DEPARTMENT OF BOTANY

With effect from the academic year 2017-2020

Courses Offered

Semester	Course	Subject code	Paper	Hours/ week	Credit
I	**Part I**	TL1711/FL 1711	Language: Tamil / French	6	3
	Part II	GE1711 / GE1712	General English (A Stream / B Stream)	6	3
	Part III	BC1711	Major Core I – Algae, Fungi and Lichens	4	4
		BC17P1	Major Practical I - Algae, Fungi and Lichens	2	-
		BA1711	Allied I –Theory: Cell Biology and Plant Anatomy	4	4
		BA17P1	Allied I – Practical - Cell Biology and Plant Anatomy	2	-
	Part IV	AEC171	Ability Enhancement Compulsory Course (AECC): English Communication	2	2
		BNM171	Non Major Elective Course (NMEC) – Food and Nutrition	4	2
		VEC172	Foundation Course I – Values for Life	-	-
	Part V	SDP172	Skill Development Programme (SDP) – Certificate Course	-	-
		STP174	Student Training Programme (STP) - Clubs & Committees/NSS	-	-
II	**Part I**	TL1721/FL 1721	Language: Tamil / French	6	3
	Part II	GE1721/ GE1722	General English (A Stream / B Stream)	6	3
	Part III	BC1721	Major Core II – Plant Anatomy and Embryology	4	4
		BC17P1	Major Practical I - Algae, Fungi and Lichens	-	2
		BC17P2	Major Practical II - Plant Anatomy &Embryology	2	2
		BA1721	Allied I – Theory: Taxonomy of Angiosperms and Plant Physiology	4	4
		BA17P1	Allied I – Practical - Cell Biology, Plant Anatomy, Taxonomy of Angiosperms and Plant Physiology	2	2
	Part IV	AEC172	Ability Enhancement Compulsory Course (AECC): Environmental Studies	2	2
		BNM172	Non Major Elective Course (NMEC)–Eco friendly Technology	4	2
		VEC172	Foundation Course – II –Personality Development	-	1
	Part V	SDP172	Skill Development Programme (SDP) – Certificate Course	-	1
		STP174	Student Training Programme (STP) - Clubs & Committees/NSS	-	-
III	**Part I**	TL1731/FL 1731	Language: Tamil / French	6	3
	Part II	GE1731 / GE1732	General English (A Stream / B Stream)	6	3

	Part III	BC1731	Major Core III – Archegoniate	4	4
		BC1732 BC1733 BC1734	Major – Elective I (a) Herbal Botany (b) Nursery and Gardening (c) Agricultural Botany	4	4
		BC17P3	Major Practical III - Archegoniate	2	-
		BA1731	Allied II – Theory: Taxonomy of Angiosperms and Plant Physiology	4	4
		BA17P2	Allied II – Practical - Taxonomy of Angiosperms and Plant Physiology	2	-
	Part IV	SBC173/ SBC174	Skill Based Course (SBC) – Yoga / Computer Literacy	2	2
		VEC174	Foundation Course II – Personality Development	-	-
	Part V	STP174	Student Training Programme (STP): Clubs & Committees/NSS	-	-
		SLP173	Service Learning Programme (SLP): Extension Activity (RUN)	-	1
IV	**Part I**	TL1741/FL 1741	Language : Tamil / French	6	3
	Part II	GE1741/ GE1742	General English (A Stream / B Stream)	6	3
	Part III	BC1741	Major Core IV – Plant Ecology and Phytogeography	4	4
		BC1742 BC1743 BC1744	Major – Elective II (a) Biological Resources (b) Food Science (c) Biodiversity and Human Welfare	4	4
		BC17P3	Major Practical III - Archegoniate	-	2
		BC17P4	Major Practical IV - Plant Ecology and Phytogeography	2	2
		BA1741	Allied II – Theory: Cell Biology and Plant Anatomy	4	4
		BA17P2	Allied II – Practical: Taxonomy, Anatomy, Plant Physiology, Cell Biology and Plant Anatomy	2	2
	Part IV	SBC173/ SBC174	Skill Based Course (SBC) – Yoga / Computer Education	2	2
		VEC174	Foundation Course II – Personality Development	-	1
	Part V	STP174	Student Training Programme (STP) - Clubs & Committees/NSS	-	1
V	**Part III**	BC1751	Major Core V - Taxonomy and Economic Botany	6	5
		BC1752	Major Core VI - Biochemistry and Biophysics	6	5
		BC1753	Major Core VII - Microbiology and Plant Pathology	5	4
		BC1754 BC1755 BC1756	Major – Elective III (a) Horticulture and Plant Breeding (b) Forestry (c) Biological Techniques	5	5
		BC17P5	Major Practical V - Taxonomy and Economic Botany &Biochemistry and Biophysics	4	-
		BC17P6	Major Practical VI - Microbiology and Plant Pathology	2	-

	Part IV	BSK175	Skill Based Course (*SBC) – Floriculture	2	2
		HRE175	Foundation Course III - Human Rights Education (HRE)	-	1
VI	**Part III**	BC1761	Major Core VIII - Genetics, Biostatistics and Bioinformatics	6	5
		BC1762	Major Core IX - Biotechnology and Molecular biology	6	5
		BC1763	Major Core X - Plant Physiology and Metabolism	5	5
		BC1764 BC1765 BC1766	Major – Elective IV (a) Marine Botany (b) Organic Farming (c) Ecotourism	5	4
		BC17P5	Major Practical V – Taxonomy and Economic Botany &Biochemistry and Biophysics	-	2
		BC17P6	Major Practical VI - Genetics, Biostatistics and Bioinformatics & Biotechnology and Molecular Biology	4	2
		BC17P7	Major Practical VII - Microbiology and Plant Pathology &Plant Physiology and Metabolism	2	2
	Part IV	BSK176	Skill Based Course (*SBC) – Project	2	2
		WSC176	Foundation Course IV - Women's Studies (WS)	-	1
			TOTAL	**180**	**140+3**

***SBC for the V & VI semesters is offered by the departments for their students**

Self Learning – Extra Credit Course

Semester	Subject code	Title of the paper	Hours/week	Credit
III/ V	BC17S1	Plant Resource Utilization	-	2
IV/VI	BC17S2	Algal Biotechnology	-	2
		On line Course (MOOC)	-	2

Value Added Courses

S.No.	Name of the Course	Total hours	Credit
I	Mushroom Culture Technology	30	1
II	Hydroponics	30	1

Semester - I
Algae, Fungi and Lichens
Sub. Code: BC1711

No. of hours per week	Credit	Total no. of hours	Marks
4	4	60	100

Objectives: 1.To understand the importance of different groups of plants and their diversity.
2. To study in detail the different genera belonging to various classes of Algae, Fungi, Lichens and their economic importance.

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	identify the important contrast characters of Algae, Fungi and Lichens	PSO - 1	R
CO - 2	describe ways in which lichens are beneficial to the environment	PSO - 4	U
CO - 3	interpret the general characteristics of lichens	PSO - 1	Ap
CO - 4	categorize the algal organisms according to Fritsch (1945)	PSO - 7	An
CO - 5	correlate the study of life form, structure, reproduction and life cycle of different classes of Algae	PSO - 1	E
CO - 6	recall the salient features of the different fungi	PSO - 1	U

Unit I

Algae*:* Classification of Algae according to Fritsch (1945). General Characters, Salient features of the classes, occurrence, structure, reproduction and life cycle of the following (Development aspect not included)
Cyanophyceae– *Nostoc*
Chlorophyceae- *Volvox, Caulerpa*

Unit II

Phaeophyceae**-** *Sargassum*
Rhodophyceae- *Gracilaria*

Unit III

Morphology and life cycle of the following
Xanthophyceae – *Vaucheria*
Bacillariophyceae – *Diatoms*
Economic and Ecological importance of Algae

Unit IV

Fungi: Classification of fungi according to Alexopoulos and Mims (1962). General characters, Salient features of the classes, occurrence, structure, reproduction and life cycle of the following (Development aspect not included)
Oomycetes - *Albugo*
Ascomycetes - *Aspergillus, Peziza*
Basidiomycetes - *Puccinia*
Economic importance of Fungi

Unit V

Lichens:
General characters of Lichens, Classification of Lichens
Ascolichens- *Usnea*
Economic importance of Lichens

Text Books:

1. Sharma, O.P. (1997). *Text book of Algae.* New Delhi: Tata Mc Graw- Hill Publications.

Reference Books:

1. Vashishta, B.R. (1997). *Algae.* New Delhi: S. Chand & Company.
2. Vashishta, B.R. (1993). *Fungi.* New Delhi: S. Chand & Company.
3. Kumar, H.D., & Singh, N.A. (1982). *A text book of Algae,* East West Press Pvt. Ltd New Delhi.

