief account of Bacteria disease of citrus canker.
10. Write note on
    a) Probiotics b) Prebiotics.

PART II

Answer any five questions. Each question carries 4 marks. **5X4=20 M**

11. Pasteur experiments.
12. TMV.
13. Cyanobacteria.
14. Economical importance of Eubacteria.
15. Role of microorganisms in soil fertility.
16. Rhizosphere.
17. Tungro disease in Paddy
18. Bio fertilizers.

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I Semester Botany Major Paper 1

COURSE 1: DIVERSITY OF MICROBES (25BOT11)

(w.e.f.2025-26 AB)

PRATICAL MODEL PAPER

Time: 3hrs **Max Marks: 50**

1. Write the procedure (A) Of Gram staining technique ---------------9M
2. Demonstration (B)of culture and cultivation of Spirulina. ---------------9M
3. Write the (C) Principle, Procedure and application Of important instruments. ---------2x4=8M
4. Write critical notes and Identify D,E,F,G..4X4=16 M
5. Record + Viva voce .... 5+3=8M

50M

Key :

A. Gram staining technique
B. Culture and cultivation of Spirulina.
C. Any two of the instruments of Microbiology laboratory
D. Slide /specimen/spotters of Virus
E. Slide /specimen/spotters of Bacteria
F. Slide of Cyano Bacteria
G. Identification of Eubacteria /Archeabacteria/Actinomycetes

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I -Semester Botany Major Paper 1 Practical Syllabus

Course1: DIVERSITY OF MICROBES PRACTICAL (25BOT11P)

(w.e.f. 2025-26 AB)

2 hrs/ week **Credits -1**

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. 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.
2. Study of Viruses (TMV and Gemini) using electron micrographs/ models.
3. Microscopic study of Cyanobacteria using temporary/permanent slides.
4. Study of Archaebacteria, Actinomycetes and Phytoplasma using permanent slides/ electron micrographs/diagrams.
5. Microscopic study of Eubacteria using temporary/permanent slides.
6. Gram staining technique of Bacteria.
7. Demonstration of culture and cultivation of Spirulina
8. Tungro in Paddy and Citrus canker

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I -Semester Botany Major Paper 2 Syllabus

Course2: DIVERSITY OF THALLOPHYTES (25BOT12)

(w.e.f. 2025-26 AB)

Hrs: 45 **Credits: 3**

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

1. Brief the general characters, classification and value of algae.
2. Discuss the morphology, reproduction and life cycles of some algae.
3. Tell the general characters, classification and value of fungi.
4. Discuss the morphology, reproduction and life cycles of some fungi.
5. Summarize the morphology, anatomy, reproduction and economic value of lichens.

II. Course 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. Summarize the important features of fungi and their economic value.
4. Distinguish different groups of fungi based on their characteristics.
5. Elaborate the features and significance of lichens.

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. F.E.Fritsch (1935) classification of algae; thallus organization in algae.
3. Life cycles in algae; 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 and (c) Rhodophyceae: Polysiphonia
2. Culture and cultivation of Chlorella

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

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

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

1. Occurrence, structure, reproduction and life cycle of: (a) Zygomycotina: Rhizopus (b) Ascomycotina: Penicillium (c) Basidiomycotina: Puccinia

Unit-5: Lichens

7 Hrs.

1. Lichens: definition, phycobionts and mycobionts in lichens; morphology and internal structure of lichens; classification based on growth form, habitat and fungal partner.

2. Reproduction – vegetative, asexual and sexual methods.

3. Ecological and economic importance of lichens. 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. 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 of economically valuable fungal products. Evaluation method: Evaluating the collections made and awarding grade.

Unit-4: Activity: Group discussion/quiz/JAM on characteristics of various groups of algae.

Evaluation method: Assessment of the performance of individual/group of students based on a rubric.

Unit-5: 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.

