Program Name: Bachelor of Science
Discipline : Botany
CHOICE BASED CREDIT SYSTEM
(For those who joined in 2022 and after)
Course scheme:

III year B.Sc. BOTANY

Semester	Part	Subject Name	Hours	Credit	Int + Ext =Total	Local	Regional	National	Global	Professional Ethics	Gender	Human Values	Environment & Sustainability	Employability	Entrepreneurship	Skill Development	Subject Code	Revised / New / No Change / Interchanged & Percentage of Revision
V	Core V	Biochemistry and Biotechniques	5	5	25+75=100				✔					✔	✔	✔	U3BYC51/ **U24BYC51**	No Change
	Core VI	Genetics and Plant Breeding	5	5	25+75=100												U3BYC52/ **U24BYC52**	No Change
	Core VII	**Taxonomy of Angiosperms**	5	4	25+75=100				✔					✔	✔	✔	**U24BYC53**	**Revised 20%**
	Core Practical V	**LAB: Biochemistry and Biotechniques, Genetics and Plant Breeding & Taxonomy of Angiosperms**	5	3	40+60=100				✔					✔	✔	✔	**U24BYCP51**	**Revised 20%**
	Allied (b) - III	Cell Biology, Developmental Biology, Physiology, Immunology and Evolution	4	4	25+75=100												U3ZYA5X3/ **U24ZYAX51**	No Change
	Allied (b) – Practical III	**LAB:** Cell biology, Developmental biology, Physiology, Immunology and evolution & Commercial Zoology	2	-	--												---	---

	Skill V –	**Employability Skills**	2	1	25+75=100													**U24PS51**	**Revised 50%**
	NME I	Plant Resources and Utilization	2	2	25+75=100				✔					✔	✔	✔		U3BYN51/ **U24BYN51**	No Change
	Total		**30**	**24**															
	Internship Programme (Extra Credit)		**60**	**2**														**U24IP51**	**New**
VI	Core VIII	Plant Physiology	5	5	25+75=100				✔					✔	✔	✔		U3BYC61/ **U24BYC61**	No Change
	Core IX	Microbiology and Biotechnology	5	5	25+75=100				✔					✔	✔	✔		U3BYC62/ **U24BYC62**	No Change
	Core X	Organic Farming	4	4	25+75=100				✔					✔	✔	✔		U3BYC63/ **U24BYC63**	No Change
	Core Practical VI	**LAB:** Plant Physiology, Microbiology and Biotechnology & Organic Farming	6	4	40+60=100				✔					✔	✔	✔		U3BYC6P/ **U24BYCP61**	No Change
	Allied (b) - IV	Commercial Zoology (Vermiculture, Apiculture, Aquaculture and Poultry Science and Dairy Farming)	4	4	25+75=100													U3ZYA6X4/ **U24ZYAX61**	No Change
	Allied (b) - Practical IV	**LAB:** Cell biology, Developmental biology, Physiology, Immunology and Evolution & Commercial Zoology	2	2	40+60=100													U3ZYA6PX/ **U24ZYAXP 61**	No Change
	Skill VI	Project work	2	2	50+50=100				✔					✔	✔	✔		U1BY6PR/ **U24BY6PR**	No Change
	NME II	Mushroom Cultivation	2	2	25+75=100				✔					✔	✔	✔		U3BYN61/ **U24BYN61**	No Change
	Total		**30**	**28**															

Self-Learning Course:

Subject	Semester	Credit	Ext =Tot	Subject Code
Food science and Nutrition	IV	5	100 = 100	U1BYSL51

SEMESTER - V
Core V - BIOCHEMISTRY AND BIOTECHNIQUES

Contact Hours per week: 5 hrs **Sub code:** U3BYC51/ **U24BYC51**
Contact Hours per Semester: 75 hrs **Credit: 5**

Course Outcomes:

COs	CO Statement
CO1	Gain knowledge on fundamental biochemical principles such as bonding structure and function of biomolecules.
CO2	Get insight about biomolecules.
CO3	Acquire knowledge about amino acids
CO4	Understand about enzymes and its mode of action.
CO5	Gain proficiency in handling basic instruments and laboratory techniques.

Unit I **15 Hrs**

Basic concepts of atoms, Bonding in biomolecules (Covalent and non-covalent interactions, Hydrogen bond, Electrostatic interactions, Hydrophobic interactions, Vander Waal's forces and their significance); Isomerism and its types; structure and properties of water and its biological significance; Henderson-Hasselbalch equation, Buffers (inorganic and organic) and their importance.

Unit II **15 Hrs**

Carbohydrates – classification, structure, properties and significance of mono, di and polysaccharides. Glucose, Sucrose, Starch and Cellulose - structure and function. Lipids - fatty acids (saturated and unsaturated fatty acids); Classification of lipids (simple, compound and derived lipids) and biological role of lipids.