Semester I
Allied I: Cell Biology and Plant Anatomy
Sub. Code: BA1711

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To study the structure and functions of cell organelles.

To know the internal structure of higher plants.

Unit I

Cell - Prokaryotic and Eukaryotic; Structure of plant cell, chemical composition and functions of the following - Plasma membrane (fluid mosaic model), Chloroplast and Mitochondria

Unit II

Non living inclusions – starch grains, aleurone grain, cystolith and raphide. Ultrastructure and functions of nucleus. Cell division – cell cycle, mitosis and meiosis - significance.

Unit III

Tissues – Meristems – Classification (origin, position and function); Permanent – structure and functions of simple tissues – parenchyma, collenchyma, sclerenchyma. structure and functions of complex tissues – xylem and phloem.

Unit IV

Primary structure of dicot stem and root - Primary structure of monocot stem and root.

Unit V

Study of the internal structure of dicot and monocot leaf - Normal secondary thickening of dicot stem

Text Books

Verma, P.S, & Agarwal, V.K.S. (2004). *Cell Biology*, Chand and Company Ltd., New Delhi.

Vashista, B.R R. (1997). *The Plant Anatomy*, Chand and Co., New Delhi.

Reference Books

Powar, C.B. (2005). *Cell Biology*. New Delhi: Himalaya Publishing House.

De Robertis, E.D.P., & De Robertis, D.M.P. (1980). *Cell and Molecular Biology*. Saunders College Philadelphia.

Gupta, P.K. (1997). Cytology, *Genetics and Evolution*. Meerut: Rastogi Publications.

Esau, K. (1953). *Plant Anatomy*. New York, NY: Wiley Publication Co.

Pandey, B.P. (1982). *Plant Anatomy*. New Delhi: S. Chand and Company Ltd.

Arthur J Eames., & Laurence H Macdaniels. (2005). An *Introduction to Plant Anatomy*. New Delhi: Tata McGraw-Hill.

Semester I
Food and Nutrition (NMEC)
Sub. Code: BNM171

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	2	60	100

Objectives

To study the sources and nutritive value of food.

To be aware of food adulteration and ill effects of junkfood.

Unit I

Energy value of food, major classes of food- carbohydrates, proteins, fats and oils, Vitamins, minerals – sources and requirements. Probiotics – a general account. Balanced diet functions and deficiency symptoms - causes and prevention. Food colourants - Natural and artificial.

Unit II

Nutritive value of rice and wheat

Cereals - Rice, processing and products; Wheat- processing, bread manufacturing and other value added products of wheat.

Beverages: Non-alcoholic- Coffee, tea and cocoa-processing.

Alcoholic- Beer, wine and distilled liquors

Unit III

Food Preservation: Importance of preservation. Methods of preservation - low and high temperature, use of oil and spices, salt and sugar. Preparation of jam, jelly, pickles and squashes.

Nutritive value of meat, fish and egg

Meat and meat products; sea foods- storage and processing of fish and fish products Egg- egg products

Unit IV

Food Additives: Definition and types. Milk and milk products, ice cream and related products; cheese, reduced fat dairy products. Food adulteration- harmful effects, simple physical tests for detection of food adulterants.

Unit V

Food borne infection and their prevention- Botulism, Salmonellosis and Shigellosis. Food intoxication- bacterial toxins and fungal toxins.

Text Book

Sumathi R Madamti & Rajagopal, M.V. (1984). *Fundamentals of Food and Nutrition*.

New Delhi: New Age Publishers.

Reference Books

Swaminathan, M. (1996). *Food Science Chemistry and Experimental Food*. Bangalore Print and Publishing Company.

Shakunthal O Manny. (1999). *Food: Facts & Principles*. New Delhi: New Age Publishers.

Sivasankar,B. (2014). *Food Processing and Preservation*. New Delhi: PHI Learning Private Limited.

4.Girdhari Lal, G.S. Siddappa., & Tandon, G.L. (1999). *Preservation of Fruits and Vegetables. Indian Council of Agricultural Research*, New Delhi: Publications and Information Division.

Martin R. Adams., & Maurice O Moss. (2008). Food *Microbiology* . (3^{rd} ed). Cambridge, RSC Publishing.

Semester II
Major Core II: Plant Anatomy and Embryology
Sub. Code: BC1721

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To know the internal structure of plants.

To learn the structure and development of reproductive units in higher plants.

Unit I

Meristems – Classification (origin, position and function); Apical organization of shoot and root.

Tissues – Structure and function of simple tissue (parenchyma, collenchyma and sclerenchyma) and complex tissue (xylem and phloem). Primary structure of dicot and monocot stem, root and leaf.

Unit II

Secondary growth in stem and root **–** Formation of cambial ring, activity of cambial ring, secondary vascular tissue, formation of periderm, lenticels, annual ring, Wood (heartwood and sapwood). Anomalous secondary thickening in dicot stem (*Boerhaavia*) and monocot stem (*Dracaena*).

Unit III

Epidermal tissue system, trichomes, glandular hairs, cuticle, stomata and its types; Nodal anatomy types - unilacunar (*Justicea*), trilacunar (*Azadirachta*) and multilacunar (*Aralia*), Hydathodes and laticifers.

Unit IV

Embryology **–** Structure of anther; Structure of microsporoangium, microsporogenesis, structure of pollen; development of male gametophyte. Structure and types of ovules; Structure of megasporangium, megasporogenesis and development of female gametophyte.

Unit V

Types of embryo sac – Monosporic – Polygonum type. Fertilization, endosperm - types- nuclear, cellular and helobial, ruminate endosperm, perisperm. Development of embryo in dicot (*Capsella*) and monocot (*Luzula*).

Text Books

Vashista, B.R. (1997). *The Plant Anatomy*. New Delhi: S. Chand & Co.

Bhojwani, S.S., & Bhatnagar. S.P. (2011). *Vikas Embryology of Angiosperm*. (5th ed.). New Delhi: Publication House Pvt. Ltd.

Reference Books

Mauseth, J.D. (1988). *Plant Anatomy*. USA: The Benjamin/Cummings Publisher.

Panday, B.P. (1982). *Plant Anatony*. New Delhi: S. Chand & Co.

Fahn, A. (1987). *Plant Anatomy*. New York. NY: Maxwell House.

Arthur J Eames., & Laurence H Macdaniels. (2005). An *Introduction to Plant Anatomy*. New Delhi: Tata McGraw-Hill.

Maheswari, P. (1976). *An Introduction to the Embryology of Angiosperms*, New Delhi: Tata McGraw Hill Publishing Company

Semester - II
Major Practical I: Algae, Fungi and Lichens
Sub. Code: BC17P1

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	50

To make suitable micro preparations of types prescribed in the syllabus

Caulerpa **–** Rhizome
Sargassum – Stipe, 'leaf'
Gracilaria – Thallus
Albugo – Conidia
Peziza - Apothecium
Puccinia – Uredosorus and Teleutosorus
Lichens – Thallus

To identify the Specimens

Nostoc – Filament
Volvox **–** Vegetative colony with daughter colonies, antheridum and oogonium *Sargassum* **–** Entire thallus, Male and Female Conceptacles
Gracilaria – Thallus with cystocarp
Vaucheria – Sexual reproduction
Diatoms- Pennate and Centric
Algal mixture
Aspergillus – Conidia
Puccinia – Aecidium and pycnidium
Lichens – Apothecium and Soredium

Semester II

Major Practical II: Plant Anatomy and Embryology

Sub. Code: BC17P2

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	50

Plant Anatomy and Embryology

To observe and identify different types of tissues

Sectioning, staining, mounting and identification of primary structure of dicot stem, dicot root, monocot stem and monocot root; Dicot and monocot leaf.

Normal secondary thickening of dicot stem and dicot root.

Anomalous secondary thickening – Dicot stem (*Boerhaavia*) and monocot stem (*Dracaena*)

Nodal types – Unilacunar, trilacunar and multilacunar.

Stomatal types – anomocytic, anisocytic, paracytic, diacytic and graminaceous.

To observe and identify the slides of

T.S of Anther (Sporogenous, Tetrad and Mature)

L.S of Ovule – Orthotropous and Anatropous

Dissection of *Tridax* embryo (Globular or Cordate stage).

Semester II
Allied I: Taxonomy of Angiosperms and Plant Physiology
Sub. Code: BA1721

No. of Hours per Week	Credits	Total no. of Hours	Marks
4	4	60	100

Objectives

To impart basic knowledge of morphology to understand Taxonomy

To study the vegetative and floral characters of Angiosperm families.

To study the functions of plants.

Unit I

Brief account of morphology: Root, stem, leaf, inflorescence and fruits. Classification – artificial, natural (Bentham & Hooker's) and phylogenetic, Bionomial nomenclature

Unit II

Study of the following families and their economic importance - Annonaceae,

Rutaceae, Lamiaceae, Euphorbiaceae and Poaceae.