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I -Semester Botany Major Paper 2

Course2: DIVERSITY OF THALLOPHYTES (25BOT12)

(w.e.f. 2025-26 AB)

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Section-A: Answer any two questions out of four questions.
Each question carries 8 marks. 2x8=16 marks

Section-B: Answer any three questions out of five questions.
Each question carries 4 marks. 3x4=12 marks

Mid Term Examination – I					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit I	2	2	6	6	40
Unit II	1	2			
Unit III	1	1			
Total	4(2X8=16M)	5(3X4=12M)			
Mid Term Examination – II					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit III	1	1	6	6	40
Unit IV	2	2			
Unit V	1	2			
Total	4(2X8=16M)	5(3X4=12M)			

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Part-1: Answer any five questions choosing at least two from each section A & B.
Each question carries 8 marks. 5x8=40 marks

Part-2 : Answer any five questions. Each question carries 4 marks. 5x4=20 marks

Unit	Part-1		Part-2	Total Marks
	Section-A	Section-B		
Unit I	2		2	24
Unit II	2		2	24
Unit III	1	1	1	20
Unit IV		2	1	20
Unit V		2	2	24
	5	5	8	112

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S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda
I -Semester Botany Major Paper 2

Course2: DIVERSITY OF THALLOPHYTES (25BOT12)
(w.e.f. 2025-26 AB)

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks :60 M**

This question paper contains Two Parts

Part -I

Answer any five questions choosing at least two from each section A and section B
Each question carries 8marks **5X8=40 M**

SECTION – A

1. Write an essay about of General characteristics of Algae.
2. Explain about ecological and economic importance of Algae.
3. Describe the life cycle of Spirogyra.
4. Give detailed account on culture and cultivation of Chlorella.
5. Explain about Ainsworth classification In Fungi.

SECTION – B

6. Write about the A Sexual Reproduction and Sexual Reproduction in Fungi.
7. Describe the Reproduction and Life cycle of Rhizopus.
8. Describe the Reproduction and Life cycle of Penicillium.
9. Write about Morphology and Structure of Lichens.
10. Explain about Ecological and Economical importance of Lichens

PART II

Answer any Five questions. Each question carries 4 marks. **5X4=20 M**

11. Pigments in algae.
12. Flagella in algae.
13. Structure of Ectocarpus.
14. Tetra spore.
15. Nutrtion in Fungi.
16. Structure of Puccinia.
17. Phycobionts and Mycobionts in Lichens.
18. Vegetative Rreproduction in Lichens.

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S.V.K.P & Dr K.S. R AJU ART S AND & SCIENCE COLLEGE (A) PENUGONDA

DEPARTMENT OF BOTANY

B.Sc I SEMESTER

COURSE 2: DIVERSITY OF THALLOPHYTES PRATICAL MODEL PAPER (25BOT12P)

Practical Model paper

Time: 3hrs Max Marks: 50

1.A.Identify giving reasons two of the given Algal mixture.Leave your preparation for evaluation Draw labeled diagrams.....3x2=6 M.

2.B,Demonstation of culture and cultivation of chlorella 8M

3.C. Preparation of section cutting for Fungi 8M

4. Write critical notes and Identify D,E,F,G.....4x5=20M

5. Record + Viva VOCE .....5+3=8M

50M

Key :

A. Algae mixture.
B. Demonstation of culture and cultivation of chlorella.
C. Fungi material.
D. Slide /specimen/spotters of Algae.
E. Slide /specimen/spotters of Fungi.
F. Specimen/spotters of Lichens.

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I -Semester Botany Major Paper 2 Practical Syllabus

Course2: DIVERSITY OF THALLOPHYTES PRACTICAL(25BOT12P)

(w.e.f. 2025-26 AB)

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 based on morphological, anatomical and reproductive features.
3. Realize the value of algal, fugal and lichen products available in markets.

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: Rhizopus, Penicillium and Puccinia
5. Identification of some fungal products available in the local market.
6. Lichens: Crustose, foliose and fruiticose
7. Identification of some lichen products available in the local market.

