

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

Accredited by NAAC with A Grade, College with potential for excellence (2016-21)
and ISO Certified Institution (with 3 ISO Certificates)



Department of Botany

BOTANY SYLLABUS

2023-24

S. V. K. P. & Dr. K. S. Raju Arts & Science College(A), PENUGONDA

Accredited by NAAC with A Grade, College with potential for excellence (2016-21)

and ISO Certified Institution (with 3 ISO Certificates)

I –Semester Syllabus

Course-1: INTRODUCTION TO CLASSICAL BIOLOGY (23BSC11)

Common for Botany, Zoology, Biochemistry and Biotechnology Majors

Hours/Week: 5

(w.e.f. 2023-24 AB)

Credits: 4

Learning objectives

The student will be able to learn the diversity and classification of living organisms and 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 macro molecules 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 Transpiration, phytohormones). (Photosynthesis, Respiration,
- 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

References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.
2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers, New Delhi, India.
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.

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

Accredited by NAAC with A Grade, College with potential for excellence (2016-21)
and ISO Certified Institution (with 3 ISO Certificates)

II Semester Botany Major/ Minor Syllabus

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

Paper Code:23BOT21

(w.e.f. 2023-24 AB)

Credits -3

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) Anthocerotopsida: *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.

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

Accredited by NAAC with A Grade, College with potential for excellence (2016-21)
and ISO Certified Institution (with 3 ISO Certificates)

II Semester Botany Major/ Minor Botany Practical 21

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

Paper Code:23BOT21P

(w.e.f. 2023-24 AB)

Credits -1

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*.

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

Accredited by NAAC with A Grade, College with potential for excellence (2016-21)
and ISO Certified Institution (with 3 ISO Certificates)

II Semester Botany Major Syllabus

Course 4: Origin of Life and Diversity of Microbes

Paper Code: 23BOT22

(w.e.f. 2023-24 AB)

Credits -3

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) Archaeobacteria
 - 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.
5. Microorganisms of rhizosphere, phyllosphere and spermatophyte; 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. Prescott, 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

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

Accredited by NAAC with A Grade, College with potential for excellence (2016-21)
and ISO Certified Institution (with 3 ISO Certificates)

Botany Practical 22

II Semester Botany Major

Course 4: Origin of Life and Diversity of Microbes

Paper Code: 23BOT22P

(w.e.f. 2023-24 AB)

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. 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 Archaeobacteria and Actinomycetes using permanent slides/ electron micrographs/diagrams.