Unit III

Plant Physiology: Water relations - Importance of water to plant life - imbibition, diffusion, osmosis and plasmolysis. Absorption of water - passive and active mechanisms, ascent of sap, transpiration – types and brief note on stomatal movement.

Unit IV

Photosynthesis: photosynthetic apparatus, Mechanism of photosynthesis,
pigment systems, light dependent reactions (cyclic and non-cyclic), C3 Cycle. Factors affecting photosysnthesis.

Unit V:

Respiration: Types - aerobic (glycolysis, Kreb's cycle and oxidative phosphorylation) anaerobic (fermentation) –Brief account on oxidative phosphorylation. Factors affecting respiration.

Plant growth - Growth hormones – physiological role of auxins and gibberellins.

Text Books

Pandey, B.P. (1997). Taxonomy of Angiosperms. New Delhi: S. Chand & Co. Pandey, K.K., & Sinha, B.K. (1988). Plant Physiology. New Delhi: Vikas Publications.

Reference Books

Singh., & and Jain. (1997). Taxonomy of Angiosperms. Meerut: Rastogi Publications. Noggle., & Fritz. (2002). Introductory Plant Physiology. New Delhi: Prentice
Hall of India, Pvt. Ltd.
Lawrence, G.H.M. (1951). Taxonomy of Vascular Plants. New York. NY: Mac Milan Company.

Semester II

Allied Practical I

Cell Biology and Plant Anatomy; Taxonomy of Angiosperms and Plant Physiology

Sub. Code: BA17P1

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	2	60	100

Cell Biology and Plant Anatomy (To be conducted in Semester – I)

To identify electron micrographs of the cell organelles and non living inclusions.

To observe and identify different types of tissues

dicot root, monocot stem and monocot root.

Sectioning, staining, mounting and identification of Dicot leaf.

Taxonomy of Angiosperms and Plant Physiology (To be conducted in Semester – II)

To make dissections of the floral parts of the families prescribed in the syllabus and to make drawings to bring out the salient features including floral diagram and floral formula.

Assigning plants to their respective families.

Demonstration only

Transpiration pull

Oxygen evolved during photosynthesis

Light- screen experiment

Khune's apparatus

Semester II
Eco - Friendly Technology (NMEC)
Sub. Code: BNM172

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	2	60	100

Objectives

To enable the students to acquire knowledge on the importance of biological resources

To be self employable.

Unit I

Mushroom: Nutritional value of Mushrooms**;** Cultivation, processing and marketing of Plerotus and *Agaricus*.

Unit II

Vermicomposting: Conditioning of sludge, disinfection of sludge, dewatering, heat drying and disposal of sludge; advantages of vermicompost.

Unit III

Fermentation: Definition – Role of microorganisms in fermentation process - wine and vinegar preparation.

Unit IV

Biogas Technology: Anaerobic digestion- Biogas production by KVIC model.

Solar Energy: Solar cooker, solar lamp and solar water heater.

Unit V

Banana Fibre Processing: Cutting and slitting, fibre separation and drying, uses of banana fibre**.** Craft Articles from natural fibres of Palm, Bamboo and Cyperus.

Text Book

Dubey, R.C. (2006). *Text Book of Biotechnology*. New Delhi: S. Chand & Company Ltd.

Reference Books

Adrian Slater., Nigel Scott., & Mark Fowler. (2003). *Plant Biotechnology*. New York. NY: Oxford University Press.

Satyanarayana, U. (2008). *Biotechnology*. Kolkata: Books and Allied (P) Ltd.

Rajni Gupta., & Mukherji, K.G. (2001). *Microbial Technology*. New Delhi: A.P.H Publishing Corporation.

Aneja, K. R. (2002). *Experiments in Microbiology*. *Plant Pathology and Biotechnology*, New Delhi: New Age International (P) Ltd.

Semester III
Major Core III: Archegoniate
Sub. Code: BC1731

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To acquire knowledge on early land plants.

To understand the life cycle patterns of archegoniate.

Unit I

Unifying features of Bryophytes, transition to land habit, classification by Rothmalar (1951). Distribution, systematic position, morphology, anatomy, reproduction and life cycle of *Marchantia* and *Polytrichum*. (Developmental details not to be included). Ecological and economic importance of Bryophytes.

Unit II

General characteristics, classification by Smith (1955), Salient features, types of stele, life cycle patterns. Distribution, systematic position, morphology, anatomy, reproduction and life cycle of Psilotum (Developmental details not to be included).

Unit III

Distribution, systematic position, morphology, anatomy, reproduction and life cycle of *Selaginella* and *Marsilea* (Developmental details not to be included). Heterospory, seed habit and stelar evolution. Ecological and economical importance of Pteridophytes.

Unit IV

General characteristics, classification by Chamberlain (1935), salient features, distribution, systematic position, morphology, anatomy and reproduction of *Pinus*. (Developmental details not to be included). Ecological and economical importance of Gymnosperms.

Unit V

Geological time scale. Fossils - Methods of fossilization and importance of fossils. Distribution, systematic position, morphology, anatomy and reproduction of ***Rhynia*** and ***Lyginopteris***.

Text Books

Vashista, P.C. (1997). *Bryophyta*. New Delhi: S. Chand and Co.

Vashista, P.C. (1997). *Pteridophyta*. New Delhi: S. Chand and Co.

Vashista, P.C. (1997). *Gymnosperms*. New Delhi: S. Chand and Co.

Reference Books

Parihar, N.S. (1967). *Bryophyta*. Allahabad: Central Book Depot Publications.

Watson, E.V. (1974). *Structure and Life Cycle of Bryophytes*. New Delhi: B.I. Publications.

Srivastava, H.N. (1990). *Fundamentals of Pteridophytes*. Jalandhar: Pradeep Publications.

Rashid, A. (1990). *An Introduction to Pteridophytes*. New Delhi: Vikas Publications.

Sharma, O.P. (2006). *Text Book of Pteridophyta*. New Delhi: Macmillan Publishers India Ltd.

Chamberlain, C.J. (2000). *Gymnosperms*. New Delhi: CBS Publishers and Distributors.

Pandey, S.N., Misra, S.P.& Trivedi, P.A. (1998). *Text Book of Botany.* Vol. II. New Delhi: Vikas Publishing Pvt Ltd.

Mishra, S.R. (2010). *Text Book of Paleobotany*. New Delhi: Discovery publishing Pvt. Ltd.

Semester III
Elective I (a): Herbal Botany
Sub. Code: BC1732

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To encourage, protect and safeguard the patent rights and Intellectual Property Rights

To serve as a source of supply of improved plants not readily available from other agencies

Unit I

Herbal medicines-History and scope: Knowledge on-Ayurveda, Siddha, Unani and Homeopathy. Brief knowledge on Ethnomedicine, Ethnomedicinal plants of Kanyakumari District.

Unit II

Folk medicines including grandmother medicinal practices (Home remedies) for common ailments like cold, fever, cough, diarrhoea

Skin and hair care: Herbal preparation, decoction, extract, infusions, oils, shampoos and powders.

Unit III

Botanical name, family, morphology of medicinally importance of useful parts, active principles and utilization of the following medicinal herbs: *Catharanthus roseus*, *Withaniasomnifera*, *Clerodendrumphlomidis* and *Centellaasiatica*. Drug yielding plants: therapeutic and habit forming drugs with special reference to *Cinchona, Rauvolfia* and *Cannabis*.

Unit IV

Evaluation and standardization of herbal drugs. Physio chemical properties - Ash, Flurosence analysis. Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, terpenoids and phenolic compounds). Adulteration: Identification of five common herbal adulterants.

Unit V

Cultivation, harvesting, processing, storage, marketing and utilization of medicinal plants Seed- *Strychnosnux-vomica,* Stem- *Adathodavasica*, Rhizome – *Acoruscalamus.* Conservation of medicinal plants: *in situ* and *ex situ.*

Masticatories and fumitories. Tobacco and health hazards.

Text Book

Kokate, C.K., Purohit, A.P. and Gokhale. S.B. (1999). *Pharmacognosy*. New Delhi:

Nirali Prakashan.

Reference Books

Agnes Arber, (1999). *Herbal Plants and Drugs.* Jaipur: Mangal Deep Publications.

KannyLallDey and Raj Bahadur (1984). *The Indigenous Drugs of India*. Dehradun: International Book Distributors.

Sivarajan, V.V. Balachandran and Indra.(1994). *Ayurvedic Drugs and their Plant Source*. New Delhi: Oxford IBH publishing Co.

Light Miller and Bryan Miller (2012). *Ayurveda and Aromatherapy*: *The Earth Essential Guide to Ancient Wisdom and Modern Healing*. New Delhi: Motilal Banarsidass Publishers Pvt. Ltd.

