



ADIKAVI NANNAYA UNIVERSITY: RAJMAHENDRAVARAM

**Single Major
B.Sc Agriculture & Rural Development
From 2023-24 (Syllabus-Curriculum)
Course Structure**

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Introduction to Classical Biology	3+2	4
	I	2	Introduction to Applied Biology	3+2	4



SEMESTER-I

COURSE 1: INTRODUCTION TO CLASSICAL BIOLOGY

Theory

Credits: 4

5 hrs/week

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 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)
- 34 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. Sathyanarayana 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



SEMESTER-I

COURSE 2: INTRODUCTION TO APPLIED BIOLOGY

Theory

Credits: 4

5 hrs/week

Learning objectives

The student will be able to learn the foundations and principles of microbiology, immunology, biochemistry, biotechnology, analytical tools, quantitative methods, and bioinformatics.

Learning Outcomes

1. Learn the history, ultrastructure, diversity and importance of microorganisms.
2. Understand the structure and functions of macromolecules.
3. Knowledge on biotechnology principles and its applications in food and medicine.
4. Outline the techniques, tools and their uses in diagnosis and therapy.
5. Demonstrate the bioinformatics and statistical tools in comprehending the complex biological data.

Unit 1: Essentials of Microbiology and Immunology

- 1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
- 1.2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi, Archaea and Virus.
- 1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.
- 1.4. Immune system – Immunity, types of immunity, cells and organs of immune system.

Unit 2: Essentials of Biochemistry

- 2.1. Biomolecules I – Carbohydrates, Lipids.
- 2.2. Biomolecules II – Amino acids & Proteins.
- 2.3. Biomolecules III – Nucleic acids -DNA and RNA.
- 2.4. Basics of Metabolism – Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

- 3.1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
- 3.2. Environmental Biotechnology – Bioremediation and Biofuels, Bio fertilizers and Bio pesticides.
- 3.3. Genetic engineering – Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.
- 3.4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salt tolerance). Transgenic animals – Animal and disease models.



Unit 4: Analytical Tools and techniques in biology – Applications

- 4.1. Applications in forensics – PCR and DNA fingerprinting
- 4.2. Immunological techniques – Immunoblotting and ELISA.
- 4.3. Monoclonal antibodies – Applications in diagnosis and therapy.
- 4.4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

- 5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.
- 5.2. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.
- 5.3. Introduction, Genomics, Proteomics, types of Biological data, biological databases- NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment
- 5.4. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

REFERENCES

1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr., E.C.S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R.C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.
7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt. ltd., Kolkata.
8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.
9. Arthur M. Lesk. Introduction to Bioinformatics. 5th Edition. Oxford publishers.
10. AP Kulkarni, 2020. Basics of Biostatistics. 2nd Edition. CBS publishers.

ACTIVITIES

1. Identification of given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganism from pond water.

4. Visit to a microbiology industry or biotech company.
5. Visit to a waste water treatment plant.
6. Retrieving a DNA or protein sequence of a gene'
7. Performing a BLAST analysis for DNA and protein.
8. Problems on biostatistics.
9. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.
10. Demonstration on basic biotechnology lab equipment.
11. Preparation of 3D models of genetic engineering techniques.
12. Preparation of 3D models of transgenic plants and animals.

[**NOTE:** In the colleges where there is availability of faculty for microbiology and biotechnology, those chapters need to be handled by microbiology and biotechnology faculty. In other colleges, the above topics shall be dealt by Botany and Zoology faculty]



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B.Sc Agriculture and Rural Development
SEMESTER – II

COURSE STRUCTURE

Year	Sem	Course	Title of the Course	No of Hrs/Week	No of Credits
I	II	3	Fundamentals of Agriculture (T)	3	3
			Fundamentals of Agriculture (P)	2	1
		4	Basics of Rural Development (T)	3	3
			Basics of Rural Development (P)	2	1



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SEMESTER-II

COURSE 3: FUNDAMENTAL OF AGRICULTURE

Theory

Credits: 3

3 hrs/week

Learning objectives:

The student will be able to learn the fundamental of agronomy and methods of cultivation of various crops

Learning Outcomes

1. Learn the scope and principles of agriculture
2. Understand the water management of various crops
3. Knowledge on soil, composition and management
4. Acquired knowledge of genetics

Unit: 1 Agronomy principles:

- 1.1 Definition and scope of agronomy
- 1.2 Classification of cross on different basis
- 1.3 General principles of crop production: calitate, soil preparation, seed, and sowing, post sowing tillage, water and nutrition management
- 1.4 Plant protection measures, harvesting and store

Unit: 2 Nutrition Management:

- 2.1 Nutritional classification for crop yielding
- 2.2 Application of manures, vermicompost, compost
- 2.3 Fertilizers, Utility, impact on crop quality and quantity yielding
- 2.4 Biofertilizers types and advantages and disadvantages

Unit:3 Soil Science

- 3.1 Soil pedological, edaphological concept, components of soil
- 3.2 Development of soil profile
- 3.3 Chemical properties of soil, cation and anion exchange phenomenon
- 3.4 Soil air, water, pH.