Unit III **15 Hrs**

Amino acids - classification (based on polarity) - physical and chemical properties. Protein structure (primary, secondary, tertiary and quaternary structures), Protein classification (based on structure), properties and functions of protein.

Unit IV **15 Hrs**

Enzymes – classification, properties, mechanism of enzyme action, factors affecting enzyme action, enzyme inhibition (reversible; competitive and non-competitive; irreversible) – Co-enzymes and iso-enzymes, Enzyme regulation. Vitamins – classification (fat-soluble and water-soluble) and its deficiencies.

Unit V **15 Hrs**

Colorimeter: Working principle (Beer Law and Lambert's law) and applications; pH meter – Working Principle and application, Chromatography and its principle – Paper chromatography, Thin layer chromatography and Column chromatography and its application. Centrifuge – principle (sedimentation coefficient – Svedberg's unit), types of centrifuge and their uses.

Text Books:

- Jain, J. L. 2000. Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi.
- Satyanarayana, U. and U. Chakrapani, 2013. Biochemistry. Elsevier Co-published with
  Books and Allied Press, New Delhi

- Lea, P.J and Leegood, R.C. 2001. Plant Biochemistry and Molecular Biology, 2nd Ed. John Wiley and Sons Ltd., England.

Reference Books:

- Conn, E.E., Stump, P.K., Bruening and Doi, R.H. (2001).Outlines of Biochemistry, John Wiley & Sons, New York
- Nelson, D. L. and M. M. Cox. 2008. Lehninger Principles of Biochemistry. W. H. Freeman Publishers, New York.
- Berg, *J. M., J. L.* Tymoczko and L. *Stryer*, 2010. Biochemistry, W. H. Freeman Publishers, New York.

Core VI - GENETICS AND PLANT BREEDING

Contact Hours per Semester: 75 hrs **Credit: 5** **Sub code:** U3BYC52/ **U24BYC52**

Course Outcomes:

COs	CO Statement
CO1	Understand the natural hereditary mechanisms in living organism
CO2	Impart knowledge in basic concepts at molecular level of organism
CO3	Understand the DNA and RNA
CO4	Know the genome organization
CO5	Learn the principles and practices in plant breeding techniques.

Unit I **15 Hrs**

Mendel's law of inheritance. Monohybrid and Dihybrid cross- test cross- Interaction of gene- Incomplete dominance , Codominance. Complementary gene, Epistasis: dominant and recessive, Multiple alleles (ABO blood group), Polygenic inheritance.

Unit II **15 Hrs**

Linkage and crossing over – significance- linkage in maize, molecular mechanism of crossing over. Types of sex determination in plants. Extra chromosomal inheritance (plastid Inheritance in *Mirabilis*). Gene mutation- induced and spontaneous – molecular basis- mutagens

Unit III **15 Hrs**

DNA as genetic material- structure of DNA and types of DNA - DNA replication (three types). RNA- types, structure and functions. Prokaryotic transcription and translation. Operon concept.- Lac operon

Unit IV **15 Hrs**

Eukaryotic genome organization–Genetic recombination in bacteria – Transformation, Transduction and conjugation.

Unit V **15 Hrs**

Principles of Plant breeding-Selfing and crossing techniques, Hybridization. Methods of selection - Mass, Pedigree, Bulk and back cross. Polyploidy and its applications, Heterosis. Mutation breeding-, applications of mutation breeding.

Institutional Visit to Sugarcane breeding institute, Tamilnadu Agricultural University, IFGTB,Coimbatore /any research institute.

Text Books:

- Veer Bala Rastogi. A Textbook of Genetics. Published by Kedar Nath and Ram Nath.
- Verma P.S and V.K Agarwal 1991.Cytology (Cell Biology and Molecular Biology). S. Chand & Co, New Delhi.
- B.D.Singh, Plant Breeding: Principles and Methods, Kalyani Publishers,2009.

Reference Books:

- Burns, G.W.1980 – The Science of Genetics, Collier acillan, New York
- Gardnet, E.J Simmons and Snustad, D.P 1985 – principles of Genetics. Edition 8, John Wiley & Sons, New York.
- Strickberger, M.W. 1999. Genetics. Prentice hall of India Pvt Ltd, New Delhi.
- Singh P.D 2000 Fundamentals of genetics. Kalyani Publishers, New Delhi.
- Gupta, P.K 2002. Genetics. Rastogi Publishers, Meerut.
- Mirta,S. 1994. Genetics. Rastogi publishers, Meerut

Course Title : Core –VII TAXONOMY OF ANGIOSPERMS	**Total Hours :75**
Course Code : U24BYC53	**Total Credits : 4**

Course Outcomes:

COs	CO Statement
CO1	Understand the classification and the role of BSI.
CO2	Get interest in admiring the variations in the vegetative and floral morphology of Angiosperms.
CO3	Acquire knowledge on identification and economic importance of Polypetalae.
CO4	Acquire knowledge on identification and economic importance of Gamopetalae.
CO5	Gain knowledge on identification and economic importance of Monochlamydeae and Monocot.