Vasant Balaji Athavale (2009). *Basic Principles of Ayurveda*. New Delhi: Chaukhamba Sanskrit Pratishthan Publishers.

Wendy Applequist, (2006). *The Identification of Medicinal Plants.* Austin: American Botanical council.

Semester III
Elective I (b): Nursery and Gardening
Sub. Code: BC1733

No. of Hours Per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To create a successful, sustainable garden using organic methods.

To encourage the students to develop valuable new life skill by creating their own seed bed.

Unit I

Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

Nursery practices for some important crops – Coconut, Arecanut, Pepper and Cardamom.

Unit II

Seed: structure and types - seed dormancy; causes and methods of breaking dormancy. Seed storage- seed banks , factors affecting seed viability, genetic erosion- Seed production technology - seed testing and certification.

Unit III

Vegetative Propagation: Layering - air and ground layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings. Hardening of plants – greenhouse, mist chamber, shade house and glass house.

Unit IV

Gardening: definition and scope, types of gardens- formal (Mughal) and informal (--- ---Japanese) Special types of gardens – Rock garden, water garden, Bog or Marsh garden, Sunken garden and roof garden.

Gardening Operations: soil laying, manuring, watering, management of pests and diseases and harvesting.

Unit V

Cultivation of vegetable crops – Tomato, Brinjal. Root Crops – Radish, Carrot. Cucurbits-Cucumber, Bitter gourd. Storage and marketing procedures.

Text Book

Kumar, N. (1997). *Introduction to Horticulture*. Nagercoil: Rajalakshmi Publications.

Reference Books

Bose, T.K. and Mukherjee, D. (1972). *Gardening in India*. New Delhi: Oxford & IBH Publishing Co.

Sandhu, M.K. (1989). *Plant Propagation*. Bangalore: Wile Eastern Ltd.

Janick Jules. (1979). *Horticultural Science* (3rd Ed.), SanFrancisco: W.H. Freeman and Co.

Agarlwal, P.K. (1993). *Hand Book of Seed Technology*. New Delhi: Dept. of Agriculture and Co-operation, National Seed Corporation Ltd.

Sheela, V.L. (2011). *Horticulture*. Chennai: MJP Publishers.

Semester III
Elective I (c): Agricultural Botany
Sub. Code: BC1734

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To study the various parameters and their influence on agriculture.

To give student elementary information on basic agronomic principles and practices.

Unit I

Introduction to agriculture, Classification of crops, Crop rotation-principles, limitation, advantages, rotational intensity, cropping scheme, cropping intensity. Cropping system – intercropping, mixed cropping, multiple cropping and relay cropping.

Unit II

Cultivation – area, soil, seed rate requirements, manuring, weed management and harvest of: Cereals and Millets: Rice and Maize; Pulses: Green gram and Horse gram; Oil Seeds: Ground nut and Sesame

Unit III

Seed Technology: Seed Viability, Dormancy, Methods of breaking dormancy, seed processing, Seed treatment for storage and seed certification

Unit IV

Factors Affecting Agriculture: Biotic: Insects, Pests, Rodents, Weeds. Abiotic: Soil, Wind, Water, Atmospheric air, Humidity, Temperature. Structure and Composition of earth, Altitude and Latitude.

Unit V

Beneficial microorganisms in Agriculture; Brief account on Biofertilizer, microbial insecticides, microbial agents for control of plant diseases, Modern agriculture- Implements and practices. Implication of GMO crops.

Text Book

Chandrasekaran, B. Annadurai, K. Somasundaram, E. (2010). *A Textbook of Agronomy*. New Delhi: New Age International Publishers.

Reference Books

Agarwal, R.L. (1976). *Seed Technology.* New Delhi: IBH Publishing Co.

Meeting, Jr., F.B. (1992). *Soil Microbial Ecology: Application in Agricultural and Environmental Management.* New York: Marcel Dekker Inc.

Kochhar, S.L. (1986). *Economic Botany in the Tropics.* Chennai: Macmillan India Ltd.

Satyanarayana, U. (2008). *Biotechnology*. Kolkata: Books and Allied (P) Ltd.

Rajni Gupta., and Mukherji, K.G. (2001). *Microbial Technology*. New Delhi: A.P.H Publishing Corporation.

Major Practical Paper III
Archegoniate
Sub Code: BC17P3
To be conducted during the Semester III

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	50

Objectives

1. To gain knowledge in distinguishing and identifying the cryptogams.
2. To understand the mode of formation of reproductive organs among the various groups in Archegoniate.

Archegoniate(Bryophytes, Pteridophytes and Gymnosperms)

Morphological and Anatomical study of the following:

Bryophytes:

Marchantia
Polytricum

Pteridophytes:

Psilotum
Selaginella
Marsilea
Rhynia (fossil)

Gymnosperms:

Pinus
Lyginopteris (fossil)

Semester III

Allied II: Taxonomy of Angiosperms and Plant Physiology

Sub. Code: BA1731

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To impart basic knowledge of morphology to understand taxonomy

To understand importance of water and its relation to the plants

To organize awareness programme about economic importance of plants and its conservation

Unit I

Morphology: Leaf - phyllotaxy, simple and compound leaf, venation. Inflorescence types. Fruit types.

Unit II

Taxonomy: Bentham & Hooker's classification. Study of the following families and their economic importance- Rutaceae, Lamiaceae, Euphorbiaceae and Poaceae.

Unit III

Plant Physiology: Water relations - Importance of water to plant life - imbibition, diffusion, osmosis and plasmolysis. Absorption of water movement-Symplast and apolplast, passive and active mechanisms(Starch-glucose interconversion theory and K^+ ion theory). Transpiration-Types and stomatal mechanism.

Unit IV

Photosynthesis: pigment systems, mechanism of photosynthesis: light dependent (cyclic and non-cyclic photophosphorylation) light indepentnt (C_3cycle). Factors affecting photosysnthesis.

Unit V

Respiration: Glycolysis, anaerobic (Fermentation), aerobic (Kreb's cycle), Electron Transport System and Oxidative phosphorylation. Factors affecting respiration.

Phyto hormones – physiological role of auxins, gibberellins and ethylene.

Text Books

Pandey, B.P. (1997). *Taxonomy of Angiosperms*. New Delhi: S. Chand and Company Ltd.

Jain V. K. (2006). *Fundamentals of Plant Physiology*. New Delhi: S. Chand and Company Ltd.

Reference Books

Lawrence G.H.M. (1951). *Taxonomy of Vascular Plants*. New York: Mac Milan Company.

Singh, V and Jain, D.K. (1997).*Taxonomy of Angiosperms*. New Delhi: Rastogi Publications.

Noggle Ray, G. and George, J. Fritz. (2002). *Introductory Plant Physiology*. New Delhi: Prentice Hall of India, Pvt. Ltd.

Purohit, S.S. (2005). *Plant Physiology*. Jodhpur: Sarswati Purohit Publishers.

Srivastava, H.N. (2002). *Plant Physiology*. Jalandhar: Pradeep Publications.

Pandey, K.K and Sinha, B.K.(1988). *Plant Physiology*. New Delhi: Vikas Publications.

Semester III

Allied Practical II: Taxonomy of Angiosperms and Plant Physiology

Sub Code: BA17P2

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	-	-	-

Taxonomy of Angiosperms and Plant Physiology (To be conducted during semester III)

To make dissections of the floral parts of the families prescribed in the syllabus and To make drawings to bring out the salient features including floral diagram

and floral formula.

Assigning plants to their respective families.

Demonstration only

Transpiration pull

Oxygen evolved during photosynthesis

Light- screen experiment

Khune's apparatus e.

Ascent of sap

Semester IV
Major Core IV: Plant Ecology and Phytogeography
Sub. Code: BC1741

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To understand the ecological groups and their interactions

To learn and create awareness about environmental problems at local, national and international levels

Unit I

Soil - importance; origin; types,formation; composition; physical, chemical and biological components; Soil profile; Role of climate in soil development.

Unit II

Water -importance: states of water in the environment; atmospheric moisture; precipitation types (rain, fog, snow, hail, dew); water in soil; water table; water bodies: aquifers, water shed management.

Unit III

Ecological groups: study of hydrophytes, xerophytes and halophytes with reference to their morphological, anatomical and physiological adaptations; Study of vegetation-Quadrat and Transect.

Unit IV

Ecosystem: Fresh water (pond) ecosystem; marine ecosystem; trophic organization, basic source of energy, autotrophy, heterotrophy, food chains and webs, ecological pyramids. Plant interactions-symbiosis, commensalism, parasitism.

Unit V

Phytogeography- principles of phytogeography; Types of plants distribution - continous, discontinous and endemic. Plate tectonics, Continental drift, theory of land bridges, age and area hypothesis. Centers of origin of cultivated crops.

Text Book

Sharma, P.D. (2010).*Ecology and Environment.* (8th ed). Meerut: Rastogi Publications.