Unit: 4 Plant Genetics

- 4.1 Definition of Genetics and history
- 4.2 Genetic material, DNA, RNA types
- 4.3Mendel's Experiments and Laws
- 4.4 Chromosomal theory, inheritance, mutation and types

Unit:5 Molecular biology

- 5.1 Central Dogma of Molecular biology
- 5.2 DNA Replication and Enzymes
- 5.3 Transcription, initiation, elongation and termination
- 5.4 Translation initiation, elongation and termination



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SEMESTER-II
COURSE 3: FUNDAMENTAL OF AGRICULTURE

Practical

Credits: 1

2 hrs/week

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1. Identification of crops, seeds, fertilizers and pesticides
 2. Identification of weeds in various crops
 3. Study on yielding of local crops
 4. Study on different types of soil
 5. Mendel's experiments (t)
 6. Microscopic examination of plant cell
 7. Isolation of DNA from Onion root tips

*(Minimum 4 Experiments)

Student Activities: Field visit and submit report
Organizing student seminars, quiz, etc

Reference:

1. Reddy , S R and Reddi Ramu 5th edition 2016, -Kalyani publishers, Ludhiana.
2. YELLAMANDA REDDY,T. and SANKARA REDDY ,G.H.(2016) PRINCIPLES OF
3. AGRONOMY. Kalyani publishers, Ludhiana
4. GOPALA CHANDRA DE.(1989) FUNDAMENTALS OF AGRONOMY. Oxford & IBH Publishing Company Pvt Ltd , New Delhi
5. GUPTA, O. P. (2011) MODERN WEED MANAGEMENT. Agribios (India) Jodhpur.



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SEMESTER-II
COURSE 4: BASICS OF RURAL DEVELOPMENT

Theory

Credits: 3

3 hrs/week

Learning objectives:

The student will be able to learn the rural society, rural habitants, families and religion culture

Learning Outcomes

1. Learn the rural society, village communities
2. Understand the rural development and economic improvement
3. Knowledge on rural people food habits
4. Acquired knowledge on nutrition of rural people

UNIT:1 RURAL SOCIETY

- 1.1 Rural society, nature, original and scope of rural sociology
- 1.2 History and growth of village communities, meaning, types and characteristics
- 1.3 Rural family, types characteristics, marriage system
- 1.4 Caste concept, merits and demerits

UNIT:2 RURAL RELIGION

- 2.1 Rural Religions- System of beliefs and rituals
- 2.2 Those related to Health, Disease and Agricultural activity
- 2.3 Social Role of Religion- Significance of Temples in Rural Areas –
- 2.4 Rural Economic System- Exchange of Goods and Services- Impact of Industrialization on Rural Society.

UNIT:3 SOCIAL POLITICS

- 3.1 Social & Political Institutions
- 3.2 Traditional and Modern Village Panchayats
- 3.3 Role in Rural Social Development
- 3.4 Rural Leaderships- Types- Qualities- People's Participation & Participatory Initiatives.

UNIT: 4 FUNDAMENTALS OF LIFE

- 4.1 Protein- Types, Importance of Protein
- 4.2 Carbohydrates- MonoSaccharide, Disaccharide, Polysaccharide
- 4.3 Importance of Lipid- Types, Importance of Lipids
- 4.4 Vitamins-Types, Water Soluble & Fat Soluble Vitamins, Sources, Importance.

UNIT: 5 NUTRITION

- 5.1 Basic classification of nutrition food
- 5.2 Daily Recommended Allowance of nutrients and calories
- 5.3 Basal Metabolic Rate and factors affecting on it
- 5.4 Rural Traditional food habits and modern food habits and types



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SEMESTER-II
COURSE 4: BASICS OF RURAL DEVELOPMENT

Practical

Credits: 1

2 hrs/week

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1. Study on rural social structure
 2. Study on social institutions and NGOs
 3. Conduct a survey on socio economic survey
 4. Conduct a survey on rural food habits and their impact on health
 5. Study on BMI of rural school adolescent children
 6. Visit the NGO and submit report

Activity:

Student Activities: Field visit and submit report
Organizing student seminars, quiz, etc

Reference Books:

1. Desai, A.R., —Rural Sociology in India, 2009.
2. Chittamber, J.B., —Introduction to Rural Sociology, 2017.
3. Dube, S.S., —Indian Villagel- 2012.
4. Majumdar, D.N., —Caste and Communication in An Indian Villagel- 2010.
5. Baden Power, D.N. — Village Community of Indial.- 2011
6. Srinivas, M.N., — Social Change in Modern Indial- 2014
7. Chambers. R. Rural Development: Putting the Last First- 2016.
8. Ambika Shanmugam, 1992 Fundamentals of Biochemistry.
9. Annathakrishnan, Y.N. 1981. Bio Resources Ecology.
10. Conn. E.E and Stumpf, P.K. 1989. Outline of Bio- Chemistry.
11. Glasstone, M. 1958. The Foundations of Life Science.
12. Lehninger, A.L. 1988. Bio Chemistry.



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MODEL QUESTION PAPER - THEORY

Time: 3 Hours.

Max Marks: 70

SECTION – A

Answer any 5 questions. Each question carries 4 marks (5 X 4 = 20M)

(Total 8 questions, questions 1-5 from Units 1-5 & questions 6-8 from any of the units)

1. Unit -I
2. Unit-II
3. Unit-III
4. Unit-IV
5. Unit-V
6. From any Unit
7. From any Unit
8. From any Unit

SECTION – B

Answer all the questions. Each question carries 10 marks. (5 X 10 = 50M)

(Each question (both 'A' or 'B') from each Unit.

9. from Unit I

(OR)

from Unit I

10. from Unit II

(OR)

from Unit II

11. from Unit III

(OR)

from Unit III

12. from Unit IV

(OR)

from Unit IV

13. from Unit V

(OR)

from Unit V