APPROVED

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PENUGONDA - 534 320, W.G.Dt. A.P

C. B. Ranjane
SUBJECT EXPERT

SUBJECT EXPERT

S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

II -Semester Botany Major Paper 1 Syllabus

COURSE 3: DIVERSITY OF ARCHEGONIATES (25BOT21)

(w.e.f. 2025-26 AB)

Learning Objectives: By the end of this course the learner has to:

1. Explain the general characters, classification and significance of Bryophytes.
2. Discuss the morphological, anatomical and reproductive characters of Pteridophytes.
3. Acquire knowledge of evolutionary trends in Pteridophytes and their value.
4. Brief the morphological, anatomical and reproductive characters of Gymnosperms.
5. Summarize the evolutionary trends in Gymnosperms.

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

1. Compare and contrast the morphological, anatomical and reproductive features of some Bryophytes.
2. Illustrate the morphological, anatomical and reproductive characteristics of some Pteridophytes.
3. Infer the evolution of vasculature, heterospory, and seed habit in Pteridophytes.
4. Compare and contrast the morphological, anatomical and reproductive features of some Gymnosperms.
5. evaluate the evolutionary trends in Gymnosperms.

III. Syllabus of Theory:

Unit-1: Biology of Bryophytes **9 Hrs.**

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 the evolution of sporophytes in Bryophyta.

Unit-2: Biology of Pteridophytes **10 Hrs.**

1. General characteristics of Pteridophyta; Smith (1955) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of: (a) Lycopsida: *Lycopodium* (b) Sphenopsida: Equisetum and (c) Filicopsida: *Marsilea*

Unit-3: Evolutionary trends in Pteridophytes **8 Hrs.**

1. Geological time scale; a brief account of *Rhynia*
2. Stelar evolution in Pteridophytes; heterospory and seed habit.
3. Ecological and economic importance of Pteridophytes.

Unit-4: Biology of Gymnosperms **10 Hrs.**

1. General characteristics of Gymnosperms; Sporne (1965) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of:(a) Cycadopsida: *Cycas* (b) Ginkgoopsida: *Ginkgo* and (b) Gnetopsida: *Gnetum*

Unit-5: Evolutionary trends in Gymnosperms **8 Hrs.**

1. A brief account on fossilization processes and types of fossils.
2. A over view of *Cycadeoidea* and *Pentoxylon*
3. A summary of evolutionary trends in Gymnosperms.
4. Ecological and economic importance of Gymnosperms.

IV. Text Books:

1. Acharya, B.C., (2019) Archchegoniates, Kalyani Publishers, 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. Hait,G., K.Bhattacharya & A.K.Ghosh (2011) A Text Book of Botany, Volume-I,New Central Book Agency Pvt. Ltd., Kolkata
4. Pandey, B.P. (2013) College Botany, Volumes-I&II, S. Chand Publishing, New Delhi

V. Reference Books:

1. Shaw, A.J.& B.Goffinet (2000) Bryophyte Biology. Cambridge University Press, New York.
2. Smith, G.M. (1971) Cryptogamic BotanyVol. II., Tata McGraw Hill, New Delhi
3. Sharma,O.P.(2012) Pteridophyta. Tata McGraw-Hill, New Delhi
4. Sporne, K.R. (1971) The Morphology of Gymnosperms. Hutchinsons Co. Ltd., London
5. Coulter, J.M. & C.J.Chamberlain(1910) Morphology of Gymnosperms, The University of Chicago Press, Chicago, Illinois
6. Bhatnagar, S.P. & Alok Moitra (1996) Gymnosperms. New Age International, New Delhi