Reference Books

Singh, J.S., Singh, S.P., Gupta, S. (2006). *Ecology Environment and Resource Conservation*. New Delhi: Anamaya Publications.

Odum, E.P. (2005). *Fundamentals of Ecology*. (5th ed.). New Delhi: Cengage Learning India, Pvt. Ltd.

Wilkinson, D.M. (2007). *Fundamental Processes in Ecology- An Earth Systems Approach.*

Kormondy, E.J. (1996). *Concepts of Ecology* . (4th ed.). New Delhi: PHI Learning Pvt. Ltd.

Semester IV
Elective II (a): Biological Resources
Sub. Code: BC1742

No. of Hours per week	Credit	Total No. of Hours	Marks
4	4	60	100

Objectives

To know the potentiality of major biomass systems, both for "green energy" and for other renewable resources.

Utilize and apply the methods to keep the planet healthy.

Unit I

Biofertilizers: Scope and importance. Bacterial Fertilizer – *Rhizobium* – mass production and uses. Cyanobacteria, Biofertilizer- *Nostoc* - mass production and application. *Azolla*- mass production and application. Vermicompost – Mass production and application.

Unit II

Single Cell Protein and Mycoprotein: Sources of single cell protein, Nutritive value of single cell protein. Mass Cultivation of *Spirulina*. Mushroom Cultivation- *Pleurotus* and *Agaricus*, nutritional values and value added products.

Unit III

Forest cover, forest resources – Utility and Values of forests: Commercial benefits, ecological benefits and aesthetic benefits

Unit IV

Biofuels: Importance of biofuel, Biodiesel Production –*Pongamia* and *Jatropa*. Alcohols – the liquid fuel- ethanol production. Gaseous fuels: Biogas production and Hydrogen fuel.

Unit V

Biopesticides: Introduction, desirable qualities of biopesticides. Microbial Pesticides

– fungi, viruses and bacteria. Advantages and disadvantages of Microbial Pesticides, Application of Biopesticides.

Text Book

Dubey, R.C. (2006). *Text Book of Biotechnology*. New Delhi: S. Chand & Company Ltd.

Reference Books

Ramawat, K.G. (2003). *Plant Biotechnology*. New Delhi: S. Chand &Company.

Oxford University Press.

Satyanarayana, U. (2008). *Biotechnology*. Kolkata: Books and Allied (P) Ltd.

Rajni Gupta., and Mukherji, K.G. (2001). *Microbial Technology*. New Delhi: A.P.H Publishing Corporation.

Aneja, K. R. (2002). *Experiments in Microbiology*, *Plant Pathology and Biotechnology*, New Delhi: New Age International Pvt. Ltd.

Semester IV
Elective II (b): Food Science
Sub. Code: BC1743

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To learn about the importance, constituents and health practices of food and balanced diet.
To obtain knowledge about fermented food products.

Unit I

Food Science – Definition, aim, constituents of food and their value. Energy value of balanced diet, carbohydrates, proteins, fats, enzymes and vitamins.

Cooking- Objectives of cooking, Preliminary preparations, Cooking methods, (Moist heat methods, Dry heat methods, Microwave cooking, Solar cooking).

Unit II

Food Colourants: Natural, Artificial and Special flavours: Spices and Condiments. Food additives – Sweetners, Emulsifiers and Stabilisers, Antioxidants, Flavour improvers. Safety measures of food additives.

Unit III

Fermented milk products – butter, yoghurt, cheese. Fermented vegetable products- sauerkraut, cucumber, Fermented meat products- Sausage and Dried Fish.

Unit IV

Food Preservation: Principle, Food spoilage, Methods of food preservation – preservation by low and high temperature, Pasteurization, Canned food.

Unit V

Industrial production of the following:
Alcoholic beverages - Beer, Wine, Ethyl alcohol
Non alcoholic beverages -Vinegar, Coffee, Tea.

Text Book

Sumathi, R.Madamti and Rajagopal,M.V.(2012). *Fundamentals of Food and Nutrition.* Kochi: New Age Publishers.

Reference Books

Adams, M.R. and Moss, M.O. (2003). *Food microbiology* ed.) New Delhi: Panima Publishing Corporation.

Sivasankar, B. (2002). Food Processing and Preservation. (New Delhi: Prentice Hall of India Pvt. Ltd. 3

El-Mansi, E.M.T and Bryce, C.F.A. (2002). Fermentation r Microbiology and Biotechnology. USA: Taylor and Francis d Group.

th. (5 ed.). New Delhi: New Age International Pvt. Ltd.

Norman. A Potter and Joseph. H Hotchkiss. Food Science th CBS Publishers & Distributers Pvt. Ltd.

Anandanb Kumaravelan, R. (2005). Environmental Science and Engineering, Chennai: Seitech Publication, (India) Pvt. Ltd.

Semester IV
Elective II (c): Biodiversity and Human Welfare
Sub. Code: BC1744

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To understand the biodiversity and its importance.
To utilize the plants for human use.

Unit I

Bio diversity and its Scope- genetic diversity, species diversity, biodiversity at the ecosystem level, agro biodiversity and cultivated plant taxa, wild taxa. Values of biodiversity; Ethical and aesthetic values of biodiversity.

Unit II

Biodiversity Hot Spots- History of hotspots, evolution of hotspots, Critical role of hotspots in species richness and endemism, Biodiversity in tropics, National biodiversity hotspots, hottest biospots of Western Ghats, Biodiversity of Tamilnadu.

Unit III

Economical Values of Biodiversity- plants, animals and microbes. Loss of genetic diversity, loss of species diversity, loss of ecosystem diversity, loss of agro biodiversity, consequences and implications; projected scenario for biodiversity loss.

Unit IV

Organizations Associated with Biodiversity Management- IUCN, UNEP, UNESCO, WWF, NBPGR; National Biodiversity Authority, Nature Conservation Foundation, The Nature Conservancy Environmental summit- PARIS 2015

Unit V

Conservation- Role of NGOs in biodiversity conversation, Conservation of genetic diversity, species diversity and ecosystem diversity, *in situ* and *ex situ* conservation, social approaches for conservation, biodiversity awareness programmes, sustainable development.

Text Book

Singh, J.S, Singh, S.P. and Gupta, S. (2006). *Ecology Environment and Resource Conservation*. New Delhi: Anamaya Publications.

Reference Books

Krishnamurthy, K.V. (2004). *An Advanced Text Book of Biodiversity - Principles and Practices*. New Delhi: Oxford and IBH Publications Co. Pvt. Ltd.

Odum, E.P. (2005). *Fundamentals of Ecology*. (5th ed.). New Delhi: Cengage Learning India Pvt. Ltd.

Trivedi, P. Trivedi, R. and Gurdeep Raj. (2002). *Environmental Ecology*. New Delhi: Akashdeep Publishing House.

Kasturi Reddy. (2010). *Biodiversity and Land Conservation*. New Delhi: Pacific Publication.

Rao, M. K. (2011). *Environmental and Climate Change*. New Delhi: Manglam Publications.

Tyler Miller, G. and Scott.E. Spoolman (2013). *Environmental Studies*. United States: Cengage Publishers

Major Practical Paper IV

Plant Ecology and Phytogeography

Sub Code: BC17P4

To be conducted during the Semester IV

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	50

Objectives

To distinguish plants based on the morphological and anatomical features.
To realize the concept of phytogeography.

Plant Ecology

Methods of studying vegetation – Quadrat and Belt transect

Morphology of locally available Hydrophytes, Xerophytes and Halophytes

To make suitable micropreparations of:

Hydrilla stem T.S.
Eichhornia petiole T.S.
Phylloclade T.S. (*Casuarina*)
Phyllode T.S. (*Parkinsonia*, *Acacia*)

Demonstration – soil permeability – (Percolation and soil holding capacity).

Models –Related to phytogeography

Field visit – One day.

Semester IV
Allied II: Cell Biology and Plant Anatomy
Sub. Code: BA1741

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	4	60	100

Objectives

To understand the structure and purpose of basic organelles of plant cells

To know how to classify meristems.

To learn the internal structure of leaf, root and shoot.

Unit I

Cell - Prokaryotic and Eukaryotic; Structure of plant cell, chemical composition and

functions of the following - Plasma membrane (fluid mosaic model), Chloroplast and Mitochondria

Unit II

Ultrastructure and functions of nucleus. Cell division – cell cycle, mitosis and meiosis - significance. Non living inclusions – starch grains, aleurone grain, cystolith and raphide.

Unit III

Tissues – Meristems – Classification (origin, position and function); Characteristic features of meristematic tissues, Difference between meristematic and Permanenttissues Permanent Tissues–structure and functions of simple permanent tissues – parenchyma, collenchyma, sclerenchyma

Unit IV

Structure and functions of complex tissues – xylem and phloem.

Unit V

Study the anatomy of Primary structure of dicot stem and root.

