



ADIKAVI NANNAYA UNIVERSITY: RAJMAHENDRAVARAM

B.Voc Horticulture

Single Major

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]

Course – I & II Model Paper (70 Marks)

SECTION A (Multiple Choice Questions)

30 x 1 = 30 M

30 Multiple Choice Questions (Each Unit 6 Questions)

SECTION B (Fill in the blanks)

10 x 1 = 10 M

10 Fill in the Blanks (Each Unit 2 Questions)

SECTION C (Very short answer questions)

10 x 1 = 10 M

10 Very short answer questions (Each Unit 2 Questions)

SECTION D (Matching) (From 5 Units)

2 x 5 = 10 M

1 A

B

C

D

E

2 A

B

C

D

E

SECTION E (True or False)

10 x 1 = 10 M

10 True or False (Each Unit 2 Questions)



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Single Major B.Voc Horticulture (w.e.f:2023-24A.B)

Programme: B.Voc. Honours Horticulture (Major)

SEMESTER – II

COURSE STRUCTURE

Semester	Course Number	Course Name	No. of Hrs/Week	No. of Credits
Semester-II	3	Principles of Horticulture	3	3
		Principles of Horticulture Lab	2	1
	4	Introduction to Soil Science	3	3
		Introduction to Soil Science Lab	2	1



SEMESTER – II
PRINCIPLES OF HORTICULTURE

THEORY: Teaching Hours: 4

CREDITS :4

LEARNING OUTCOMES:

1. The students should be realize its importance, scope and vast applications of horticulture
2. Understand the Plant propagation-methods (sexual & asexual), , grafting, budding, layering), High density planting etc.,
3. Principles and methods of training and pruning, pollination, pollinizers and pollinators; fertilization and parthenocarpy
4. Understand the Layout and planting of Vegetable gardens & ornamental garden types and parts; Lawn making, Use of plant bio-regulators in horticulture,
5. Understand the Preparation of potting mixture, potting and repotting, Fertilizer application in different crops, Visits to commercial nurseries/orchard

Theory Lecture Outlines:

UNIT 1

1. Horticulture – Definition - Divisions of horticulture with suitable examples.
2. Scope and importance of horticulture - Importance of horticulture in terms of income, employment generation, industry, religious, aesthetic, food & nutritive value and export.
3. Horticultural classification based on soil, climate and botanical classification.
4. Climate and soil for horticultural crops - Influence of environmental factors on horticultural crop production – Temperature, humidity, wind, rainfall and solar radiation – Influence of soil factors – Soil type, pH, EC.

UNIT 2

1. Propagating structures- Plant propagation- Methods - Sexual and asexual – Propagation by cuttings – Definition of cutting – Stem cuttings – Leaf cuttings – Root cuttings.
2. Propagation by Layering - Types of layering (tip, simple, compound, mound, trench, air layering) - Natural modifications of layering (runners, suckers, stolon, offset)- Propagation by separation - Bulbs, corms; division (rhizome, stem tuber, tuberous roots).
3. Grafting, budding -Rootstock and scion selection – Grafting methods – Attached scion methods of grafting, simple or approach grafting, detached scion methods of grafting (side grafting - Veneer grafting, apical grafting- epicotyl grafting, double, soft wood grafting, cleft grafting, tongue grafting, whip grafting) - Graft incompatibility – Types – Translocated and localized incompatibility; Budding – Methods of budding – T-budding, inverted T-budding, patch budding and ring budding - Top working.



UNIT 3

1. Principles of orchard establishment – Points to be kept in mind while selecting site for the establishment of orchards - Principles and steps in orchard establishment –
2. Layout of orchards – Systems of planting - Square, rectangle, quincunx, hexagonal and contour systems of planting-their merits and demerits.
3. Principles and methods of training and pruning - Definition of training, objectives and training, principles and methods of training of fruit crops - Open centre, closed centre and modified leader systems their merits and demerits –
4. Definition of pruning, objectives of pruning, principles and methods of pruning of fruit crops.
5. Juvenility and flower bud differentiation – Methods for shortening juvenility - Application of growth regulators (Gibberellins, Auxins, cytokinins, Abscissic acid, Ethylene), environmental methods (photoperiod, temperature) - Cultivation techniques (grafting, pruning, girdling, irrigation, nutrition) –

UNIT 4

1. Bearing habits of fruit trees. Unfruitfulness, factors (physiological, phylogenical, management, parasitical, climatological) pollination –
2. Self and Cross pollination, pollinizers and pollinators - Fertilization and parthenocarpy – Types.
3. Types of vegetables Gardens – Kitchen Garden, market garden, truck garden, vegetable forcing, garden for processing, seed production garden and floating garden. Ornamental garden types – Formal – Informal – Wild Garden – Parts/features of an ornamental garden.
4. Lawn making – Selection of Grass – Bermuda grass – Korean grass – Poa grass – Fescue grass – Kentucky blue grass - Grasses for shady areas – Site Selection – Soil - Preparation of soil – Drainage – Digging – Manuring and grading –

UNIT 5

1. Methods of planting – Sowing of seeds – Dibbling – Turfing – Maintenance of lawn – Mowing – Rolling – Sweeping –Scraping – Raking – Weeding – Irrigation
2. Top dressing with compost and fertilizers - Diseases and other problems – Fairy ring – Pale Yellow Laws.
3. Use of plant bio-regulators (PBR) in horticulture – Introduction – Applications of PBR in fruit crops.
4. Irrigation methods in horticulture crops - Different methods followed in horticultural crops (check basin, furrow, ring basin, basin, flood, pitcher, funnel, drip and sprinkler).
5. Fertilizer application- Different methods of application to horticultural crops Broad casting, top dressing, localized placement, contact placement Band placement, row placement, pellet, foliar application, starter solution, fertigation.