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Collection and identification of Bryophytes from their locality.
Evaluation method: Assessing the collections made by the student and assigning a grade.
Unit-2: Activity: Making temporary slides/models/drawings of Pteridophytes in the syllabus.
Evaluation method: Assessment of the temporary slides/model/drawing.
Unit-3: Activity: Group discussion/Quiz/JAM on evolutionary trends in Pteridophytes.
Evaluation method: Assessing the abilities of a group/ an individual based on the performance.
Unit-4: Activity: Study of wood elements in locally available Gymnosperms and making temporary slides.
Evaluation method; Validation of prepared slides submitted by the learner.
Unit-5: Activity: Assignment/seminar on evolutionary trends in Gymnosperms-making comparative account.
Evaluation method: Evaluating the quality of assignment written with apt examples/quality of presentation using a rubric.

APPROVED

15/10/25

UNIVERSITY NOMINEE

Chairman, Board of Studies
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SUBJECT EXPERT

SUBJECT EXPERT

S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

II -Semester Botany Major-1

COURSE 3: DIVERSITY OF ARCHEGONIATES(25BOT21)

(w.e.f. 2025-26 AB)

THE BLUEPRINT FOR CIA

Section-A: Answer any three questions out of five questions.
Each question carries 6 marks. 3x6=18 marks

Section-B: Answer any three questions out of five questions.
Each question carries 4 marks. 3x4=12 marks

Mid Term Examination – I					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit I	2	2	5	5	40
Unit II	2	2			
Unit III	1	1			
Total	5(3X6=18M)	5(3X4=12M)			

Mid Term Examination – II					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit III	1	1	5	5	40
Unit IV	2	2			
Unit V	2	2			
Total	5(3X6=18M)	5(3X4=12M)			

THE BLUEPRINT FOR SEE

Part-1: Answer any five questions choosing at least two from each section A & B.
Each question carries 8 marks. 5x8=40 marks

Part-2 : Answer any five questions. Each question carries 4 marks. 5x4=20 marks

Unit	Part-1		Part-2	Total Marks
	Section-A	Section-B		
Unit I	2		1	20
Unit II	2		2	24
Unit III	1	1	2	24
Unit IV		2	2	24
Unit V		2	1	20
	5	5	8	112

APPROVED

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II -Semester Botany Major-1

COURSE 3: DIVERSITY OF ARCHEGONIATES(25BOT21)

(w.e.f. 2025-26 AB)

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks: 60**

This Question Paper contains Two Parts

Part-I

Answer any **five** questions choosing at least **two** from each section A and section B.
Each question carries 8 marks **5 X 8 = 40 M**

Section-A

1.
2.
3.
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Section-B

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10.

PART II

Answer any five questions. Each question carries 4 marks. **5x4=20 marks**

11.
12.
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14.
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16.
17.
18.

APPROVED

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#######

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SUBJECT EXPERT

S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

II -Semester Botany Major-1 Practical Syllabus

COURSE 3: DIVERSITY OF ARCHEGONIATES PRACTICAL(25BOT21P)

(w.e.f. 2025-26 AB)

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

1. distinguish the Pteridophytes and Gymnosperms based on their morphological, anatomical and reproductive structures.
2. make systematic classification of plant species using vegetative and floral characters.
3. identify angiosperm plant species and make herbarium specimens.

II Laboratory/field exercises:

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

A. Bryophyta: *Marchantia, Anthoceros* and *Funaria*

B. Pteridophyta: *Rhynia, Lycopodium, Equisetum*, and *Marselia*

C. Gymnosperms: *Cycadeoidea, Pentoxylon, Cycas, Ginkgo* and *Gnetum*

2. Field trip to a Botanic garden or local floristic area/forest.

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C. B. Rajani
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N. Hadassa
SUBJECT EXPERT

S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda
II -Semester Botany Major-2 Syllabus

COURSE 4: ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS (25BOT22)

(w.e.f. 2025-26 AB)

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

1. Deliberate about various types of tissues in plants and their organization.
2. Explain anomalous secondary growth in plants and economic value of woods.
3. Debate on structure of anther and development of male gametophyte in plants.
4. Discuss the structure of ovules and process of fertilization.
5. Explain the embryo development and seed structure in monocots and dicots.