Primary structure of monocot stem and root. Dicot leaf and monocot leaf.
Normal secondary thickening in dicot stem.

Text Books

Verma, P.S. and Agarwal, V.K.S. (2004). Cell Biology. New Delhi: S. Chand and Company Ltd.
Vashista, B.R.R. (1997). The Plant Anatomy. New Delhi: S.Chand and Co.Ltd.

Reference Books

Powar, C.B. (2005). Cell Biology. New Delhi: Himalaya Publishing House. De Robertis, E.D.P. and De Robertis, D.M.P. (1980). Cell and Molecular Biology. Philadelphia: Saunders College.
Gupta, P.K. (1997). Cytology, Genetics and Evolution. Meerut: Rastogi Publications.
Esau, K. (1953). Plant Anatomy. New York: Wiley Publication Co.
Pandey, B.P. (1982). Plant Anatomy. New Delhi: S. Chand and Company Ltd. Arthur J Eames and Laurence H McDaniels. (2005). An Introduction to Plant Anatomy. New Delhi: Tata McGraw-Hill.

Allied Practical II

Taxonomy of Angiosperms, Anatomy and Plant Physiology; Cell Biology and Plant Anatomy

Sub Code: BA17P2

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	100

Objectives

To enable the students to identify plants prescribed in the syllabus.

To learn the skills related to physiological experiments.

To develop an interest to know about the plant cell organelles and the anatomy of plant parts.

Taxonomy of Angiosperms and Plant Physiology (To be conducted during semester III)

To make dissections of the floral parts of the families prescribed in the syllabus and To make drawings to bring out the salient features including floral diagram and floral formula.

Assigning plants to their respective families.

Demonstration only

Transpiration pull

Oxygen evolved during photosynthesis

Light- screen experiment

Khune's apparatus e.

Ascent of Sap

Cell Biology and Plant Anatomy (To be conducted during semester IV)

To identify electron micrographs of the cell organelles and non living inclusions.

To observe and identify different types of tissues

Sectioning, staining, mounting and identification of primary structure of dicot stem, dicot root, monocot stem and monocot root.

Sectioning, staining, mounting and identification of Dicot and Monocot leaf.

Stomatal types – anomocytic, anisocytic, paracytic, diacytic and graminaceous.

Semester V
Major Core V: Taxonomy and Economic botany
Sub. Code: BC1751

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives

To list out the characteristic features and economic importance of selected families
To utilize the taxonomical terminology and use their skills to identify plants.

Unit I

Objectives and importance of systematic botany: Morphology – root, stem, leaf, inflorescence, flower and fruits – their modifications. Contribution to systematic botany by Indian Taxonomists – K.M. Mathew and HermenegildSantapau

Unit II

Systems of classification; Artificial – Linnaeus; Natural – Bentham and Hooker – merits and demerits; Phylogenetic - Engler and Prantle. Nomenclature – Binomial system, Principles of ICN, Type method – Principle of priority – Author citation – Effective and valid publication. Herbarium techniques. Digital Herbarium

Unit III

Detailed study of the following families with their economic importance:

Annonaceae, Brassicaceae, Rutaceae, Anacardiaceae, Caesalpiniaceae and Myrtaceae.

Unit IV

Cucurbitaceae, Rubiaceae, Solanaceae, Sapotaceae, Apocynaceae and Asclepiadaceae.

Unit V

Lamiaceae, Euphorbiaceae, Arecaceae, Cannaceae,Orchidaceae and Poaceae,

Text Book

Sharma O.P. (1993). *Plant Taxonomy*. New Delhi: Tata McGraw Hill Publishing Co Ltd.

Reference Books

Lawrence, G.H.M. (1951). *Taxonomy of Vascular Plants*. New York: MacMilan Publishers.

Singh and Jain. (1997). *Taxonomy of Angiosperms*. New Delhi: Rastogi Publications.

Pandey, B.P.S. (1997). *Taxonomy of Angiosperms*. New Delhi: S. Chand and Company Ltd.

Rendle, A.B. (1979). *The Classification of Flowering Plants* (I &II). London: Cambridge University Press.

5. Roslin, A.S. (2005). *A Text Book on Taxonomy of Flowering Plants*. Nagercoil: Assisi Offset Press.

5. Vashista, P.C. (1985). *Taxonomy of Angiosperms*. New Delhi: Vikas Publications.

Semester V
Major Core VI: Biochemistry and Biophysics
Sub. Code: BC1752

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives

To understand the structure and properties of biomolecules.
To know the role of enzymes in physiological activities.
To study the principles of bioenergetics.

Unit I

Structure and properties of water; bonds - types; pH and buffers. Carbohydrates classification; Monosaccharides: Structure and properties of glucose (structure - linear, open chain, ring form) and fructose. Disaccharides: Structure and properties of maltose, sucrose and lactose. Polysaccharides: Structure and properties of starch, cellulose and Isomerism.

Unit II

Classification, structure and properties of amino acids; Protein - primary, secondary, tertiary and quaternary. Protein denaturation and biological roles of proteins. Vitamins - fat soluble and water soluble, sources and deficiency syndrome.

Unit III

Structural classification and properties of lipids; Fatty acids structure and functions; essential fatty acids. General account of simple lipids (Triglycerides), compound lipids (Phospholipids), derived lipids (Cholesterol). Nucleic acids: Structure of DNA, RNA.

Unit IV

Enzymes: Nomenclature and classification, Structure of enzyme: activesite cofactors, coenzymes, isoenzyme; mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), enzyme inhibition and factors affecting enzyme activity.

Unit V

Bioenergetics: Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule. Photobiology - Dual nature of light and its characteristics. Electro Magnetic Spectrum, Action and Absorption spectrum, Emission spectrum – excitation and de-excitation. Phosphorescence, fluorescence and bio-luminescence.

Text Book

Jain, J.L. (2000). *Fundamentals of Biochemistry*. New Delhi: S. Chand and Co.

Reference Books

Conn, E.J. and Stumpf, P.K. (2009). *Outlines of Biochemistry*. (5th ed.) New Jersey: Wiley Eastern Ltd.,

Lehninger, A.L. (2002). *Principles of Biochemistry*. New Delhi: CBS Publishers and Distribution.

Arun Mittal, C. (2002). *Biochemistry*. New Delhi: A.P.H. Publishing Corporation.

Sathyanarayana, U. and Chakrapani, U. (1999). *Biochemistry*. Kolkatta: Books and Allied Ltd.

Campbell, M.K. (2012). *Biochemistry* (7th ed.). USA: Cengage Learning.

Campbell, P.N. and Smith, A.D. (2011). *Biochemistry* (4th ed.). New York: Churchill Livingstone Publishers.

Semester V
Major Core VII: Microbiology and Plant Pathology
Sub. Code: BC1753

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	4	75	100

Objectives

To study the role of microorganisms in soil,water and food industries.

To be equipped in specific areas in the field of microbiology to seek jobs in relevant areas.

Unit I

Morphology of bacterial cells – size, shape, arrangement, Structure of bacteria - Cell wall (chemical composition), cytoplasmic membrane, flagella, pili (fimbriae), capsule and mesosomes

Nutritional types of bacteria - autotrophs and heterotrophs

Reproduction of bacteria – binary fission, endospore formation, conjugation, transformation and transduction.

Unit II

Contributions to Microbiology: Anton Van Leeuwenhoek, Louis Pasteur and Robert Koch.

Virus - general characters -structure of DNA virus T- phage, Reproduction of bacteriophage– lytic and lysogenic cycle. Structure of RNA virus- TMV and AIDS virus.

Unit III

Growth- growth curve- pure culture, batch culture, continuous culture. Characteristics of bacteria. Physical and chemical agents for controlling microorganisms. Dry and Wet sterilization - Working principles of Autoclave, Laminar Air Flow and Incubator.

Unit IV

Food Microbiology: General account of food spoilage through microbes. Food borne infections and preventions – Botulism and Salmonellosis

Dairy microbiology – Sources of milk contamination, Pasteurization technique, Test for grading milk quality

Water microbiology: Potable and non potable water, Test for detection of coliform bacteria

Unit V

Plant pathology: An introduction to plant pathology.

Study of the following diseases with reference to causal agents, symptoms, cycle, dissemination, disease cycle and control measures of: Citrus Canker; Bunchy top of Banana; Tikka disease of Groundnut; Red Rot of Sugarcane; Late Blight of Potato

Text Book

Dubey, R.C and Maheswari, D.K. (2003). *A Text Book of Microbiology*. New Delhi: S. Chand and Company.

Reference Books

Prescott, L.M, Harley, J.P and Klein D.A. (1999). *Microbiology*. New York: McGraw Hill.

John Ingraham, L and Catherine Ingraham, A. (2000). *Introduction to Microbiology*. Singapore: Thomson Books.