UNIT I **15 Hours**

Importance of Taxonomy, Classification – Linnaeus, Bentham and Hooker's, Engler and Prantl and APG system (in brief); Herbarium techniques; Role of BSI.

UNIT II **15 Hours**

Vegetative morphology: Leaves – Phyllotaxy, Simple and Compound, Venation and its types. Reproductive morphology - Inflorescence types: Racemose, Cymose and Special types. Calyx, Corolla (arrangement and aestivation), Perianth; Androecium (Cohesion and Adhesion), Gynoecium (Structure and Placentation types). Types of fruits.

UNIT III **15 Hours**

Study of the following families with special reference to morphology and economic importance – Annonaceae, Nymphaeaceae, Malvaceae, Caesalpiniaceae, Rosaceae.

UNIT IV **15 Hours**

Study of the following families with special reference to morphology and economic importance – Rubiaceae, Solanaceae, Apocynaceae, Acanthaceae, Lamiaceae.

UNIT V **15 Hours**

Study of the following families with special reference to morphology and economic importance – Nyctaginaceae, Euphorbiaceae, Amaryllidaceae, Poaceae.

***A minimum of three days Field trip to Hill stations / Research Institutes**

Text Books:

- Dutta A.C (2008) Botany for degree students (6th edition). Oxford university press
- Pandey, S.N and Misra, S.P (2008) Taxonomy of Angiosperms. Ane books India, New Delhi.

Reference Books:

- George H.M. Lawrence (1964) Taxonomy of vascular plants, Oxford and IBM publishing co. New Delhi.
- Michael G.Simpson (2019) Plant Systematics (third edition),Academic Press
- Vasishta P.C (2001) Taxonomy of Angiosperms. S.Chand & company, New Delhi
- Pandey, B.P (2001) Taxonomy of Angiosperms. S.Chand & company, New Delhi

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Course Title : LAB - V: BIOCHEMISTRY AND BIOTECHNIQUES, GENETICS and PLANT BREEDING & TAXONOMY OF ANGIOSPERMS	**Total Hours :75**
Course Code : U24BYCP51	**Total Credits : 3**

PRACTICAL SYLLABUS

Course Outcomes:

COs	CO Statement
CO1	Gain proficiency in handling basic instruments and laboratory techniques.
CO2	Understand the natural hereditary mechanisms in living organisms.
CO3	Learn the principles and practices in plant breeding techniques.
CO4	Understand the morphological variations among plant species
CO5	Acquire identification skills of Dicot and Monocot plants.

BIOCHEMISTRY and BIOTECHNIQUES

- Determination of the pH of different solutions
- Determination of pKa value of acetic acid
- Determination of Rf value of amino acids by paper chromatography
- Verification of Beer's and Lambert's law
- Estimation of starch in plant tissue by gravimetric method
- Qualitative tests for carbohydrates, proteins, amino acids and lipids

GENETICS AND PLANT BREEDING

- Solving Problems related to Monohybrid, Dihybrid crosses, Test cross, Incomplete dominance, co-dominance
- Problem related to complementary gene, epistasis,
- Study of polygenic inheritance for quantitative traits in plants such as length of pods and leaves, number of seeds in fruits
- Emasculation techniques, various breeding experiments.

TAXONOMY OF ANGIOSPERMS

- Assign angiosperm plants to their respective families by giving reasons.
- Dissection of floral parts of plants prescribed in the syllabus.
- Describe the plant in technical terms. (Draw labelled diagrams of the floral parts including longitudinal sections of the flower, construct the floral diagram and write the floral formula.)
- Identify the local flora - collected during the field study.
- Preparation of Herbarium. (10 plants)

Field trip is mandatory for floristic study.

CELLBIOLOGY, DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, IMMUNOLOGY AND EVOLUTION

Contact hours per Week – 4 hours **Subject Code:** U3ZYA5X3/ **U24ZYAX51**
Contact hours per Semester – 60 hours **Credits: 4**

Objectives

- To understand various structure and functions cell and organelles
- To Study about the development and function of various organs in animal body
- To find out ancestral development in earth

Unit I **(12 hours)**

Cell Biology

Structure and functions of animal Cell- cell membrane- cell organelles- mitochondria, endoplasmic reticulum, Golgi complex, ribosomes. Cancer- site of infection- types- causes – treatment.

Unit II **(12 hours)**

Developmental Biology

Structure of sperm and ovum in frog- Gametogenesis-cleavage, blastulation and gastrulation. Human reproductive system, birth control –Test tube baby.