SEMESTER – II
PRINCIPLES OF HORTICULTURE

Practicals

Teaching Hours: 2

Credits :1

1. Identification of garden tools.
2. Identification of horticultural crops.
3. Layout of different planting systems.
4. Layout of kitchen garden.
5. Preparation of nursery bed (raised and flat beds) and sowing of seeds.
6. . Practice of different asexual methods by divisions.
7. Practice of different asexual methods by cuttings.
8. Practice of different asexual methods by grafting.
9. Practice of different asexual methods by budding.
10. Practice of different asexual methods by layering.
11. Training and pruning of fruit trees.
12. Transplanting and care of vegetable seedlings.
13. Making of herbaceous and shrubbery borders.
14. Preparation of potting mixture, potting and repotting.
15. Fertilizer application in different crops.
16. Visits to commercial nurseries/orchard.

References

1. Chadha, K.L. 2001. Handbook of Horticulture. ICAR, New Delhi.
2. Jitendra Singh, 2012. Basic Horticulture. Kalyani Publishers. New Delhi.
3. Randhawa, G.S. and Mukhopadhyaya, A. 1994. Floriculture in India. Allied Publishers Pvt. Ltd., New Delhi
4. Kumar, N. 1997. Introduction to Horticulture. Rajyalakshmi Publications, Nagorcoil, Tamilnadu.



SEMESTER – II

INTRODUCTION TO SOIL SCIENCE

CREDITS: 4

Teaching Hours: 4

Theory: Learning Outcome:

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

- **Understand basic principles of Soil science**
- **Understand the soil formation, soil profile, and soil physical properties**
- **Understand the elementary knowledge of soil taxonomy**
- **Understands the problematic soils and their management**
- **Understand soil organic matter composition and its influence on soil micro organisms**

COURSE OUTLINES –SYLLUBUS OF THE COURSE

UNIT – I.INTRODUCTION:

- 1.1 Definition of soil
- 1.2 Soil as a Natural Body

UNIT - II.SOIL COMPONENTS:

- 2.1 Soil air
- 2.2 Soil water
- 2.3 organic and inorganic solids

UNIT - III.PHYSICAL PROPERTIES:

- 3.1 Soil separates, texture, Aggregation and Structural Characters, Temperature, Colour.
- 3.2 Properties of Soil Mixture, Pore Space, Bulk Density, Particle Density, Aeration.
- 3.3 Drainage, compaction, Surface area, Soil water relations.

UNIT - IV. MORPHOLOGY OF COLLOIDS & BIOLOGICAL PROPERTIES OF SOIL

- 4.1 Chemistry of clays, Ionic exchange
- 4.2 Acidity, alkalinity, PH, and salinity relations, Liming and Acidification.
- 4.3 Soil Organic matter, C:N relations
- 4.4 N Transformations, Soil organisms, Sulphur transformation.

UNIT - V. GENESIS AND CLASSIFICATION

- 5.1 Profile, Soil forming factors
- 5.2 Soil Survey methods
- 5.3 Soil survey Reports
- 5.4 Soil distribution, Classification of Systems, Drainage, Erosion: Mechanisms - Control.



SEMESTER – II
INTRODUCTION TO SOIL SCIENCE
PRACTICALS

Teaching Hours: 2

Credits: 1

Learning outcomes

After completion of this course, the students should have learned the skills

- 1. Conducting chemical analysis, Principles, techniques and calculations**
- 2. about soil physical characteristics, nutrient analysis, and soil Structure**
- 3. Determination of infiltration rate of the soil, determination of Cation Exchange capacity**

PRACTICAL SYLLABUS

1. Soil sampling procedures for field and horticultural crops
2. Determination of EC.
3. Determination of PH of soil.
4. Land use, texture bulk density, Definition of Soil Physical properties.
5. Determination of N, P and K of the soil
6. Determination of Sulphur.
7. Fertilizer recommendations.
8. Soil health card, parameters, EC, PH and their Importance

References

1. Indian Society of Soil Science.2012. Fundamentals of Soil Science. IARI, New Delhi.
2. Yawalkar K.S, Agarwal, T.P and Bokde, S 1995. Manures and Fertilisers. Agril.Publishing House, Nagpur
3. Samuel Tisdale, Nelson Werner L, Beaton James D and Havlin John L.2005.
4. Soil Fertility and Fertilizers: An Introduction to Nutrient Management, Macmillian Publishing Co., New York.
5. D. K .Das 2014. Introductory Soil Science. Kalyani Publishers, New Delhi



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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