Purohit, S.S. (2006). *Microbiology*. India: Agro Botanical Publishers.

Pelzar, M.H, Chan, E.C.S and Erieg, N.R. (1993). *Text Book on Microbiology*. New Delhi: Tata McGraw Hill Pub. Co. Ltd.

Mehrotra, R.S. and Ashok Agarwal (2017). *Plant Pathology*. New Delhi: Tata McGraw Hill Publishing Company Ltd.

Rangaswami, G. (1998). *Diseases of Crop Plant in India*. Delhi: Prentice Hall of India Pvt. Ltd.

Singh, R.S. (1988). *Introduction to Principles of Plant Pathology*. Delhi: Oxford and IBH Publishing Company.

Semester V
Elective III (a): Horticulture and Plant Breeding
Sub. Code: BC1754

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	5	75	100

Objectives

To learn the different techniques of vegetative propagation through hands-on training.

To develop skills for growing fresh and safe vegetables through organic farming.

Unit I

Scope and divisions of Horticulture. Propagation methods: Vegetative - advantages and disadvantages.

Cuttage - root, stem and leaf

Layerage - simple, compound and air layering

Graftage - approach, tongue and cleft.

Budding - T-budding and patch budding.

Vegetative propagules - tubers, suckers, bulbs and corm.

Unit II

Propagation by seeds - Advantages and disadvantages, raising nurseries, aftercare and transplantation.

Pomology - establishment of an orchard – planning, layout, planting and cultivation of Banana and Mango.

Special techniques – ringing, notching, smudging, de-blossoming, thinning and pruning.

Olericulture - importance and objectives of vegetable culture. Kitchen garden - site, layout and choice of plants.

Vegetable cultivation - Brinjal and Tomato.

Plantation crops - Tea, Cardamom, Pepper and Cloves.

Unit IV

Floriculture: Principles and components of ornamental garden - Layout of lawns, topiary, pergolas and hedges. Rockery, bonsai, water garden and indoor hanging basket.Commercial floriculture with reference to Jasmine and Rose.

Unit V

Plant breeding: definition, scope and objectives. Introduction, Methods of selection – pure line, mass and back cross methods. Hybridization techniques - F_1 seeds. Role of polyploids in crop improvement.

Text Books

Kumar, N. (1997). *Introduction to Horticulture*. Nagercoil: Rajalakshmi Pub.

Sharma, J.R. (1994). *Principles and Practice of Plant Breeding.* New Delhi: Tata McGraw- Hill Publishing Company Ltd.

Reference Books

Michael J. McGroarty. (2007). *Easy Plant Propagation.* U.K.: Author House.

Manibhushan Rao, K. (2003). *Text book of Horticulture.* New Delhi: Macmillan India Ltd.

Chadha, K.L. (2003) *Hand book of Horticulture.* New Delhi: ICAR publication.

Sheela, V.L.(2011). *Horticulture*. Chennai: M.J Publishers.

Robert. W. Allard. (1999). *Principles of Plant Breeding.* New York: Wiley & Sons Inc.

Singh B.D. (1994).*Plant Breeding*. New Delhi: Kalyani Publishers.

Semester V
Elective III (b): Forestry
Sub. Code: BC1755

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	5	75	100

Objectives

To enable the students to have a broad knowledge about the forest and forest products.

To know forest management plans.

Unit I

Importance of forest– utility and values of forests: Commercial benefits, ecological benefits and aesthetic benefits. Forest as a balanced ecosystem; Types and distribution of forest with reference to India and Tamilnadu (Champion and Seth's classification).

Forest management and conservation - Regeneration - Tending operations - Sustainable utilization of forest resources - Forest organizations. Role of remote sensing in forest management. Eco tourism.

Unit III

Forest utilization - Harvesting, conservation, storage and disposal of wood in forest; major and minor forest products; Forest based industries - paper and pulp industry, resin tapping and turpentine manufacture.

Unit IV

Forest degradation - Damage caused by fire, climatic factors and injuries by insects, plants, animals and diseases, activities of man including encroachment and shifting cultivation; Measures to protect the forest damage caused by various factors. Social forestry.

Unit V

Agroforestry - objectives - advantages and disadvantages - Energy plantations; recreational forestry - role of botanical gardens, Zoos, National Parks and Sanctuaries in recreation/conservation of wild life, social forestry.

Text Book

Anandan Kumaravelan, R (2005). *Environmental Science and Engineering*. Chennai: Seitech publication (India) Pvt. Ltd.

Reference Books

Kasturi Reddy (2010). *Biodiversity and Land Conservation*. New Delhi: Pacific publication.

Rana, S.V.S. (2009). *Essential of Ecology and Environmental Science*. (4th ed.). New Delhi: PHI learning Pvt. Ltd.

Rao, M. K. (2011). Environmental and Climate Change, New Delhi: Manglam publications.

Shukla, R.S. and Chandel, P.S. (2006). A Text Book of Plant Ecology. New Delhi: S. Chand and Co.

Trivedi, P.R. and Gurdeep Raj. (2002). Environmental Ecology, New Delhi: Akashdeep Publishing House.

Semester V
Elective III (c): Biological Techniques
Sub. Code: BC1756

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	5	75	100

Objectives

To know the techniques of preparing permanent slides.

To study the principle, working mechanism and uses of instruments used in biology.

Unit I

Microscopy and micrometry: Light microscopic techniques-Principles of microscopy types- light –dark field. Electron microscopy-TEM and SEM.

Unit II

Micro technique –fixatives, stains-dehydration and embedding-sectioning with rotary microtome and staining-microphotography-principles and methods.

Unit III

Basics of weights- Atomic weight, molecular weight, Gram molecular weight, Equivalent weight, Gram equivalent weight, Units measurements-units of length, units of area, units of volume, units of mass, units of depth, units of speed, units of temperature and Concentrations- Density, specific gravity, expression of concentration of solutions (molar(M), normal(N), Weight - volume per cent w/v, osmolar, molal(m), parts per million(PPM), Per cent by weight (W/W), expression of concentration of ionic strength, expression of concentration in logarithmic form (pH).

Centrifugation techniques-basic principles, types and their applications with special reference to Ultracentrifuge.

Unit IV

Spectroscopic techniques-basic principles-Basic laws of light absorption-visible and UV spectrophotometry.

FTIR Spectroscopy, NMR Specroscopy

Unit V

Chromatographic techniques-basic principles and applications of Paper Chromatography; Thin Layer Chromatography and Column Chromatography.

Electrophoresis technique: Principles, types and applications – Agarose Gel Electrophoresis, SDS – PAGE.

Text Book

Veerakumari, L. (2006). *Bioinstrumentation*. Chennai: MJP Publishers.

Reference Books

Anbalagan,K. (1985) *Electrophoresis*. New Delhi: Life Science Book House.

David Plummer, (2008) *An introduction to practical Biochemistry* . (3rd ed.). New Delhi: Tata McGraw-Hill,

Jeyaraman, J. (1981). *Laboratory Manuel in Biochemistry*. New Delhi: Wiley Eastern Ltd.

Stock, R and Rice, C.B.F. (2013). *Chromatographic Methods*. London: Chapman & Hall.

Kothari C.R. (2013) *Research Methodology*: *Methods and Techniques*. (2nd Ed.). Kochi: New Age International (P)Ltd.

Edward Chee Tak Yeung, Claudio Stasolla, Michael John Sumner and Bing Quan Huang (2015). *Plant Microtechniques and Protocols*. Switzerland: Springer International Publishing.

Semester V
Major Practical V
Taxonomy and Economic Botany and Biochemistry and Biophysics
Sub. Code: BC17P5

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	2	60	-

Objectives

To enable the students to identify and to know the economic importance of plants.
To quantitatively estimate the different plant biomolecules.

Taxonomy and Economic Botany

Identification of commonly available Leaves, Inflorescence and Fruit types
Technical description of plant parts, including floral parts (L.S. of flower, floral diagram and floral formula) with reference to the families prescribed in theory.
Identification of the plant specimens with reference to their families following the Bentham & Hooker's classification.
Survey of locally available plant species belonging to the families prescribed in the syllabus
Taxonomic field trip under supervision and submission of 10 photographs. Field note book to be submitted for external evaluation.
Study of various modifications and record of economically important products from the members of the families prescribed in the syllabus.
Submission and Record note book, Photographs and Field note book

Biochemistry and Biophysics

Verification of Beer's law
Quantitative estimation of soluble starch by Colorimetry (Iodine-Test Method)
Quantitative estimation of insoluble starch by gravimetric method
Quantitative estimation of sugar by Colorimetry (Phenol - Sulfuric Acid method)
Quantitative estimation of proteins in plant samples. (Lowry's method)
Titration of weak acid against strong base
Preparation of Buffers
Separation of dye mixture by circular paper chromatography
Spotters –a. Instruments – Colorimeter, pH meter
b. Enzyme model - Lock and Key, Koshland's induced fit model
c. Effect of pH on enzyme activity
d. Effect of substrate concentration on enzyme action
Fluorescence
Phosphorescence
Demonstration
Qualitative estimation of Glucose (Benedict's Test)
Qualitative estimation of Starch (Iodine Test)
Qualitative estimation of Protein (Biuret Test)
Qualitative estimation of Lipid (Sudan III Test)

Semester V

Major Practical VI: Microbiology and Plant Pathology

Sub. Code: BC17P6

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
2	2	-	-

Objectives

To identify the plant pathogens and the diseases caused by them.
To improve their capacities in microbiology in maintaining the accuracy in diagnostic approach.