Unit III **(12 hours)**

Physiology

Digestion and absorption of Carbohydrates, proteins and lipids- Structure of Nephron. Neuron and conduction of Nerve impulse.

Unit IV **(12 hours)**

Immunology

Types of immunity (Innate and Acquired immunity) - Lymphoid organs (Primary and Secondary)– Immunoglobulin-IgG- Antigen antibody reactions.

Unit V **(12 hours)**

Evolution

Paleontological evidences for evolution- Lamarckism- Darwinism- Modern synthetic theory, Allopatric and sympatric speciation- cultural evolution of man.

Text Books:

1. Cell Biology, Molecular biology, Genetics, Immunology, And Biotechnology, Arumugam. N. (2007), Saras publication, Nagercoil.
2. Physiology, Developmental biology, Biochemistry, Microbiology and Evolution, Arumugam. N., (2007), Saras publication, Nagercoil.

Reference Books:

1. Chordate embryology, PS Verma & VK .Agarwal, (2012), Chand Publication
2. Fundamentals of biochemistry for medical students, Ambika Shanmugam (2007),
3. Evolution, Veera bala Rastogi-.
4. Animal Physiology, Rastogi-
5. Immunology –Ivan Roitt

EMPLOYABILITY SKILLS

Course Title : Employability Skills	**Total Hours : 30 Hours**
Course Code : U24PS51	**Total Credits : 1**

COURSE OUTCOMES:

On completing this course, students can/are able to

Cos	CO STATEMENT
CO1:	enhance their skills in solving quantitative aptitude problems
CO2:	expertise themselves in solving verbal and non-verbal reasoning problems.
CO3:	prepare for various public and private sector exams and placement drives.
CO4:	interpret the concepts of LOGICAL REASONING Skills.
CO5:	analyze the problems logically and approach the problems in a different manner

Unit I: Quantitative Aptitude – I **6 Hours**

H.C.F. and L.C.M. of Numbers - Average - Percentage - Profit and Loss - Ratio and Proportion - Time and Work - Time and Distance - Train Speed.

Unit II: Quantitative Aptitude – II **6 Hours**

Area related problems - Problems on Ages - Boat and Stream - Simple Interest - Compound Interest – True discount – Calendar – Clocks - Data Interpretation - Bar Graphs - Pie Chart.

Unit III: Verbal Reasoning – I **6 Hours**

Analogy - Classification – Series - Coding & Decoding - Coded inequality - Blood relations - Direction sense test.

Unit IV: Verbal Reasoning – II **6 Hours**

Number Test - Ranking and Time Sequence Test - Seating arrangements - Alphabet Test - Logical Venn Diagram.

Unit V: General Knowledge **6 Hours**

Abbreviations & Acronyms - Famous Personalities - Important Days (National & International) - Capital Cities and Currencies – Current affairs - Sports – RBI & Banking Terms – Basics of Computers and Internet.

Reference Books:

1. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing company; Revised edition (21 February 2017).
2. R.S.Agarwal, A modern approach to logical reasoning, S Chand Publishing company; August 2022.
3. R.S.Agarwal, A Modern Approach To Verbal Reasoning (Old Edition), S Chand Publishing company.
4. R.S.Agarwal, Advanced objective general knowledge revised edition, S Chand Publishing company, 2017.

e-Resources:

1. https://www.cuemath.com/numbers/hcf-and-lcm/
2. https://www.geeksforgeeks.org/speed-time-distance-formula-and-aptitude-questions/
3. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cdn1.byjus.com/wp-content/uploads/2020/06/Boat-Stream-Sample-Questions.pdf
4. https://www.hitbullseye.com/Simple-Interest-and-Compound-Interest.php
5. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://examsdaily.in/wp-content/uploads/2018/09/br.pdf
6. https://testbook.com/objective-questions/mcq-on-direction-and-distance--5eea6a0e39140f30f369e42a
7. https://unacademy.com/content/cat/study-material/data-interpretation-and-logical-reasoning/ranking-and-time-sequence/
8. https://www.toppr.com/guides/computer-aptitude-and-knowledge/basics-of-computers/basic-computer-terminology/

NME - PLANT RESOURCES AND UTILIZATION

Course Title : NME - PLANT RESOURCES AND UTILIZATION	**Total Hours :30**
Course Code : U3BYN51/ **U24BYN51**	**Total Credits : 2**

Course Outcomes:

COs	CO Statement
CO1	Develop their understanding on Plants morphology and Uses.
CO2	Increase the awareness and appreciation of plants & plant products encountered in everyday life.
CO3	Develop a basic knowledge of taxonomic diversity of plants and its economic importance.
CO4	Understand core concepts of Economic importance of Plants and their value added processing plants in human use.
CO5	Acquire identification skills of methods and processing of herbals.