II. Course 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. Illustrate the events in mega-sporogenesis and development of female gametophyte.
5. Propose the incidents in embryogenesis and structure of seeds in angiosperms.

III. Syllabus of Theory:

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

1. Meristematic tissues: Definition, classification, structure and functions.
2. Apical meristems: Generalized 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); 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; anomalous secondary growth in stems of Boerhaavia and Dracaena
3. Study of timbers of economic importance - Teak, Red-sanders and Rosewood; applications of anatomy forensics and pharmacognosy.

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

1. Anther: Structure and functions of anther wall, micro-sporogenesis.
2. Pollen wall structure, NPC system; development of male gametophyte, MGU (male germ unit).
3. Pollen wall proteins; pollen viability, storage and germination; abnormal features: Pseudomonads and polyads; Nemec phenomenon.
4. A brief account of palynology and its scope.

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. Pollination: types of self and cross pollination – contrivances; agents of 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. Embryo development in dicot (*Capsella bursa-pastoris*) and monocot (*Sagittaria sagittifolia*) plants.
2. Seed structure in monocot and dicot; importance of seed and seed dispersal mechanisms.
3. 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.

APPROVED

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C.B. Ranjani
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SUBJECT EXPERT

S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

II -Semester Botany Major-2

COURSE 4: ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS (25BOT22)

(w.e.f. 2025-26 AB)

THE BLUEPRINT FOR CIA

Section-A: Answer any three questions out of five questions.
Each question carries 6 marks. 3x6=18 marks

Section-B: Answer any three questions out of five questions.
Each question carries 4 marks. 3x4=12 marks

Mid Term Examination – I					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit I	2	2	5	5	40
Unit II	2	2			
Unit III	1	1			
Total	5(3X6=18M)	5(3X4=12M)			

Mid Term Examination – II					
Unit	Section-A	Section-B	Co-Curricular Activity	Extra-Curricular Activity	Total Marks
Unit III	1	1	5	5	40
Unit IV	2	2			
Unit V	2	2			
Total	5(3X6=18M)	5(3X4=12M)			

THE BLUEPRINT FOR SEE

Part-1: Answer any five questions choosing at least two from each section A & B.
Each question carries 8 marks. 5x8=40 marks

Part-2 : Answer any five questions. Each question carries 4 marks. 5x4=20 marks

Unit	Part-1		Part-2	Total Marks
	Section-A	Section-B		
Unit I	2		1	20
Unit II	2		2	24
Unit III	1	1	2	24
Unit IV		2	2	24
Unit V		2	1	20
	5	5	8	112

APPROVED

L. N. Naidu 15/10/25
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S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

II -Semester Botany Major-2

COURSE 4: ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS (25BOT22)

(w.e.f. 2025-26 AB)

MODEL QUESTION PAPER

Time: 3 hours **Max. Marks: 60**

This Question Paper contains Two Parts

Part-I

Answer any **five** questions choosing at least **two** from each section A and section B. Each question carries 8 marks **5 X 8 = 40 M**

Section-A

1.
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Section-B

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PART II

Answer any five questions. Each question carries 4 marks. **5x4=20 marks**

11.
12.
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APPROVED

L.m.naidu 15/10/25
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SUBJECT EXPERT

S.V.K.P. & Dr. K.S. Raju Arts & Science College(Autonomous), Penugonda

II -Semester Botany Major-2 Practical Syllabus

COURSE 4: ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS Practical (25BOT22P)

(w.e.f. 2025-26 AB)

Practical Credits: 1 **2 hrs/week**

I. 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. Explain the embryological characteristics from sex organs to seeds in angiosperms.
3. Demonstrate skills in studying anatomical and embryological features of angiosperms.

II. 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 ovules 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.

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K. Srulakshmi 25/10/25

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