Unit I **6 Hours**

Brief Study of the following economic produces with special reference to botanical name, family, morphology of the useful parts and uses; Cereals – Paddy, Wheat; Pulses - Red gram, Black gram; Fruits - Banana, Mango.

Unit II **6 Hours**

Brief Study of the following economic produces with special reference to botanical name, family, morphology of the useful parts and uses. Spices and Condiments: Garlic, Cardamom, Pepper and Ginger; Dyes – Indigo; Nuts – Cashew and Almond

Unit III **6 Hours**

Brief Study of the following economic produces with special reference to source, family, morphology and uses Latex - rubber, Oil- Gingelly, Coconut; Tannins - Myrobalan, Resins and gums - Oleoresin, Canada balsam and Turpentine

Unit IV **6 Hours**

Brief Study of the following economic produces with special reference to botanical name, family, morphology and uses: Essential oil- Lemon grass oil, sandalwood oil; Wood - Teak wood, neem and rose wood; Medicinal- Common periwinkle and Amla

Unit V **6 Hours**

Methods of Processing: Tea, Coffee, Extraction of Eucalyptus oil, preparation of Aloe gel; Importance of Ethnobotany in Indian context.

Text books: H.D.Kumar .Economic Botany.2003.Macmath Publications.New Delhi

Reference Books: Dr.V.Singh .C.Pandey• &J.K.Jain. Economic Botany.2012.Rastogi publications. New Delhi.

SEMESTER – VI

Course Title : CORE VIII - PLANT PHYSIOLOGY	**Total Hours :75**
Course Code : U3BYC61/ **U24BYC61**	**Total Credits : 5**

Course Outcomes:

COs	CO Statement
CO1	Impact an insight into the various plant water relations.
CO2	Understand the mechanism of various metabolic processes in plants.
CO3	Acquire basic knowledge about growth and development in plants.
CO4	Equip students with skills and techniques related to plant physiology so that they can design their own experiments.
CO5	Take students to higher levels of learning about the mineral nutrition in plants.

Unit I **15 Hrs**

Absorption of water – imbibition, diffusion, osmosis, plasmolysis. Mechanism of water absorption – active and passive. Ascent of sap – path of ascent of sap, mechanism of ascent of sap, physical force theories. Transpiration –Types - stomatal, cuticular and lenticular. Mechanism of stomatal movement, Transpiration a necessary evil. Factors affecting transpiration. Guttation

Unit II **15 Hrs**

Mineral nutrition – Macro (N, P, K & Mg) and micro (Bo,Cu &Zn) its physiological role and its deficiency symptoms. Sand culture, Hydroponics, and Aeroponics. Photosynthesis – photosynthetic unit. Site of photosynthesis. Light reaction – two photosystems, Electron transport ,Photophosphorylation – cyclic and non-cyclic. Dark reaction – Calvin cycle, Hatch and Slack pathway, C_2 cycle.

Unit III **15 Hrs**

Respiration – types of respiration – aerobic and anaerobic, site of respiration, respiratory substrates. Mechanism of respiration – Glycolysis, Kreb's cycle, Electron transport and oxidative phosphorylation. Nitrogen fixation – symbiotic and asymbiotic

Unit IV **15 Hrs**

Physiology of flowering – Photoperiodism, cryptochrome, Phytochrome. Vernalization. Plant growth hormones – physiological effects of auxins, gibberellins, cytokinins and ethylene. Seed dormancy – Factors affecting seed dormancy. Methods of breaking seed dormancy.

Unit V **15 Hrs**

Plant movements : Autonomic – ciliary, amoeboid, cyclosis Paratonic – phototaxis, chemotaxis, thermotaxis and thigmotaxis. Tropic movements – phototropism, geotropism, hydrotropism. Movement of Curvature – nutation and nastic movement (nyctinastic, seismonastic, thigmonastic)

Text Books:

- S.N. Pandey and B.K. Sinha, Plant physiology –Vikas Publishing house 1999.
- Subash chandra dutta ,Plant physiology- New Age International (P) Limited, Publishers; First edition (2007)
- S.K.Verma, Text Book of Plant Physiology –S.Chand and company,New Delhi, 2003.

Reference Books:

- R.K. Sinha , Modern Plant physiology –Narosa Publishing house New Delhi, 2004.
- Devlin and Witham, Plant Physiology – CBS Publishers and Distributors, 1999
- Salisbury and Ross ,Plant Physiology –CBS Publishers and distributors ,Delhi 1995.

Course Title : CORE-1X MICROBIOLOGY AND BIOTECHNOLOGY	**Total Hours :75**
Course Code : U3BYC62/ **U24BYC62**	**Total Credits : 5**

Course Outcomes:

COs	**CO Statement**
CO1	Develop their knowledge about microbes.
CO2	Create awareness on sewage water treatment, preservation of food products and antibiotic.
CO3	Build up the knowledge on tissue culture and its applications.
CO4	Understand the multidisciplinary approaches in the field of biotechnology.
CO5	Know about the gene delivery.

Unit I **15 Hrs**

Historical background of Microbiology - Bergey's classification of Bacteria - General and morphological characteristics of Bacteria – Ultra structure of bacterial cell. Reproduction in Bacteria, Growth curve, Methods of measurement of bacterial growth, Nutritional types of bacteria.

Unit II **15 Hrs**

Viruses - Characteristics, Classification of virus based on Symmetry and Nucleic acids. Structure of TMV. Structure and reproduction of Bacteriophage -T_4 Phage.

Unit III **15 Hrs**

Sewage treatment – oxidation pond and trickling filter. Spoilage of food (Perishable and non perishable)and preservation techniques, Microbiology of milk and milk products, Pasteurization of milk. Disinfectants. Structure and mode of action of Antibiotics - Penicillin, Streptomycin and Tetracycline.

Unit IV **15 Hrs**

Scope – definition, multidisciplinary approach of biotechnology, Introduction to gene cloning, Vectors: Plasmids – pBR322: Bacteriophage vectors- M13.Ti plasmid based vectors

Restriction endonucleases, DNA ligases, DNA Polymerase (Taq), Reverse Transcriptase. Blotting techniques. – southern and western. Tissue culture: Protoplast culture, micro propagation, embryo culture. Artificial seeds. Application of Tissue culture.

Unit V **15 Hrs**

Methods of gene delivery - direct gene transfer using PEG, Electroporation, Biolistics, Microinjection and Liposome mediated. Identification of recombinants - Insertional inactivation of antibiotic resistance marker gene-Inactivation of Lac Z gene, Selection of recombinant phages, Colony Hybridization.

Text books:

- Powar, C.B and M.E. Daginawala – General Microbiology Vol- 1 and Vol-II 2011
- A.S Rao. Introduction to Microbiology. 2012
- P.D Sharma – Microbiology and Plant pathology. 2009
- R.C. Dubey, 2006A text Book of Biotechnology , - S. Chand & Company Ltd, Ram Nagar, New Delhi.
- Kalyan Kumar De., 1992 .Plant tissue culture, - New central book Agency P .Ltd, Calcutta.
- Shanmugavel,P.2005.Principles of Bioinformatics. Pointer Publishers,Jaipur,India

References books:

- Pelczar, M.J. Chan, E.C.S. and Krieg, N.R. 1993 – Microbiology- Concepts and application. Mc Grew Hill, Inc. New York.
- R.C Dubey and D.K. Maheshwari. A text book of Microbiology- S.Chand &Company Ltd, New Delhi.
- Kumar, H.D. and Swati Kumar, 1999. Modern Concepts of Microbiology. Vikas Publishing House Pvt.Ltd. New Delhi.
- Brown, C.M, Campbell, I. and Priest, F.G, 1990. Introduction to Biotechnology. Blackwell Scientific publications Oxford, London.
- Brown, T.A, 1999. Genomes. John Wiley & Sons. Newyork.
- Chawla, H.S. 2000. Introduction to plant biotechnology. Oxford & IBH Publishing Co. Pvt.Ltd. New Delhi.
- Dixon, R.A and Gonzales, R.A (Eds.) 1994. Plant Cell Culture- A Practical Approach. Oxford University Press, Newyork.

Course Title : Core X - ORGANIC FARMING	**Total Hours :60**
Course Code : U3BYC63/ **U24BYC63**	**Total Credits : 4**

Course Outcomes:

COs	**CO Statement**
CO1	Know the values of organic waste and their utilization by adopting different technologies.
CO2	Assess the nutritive value of organic products.
CO3	Get awareness on organic agriculture.

Unit I **12 Hrs**

Farming, organic farming, concept and development of organic farming. Principles of organic farming & Need for organic farming, Agencies and institutions related to organic agriculture, Types of organic farming, Biodynamic farming, Benefits of organic farming. Differences between Conventional farming v/s organic farming.

Unit II **12Hrs**

Manures and Fertilizers – definition, differences, classification – major nutrient fertilizers – N,P, K fertilizers – secondary and micronutrient fertilizers – complex and mixed fertilizers – losses of nutrients from soil – biofertilizers – plant growth regulators – Preparation of Enriched farm yard manure and micro nutrient mixtures.

Unit III **12 Hrs**

Erection of Vermicompost unit, Drainage arrangement and collection of the liquid, Raising leguminous crops around the pit, Collection of raw materials & Processing, introducing active worms (specific sps.) and processed raw materials in the pit, Collection of final product.Vermi wash.

Unit IV **12 Hrs**

Some Other forms of Organic Management and Inputs: Biodynamic Agriculture, Rishi Krishi, Panchgavya Krishi, Natural farming, Natueco Farming, Homa Farming, Effective microorganism Technology

Unit V **12 Hrs**

Organic Management: Developing organic farm, Conversion of soil to organic, Multiple cropping and crop rotation, Crop rotation, Seed/ Planting material Treatment, Manuring and soil enrichment, Use of Biofertilizers and microbial cultures, Some important formulations for soil enrichment, Management of Temperature, Protection to all life forms, Pest management

Text Books:

- A.K. Sharma, A hand book of organic farming –Agrobios publication.
- A.K Yadav Organic Agriculture (Concept, Scenario, Principals and Practices) Director National Centre of Organic Farming, Ghaziabad

Reference Books:

- A.K. Dahama, Organic farming for sustainable Agriculture –Agrobios.
- Rana S.S 2011, Organic Farming - Department of Agronomy, College of Agriculture, CSK Himachal Pradesh KrishiVishvavidyalaya, Palampur.

Course Title : LAB: PLANT PHYSIOLOGY, MICROBIOLOGY AND BIOTECHNOLOGY & ORGANIC FARMING	**Total Hours :90**
Course Code : U3BYC6P/ **U24BYCP61**	**Total Credits : 4**

Course Outcomes:

COs	CO Statement
CO1	Understand the mechanism of various metabolic processes in plants.
CO2	Acquire basic knowledge about growth and development in plants.
CO3	Create awareness on sewage water treatment, preservation of food products and antibiotics

CO4	Build up the knowledge on tissue culture and its applications.
CO5	Impart Knowledge on organic waste and their utilization by adapting different technologies.
CO6	Assess the nutritive value of organic products.
CO7	Know the importance of organic agriculture.

PLANT PHYSIOLOGY

To carry out the following experiments and explain the working principle, observation, Results & Interpretations.

- Imbibition – Direct weight method.
- Osmotic pressure – Plasmolytic method.
- Rate of transpiration – Farmer's Potometer.
- Rate of Photosynthesis – Test tube Funnel method.
- Separation of photosynthetic pigments- Paper chromatography method.
- Demonstrate the Physiological Experiment set up.
- Potato osmoscope.
- Bell – jar experiment
- Ganong's Potometer
- Kuhne's fermentation
- Ganong's Light screen
- Mohl's half leaf experiment.
- Measurement of growth using Lever Auxanometer.
- Geotropism
- Phototropism.
- Hormones

MICROBIOLOGY AND BIOTECHNOLOGY

- Basic equipments used in Microbiology Laboratory.
- Sterilization of glass wares and culture media
- Motility of Bacteria – Hanging drop method.
- Gram staining of bacteria
- Preparation of culture media – Nutrient Broth, Nutrient Agar, Potato Dextrose Agar.
- Isolation of microorganisms from environment.
- Demonstration of DNA from tender coconut endosperm.
- Quantitative estimation of DNA.
- Agarose gel electrophoresis - Demonstration
- Blotting techniques.
- Plant tissue culture - Demonstration

ORGANIC FARMING

- Demonstration of Vermi compost preparation.
- Preparation of Panchagavya Krishi
- Biofertilizer.

Industrial Visits and Educational Institutional visits for a minimum of two days

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COMMERCIAL ZOOLOGY
(VERMICULTURE, APICULTURE, AQUACULTURE AND POULTRY SCIENCE AND DAIRY FARMING)

Contact hours per Week – 4 hours **Subject Code:** U3ZYA6X4/ **U24ZYAX61**
Contact hours per Semester – 60 hours **Credits: 4**

Objectives

- To understand the concepts of maintain animals like earthworms, honey bees, fishes, chicks and cattle.
- To develop the students as entrepreneur of the zoology

Unit I **12 hours**

Vermiculture

Cultivatable species of earthworms-*Eisenia fetita, Endrilus eugeniae, Perionyx excavates* and *Lampito mauritti* - Vermicomposting methods (Pit, Heap, Tray and Bed methods) -conditions required for vermicomposting- vermicast- vermiwash.

Unit II **12 hours**

Apiculture-Life history of honey bee, kinds of honey bee-types of hives-newton's hive and other appliances, enemines (Bee wax moth and Wasps) and diseases of honey bee (*Nosema* and *Acarine* deseases) –Medicinal values of honey.

Unit III **12 hours**

Aquaculture –scope of aquaculture –aquaculture in India-Culturable organisms (Cata, Rohu and Mrigal) - construction of fish pond-Culture of Indian major carps, induced breeding-prawn culture- pearl culture.

Unit IV **12 hours**

Poultry science

Breeds of fowls-poultry industry in India-Choosing of parents- sexing of day old chick construction of poultry house- deep litter system- Cage system-Rearing of layers and broilers-nutritive value of egg-poultry diseases (common diseases like Raniket diseases, coryza, fowl pox, polyneuritis, coccidiosis, curled toe)

Unit V **12 hours**

Dairy farming

Importance of dairy farming, dairy animals-cattle cow –buffalo-goat (any one example to each)-management of a model dairy farm-live stock diseases- foot and mouth diseases, udder diseases, Rinder pest – nutritive values of milk and milk products.

Text Books:

1. Arumugam .n, Murugan.T,Johnson Rajeswar.J,Ram Prabhu.R, 2009 Applied zoology,saras publication,Nagarkovil

Reference Books:

1. Sharma, Bee Keeping in India, ICAR Publications.
2. Ganamani.M.R., 2010 Modern aspects of Commercial poultry keeping, Giri Publications, Madurai
3. Sulthan Ismail,Vermitechnology, Chennai
4. Jamson and Santhanakumar, Concepts of Aquaculture,

LAB: CELLBIOLOGY, DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, IMMUNOLOGY AND EVOLUTION & COMMERCIAL ZOOLOGY

(To be done at the end of the Sixth semester)

Contact hours per week: 2 hours. **Subject Code:** U3ZYA6PX/ **U24ZYAXP61**
Contact hours per semester: 30hours **CREDITS: 2**

List of Practical

1. Preparation of Onion root tip and observe the Mitotic stages.
2. Preparation of Squamous epitheilial cells.
3. Qualitative test for Ammonia, Urea and Uric acid.
4. Qualitative test for Protein, Carbohydrate and lipids.
5. Mounting of mouth parts , sting of Honey bees- Demo only

List of Spotters

1 Mitochondria , Golgi Body , Endoplasmic reticulum, lysosome and Ribosome
2 Mitosis –Stages identification
3 Meiosis -stages identification
4 Following stages of frog embryo i)Egg ii)Sperm iii)Blastula iv) Gastrula
5 Primary lymphoid organ – Thymus.
6 Secondary lymphoid organ – Spleen.
7 Paper cutting of Giraffe neck growth to explain Lamarckism
8 Identification of Catla ,Roghu, Mrigal
9 Model fish pond
10 Vermicompost
11 Newton's hive
12 Poultry feeds, feeder and waterers
13 Milk and their by products.

PROJECT WORK

Hours/week-2 **Sub Code:** U1BY6PR/ **U24BY6PR** **Credit: 2**

Objectives:

- To train the student in various spears of learning skills like critical thinking, creativity, synthesis of knowledge, analyzing capacity, instrument basics and handling and scientific report writing.
- To introduce the frontiers areas of research in botany among students
- To understand the scope of research programme in Botany
- The project work (field/ lab work) is to inculcate students to learn adequate knowledge on research methodology in the subject and prepare them for pursuing research in experimental areas of the subject.

Project will be carried out by the final year students in the sixth semester under the guidance of respective guides. The Project work or Field Study is to be undertaken under the guidance of a Teacher of the Department. Projects will be carried out in groups (with maximum of 5 students per group). For projects internal marks (max 50) will be awarded by the respective guide and external marks (max 50) will be awarded by the external examiner during summative practical examination.

Course Title : Non Major Elective - MUSHROOM CULTIVATION	**Total Hours :30**
Course Code : U3BYN61/ **U24BYN61**	**Total Credits : 2**

Course Outcomes:

COs	CO Statement
CO1	Explore mushroom cultivation and its economic importance.
CO2	Understand about mushroom spawn preparation for mushroom cultivation and mushroom marketing
CO3	Know the mushroom cultivation in small scale industry
CO4	Know about diseases mushroom cultivation.
CO5	Understand and appreciate the role of mushrooms in Nutrition, Medicine and health

Unit I **6 Hours**

History of Mushroom Cultivation, General Characters of Mushroom - Morphology of Common edible and Poisonous Mushrooms.

Unit II **6 Hours**

Spawn & Spawning – Types of Spawn – Grain spawn production - Advantages - Factors determining spawn production – Methods of spawning, Storage of Spawn.

Unit III **6 Hours**

Mushroom Cultivation & Harvesting - Paddy straw mushroom, Button Mushroom, and Oyster mushroom, post harvesting technology of Mushrooms

Unit IV **6 Hours**

Disease of Mushrooms – Bacterial, Fungal, Insect Pest and Nematodes.

Unit V **6 Hours**

Food and Medicinal value of edible mushrooms, Economic importance of mushrooms, Recipes of Mushroom, Packing and marketing of mushroom.

Text book:

- Nita bahl 2009. Handbook on Mushrooms. Oxford & IBH Publishers, New Delhi

Reference books:

- Tripathi.D.P 2005. Mushroom Cultivation. Oxford & IBH Publishers, New Delhi
- Muthusamy. A.D & Yesuraja.I 1999. Mushrooms Culture, TNAU Publishers, New Delhi

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