I. Demonstration only

Bacterial culture. (plate, slant)
Gram's staining of bacteria.
Analysis of milk – Dye reduction test.
Detection of Coliform bacteria in water samples.
Motility Test (hanging drop)

Spotters

Sterilization - Autoclave, Pressure Cooker, Laminar Air Fow, Hot Air Oven.
Ultrastructure of Bacteria and Bacteriophage
Plant pathology specimens
Citrus Canker
Bunchy top of Banana
Tikka disease of Groundnut
Red Rot of Sugarcane
Late Blight of Potato
Photographs of famous Microbiologist

III. Field Visit

Dairy farm visit.

Semester V
Skill Based Course: Floriculture
Sub. Code: BSK175

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	100

1. To learn the cultivation methods of cut flowers.
2. To develop an interest to create a garden around the home and office to reduces the stress related depression.

Unit I

Introduction: Importance and scope of floriculture - pluck flowers – cultivation of *Chrysanthemum*, *Polyanthus*, Jasmine, Rose and Gomphrena.

Unit II

Soil sterilization: Seed sowing – Pricking - Planting and transplanting - Shading - Stopping or pinching – Defoliation – Wintering- Mulching - Topiary.

Unit III

Cultivation of plants in pots; Indoor gardening- Bonsai. Cultivation of *Anthurium* and *Orchids*.

Unit IV

Features of a garden: Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden.

Unit V

Flower arrangement: General Principles of flower arrangement - Western and Japanese style - Dry flower decorations.

Text Books

Randhawa,G.S. and Mukhopadyay A. (1986). *Floriculture*. New Delhi: Mac Milan India Ltd.

Kumar, N. (1986).*Introduction to Horticulture*. Nagercoil: Rajalakshmi Publishers

Reference Books

Ray. R. Larsen. (2013). *Introduction to Floriculture*. London: Academic Press.

Charles.P.Griner. (2011). *Floriculture – Designing and Merchandising.* U.S.: Cenage Publishers.

Rao K.M. (1991). *Text Book of Horticulture*. New Delhi: Mac Milan India Ltd.

Sheela V.L. (2011). *Horticulture*. Chennai: M.J. Publishers.

Hartman H.T and Kester. D.E. (1976). *Plant Propagation Principles and Practices*. New Delhi: Prentice Hall of India.

Semester VI
Major Core VIII: Genetics, Biostatistics and Bioinformatics
Sub. Code: BC1761

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

To enable the students to predict genetic inheritance patterns using Mendelian. principles.
To generate logical interpretations and conclusions from graphs, models, and data of scientific research.

Unit I

Mendel's laws of heredity with reference to monohybrid and dihybrid crosses. Incomplete dominance, Codominance. Lethal genes in mice and maize. Gene interaction - comb shape in fowls-complementary genes, epistasis (dominant-12:3:1 and recessive-9:3:4), Sex-linked inheritance.

Unit II

Polygenic inheritance with reference to ear length in maize; Multiple alleles with reference to ABO blood group in man, Rh factor. Linkage, crossing over and its significance.

Unit III

DNA as the Genetic material, Cell division, Replication of DNA (semi conservative method). Mutationtypes - Chromosomal abberations- addition, deletion, translocation, inversion, polyploidy.

Chromosomal abnormality- Down Syndrome and Klinefelter Syndrome.

Unit IV

Biostatistics: Importance of statistics in Biology, sampling - random sampling, collection and interpretation of data, tabulation, presentation of data - frequency distribution, frequency curve, frequency polygon, histogram and bar diagrams. Measures of central tendencies -mean, median and mode. Measures of dispersion – standard deviation, standard error, Null hypothesis - Chi - square test.

Unit V

Bioinformatics: Introduction –Biological data bases- classification; primary, secondary, specialized. Importance data bases- NCBI, Swiss-Prot, DDBJ. Application of Bioinformatics.

Text Books

Verma, P.S. Agarwal, V.K., (1994). *Genetics*. New Delhi: S. Chand and Company Ltd.

John De Britto. (2011). *Biosatatiscs*. Sivakasi: Anto Art

Mani K and Vijayaraj N. (2003). *Bioinformatics for the Beginners*. Coimbatore: Kalailatheer Achagam.

Reference Books

Gupta P.K. (1997). *Cytology, Genetics and Evolution*. Meerut: Rastogi Publications.
Gardner, E.J. Simmons, M.J. Snustad, D.P. (1991). *Principles of Genetics*. 8th edition India: John Wiley & sons.

Snustad, D.P. and Simmons, M.J.(2010). *Principles of Genetics*. (5th ed). India: John Wiley & Sons Inc.
(9th ed.).U.S.A: Benjamin Cummings Publishers

Griffiths, A.J.F. Wessler, S.R. Carroll, S.B.Doebley, J. W. H. (2010).*Introduction to Genetic Analysis.* (10th ed.). U.S.A: Freeman and Co.

Gurumani, N. (2005). *An Introduction to Biostatistics*. (2nd ed.). Chennai: MJP Publishers.

Prasad S. (1990). *Elements of Biostatistics*. Meerut: Rastogi Publications.

Semester VI
Major Core IX: Biotechnology and Molecular Biology
Sub. Code: BC1762

No. of Hours per Week	Credits	Total No. of Hours	Marks
6	5	90	100

Objectives

To learn and apply the general principles of biotechnology and ensure adequate training in modern biotechnology

To evaluate and use biological information effectively, ethically, and legally.

Unit I

Definition and scope of biotechnology. Introduction to genetic engineering- Principles of recombinant DNA technology, gene cloning, cloning vectors-plasmids, cosmids, binary and shuttle vectors, restriction enzymes –exonucleases, endonucleases: type I, II and III. and Ligases. Gene transfer methods- Fragmentation, Microinjection, shot gun methods.

Unit II

Scope and importance, laboratory requirements for plant tissue culture, Sterilization techniques

Culture media preparation (M.S. Medium). Concept of totipotency – differentiation, de-differentiation and redifferentiation. Explants- culture of explants, callus induction and maintenance, callus sub culture on a fresh nutrient medium, Organogenesis

Unit III

Protoplast culture-Isolation and purification, culture and regeneration, uses of cultured protoplasts. Somatic hybridization- methods, production of Hybrids and Cybrids. Production of haploid plants – Anther culture and Pollen culture. Production of somatic embryos.

Transgenic plants- merits and demerits; Cryopreservation, Brief knowledge on IPR

Unit IV

DNA Replication in prokaryotes and transcription in prokaryotes, Protein Synthesis- Translation, post translation processing, inhibitors of protein synthesis

Unit V

Characteristic of Genetic Code, Codons, anticodons. Degeneracy of codons, Wobble hypothesis.

Gene regulation in Prokayotes- Lac Operon. Gene Mutation- Molecular mechanism, Mutagens, DNA Repair mechanisms.

Text Books

Dubey, R.C. (2006). Text Book of Biotechnology. New Delhi: S. Chand and Company Ajoy Paul, (2011). Text Book of Cell and Molecular Biology. Jaipur: Books and Allied Pvt. Ltd.,Transgenic plants- merits and demerits; Cryopreservation, Brief knowledge on IPR

Unit IV

DNA Replication in prokaryotes and transcription in prokaryotes, Protein Synthesis- Translation, post translation processing, inhibitors of protein synthesis

Reference Books

Ignacimuthu. S. (1999). *Basic Biotechnology.* New Delhi: Tata McGraw Hill publishing company Ltd.

Ramawat K.G. (2003). *Plant Biotechnology.* New Delhi: S.Chand and Company.

Adrian Slater, Nigel Scott and Mark Fowler. (2003). *Plant Biotechnology*. New York: Oxford University press.

Rajni Gupta and Mukerji K.G. (2001). *Microbial Technology*. New Delhi: A.P.H Publishing Corporation.

Chawla, H.S. (2004). *Introduction to Plant Biotechnology*. (2^{nd} ed.). London: Oxford University.

David Freifelder (2002). *Essentials of Molecular Biology*. New Delhi: Narosa Publishing House.

William H. Elliot and Daphne C. Elliot, (2001).Biochemistry and Molecular Biology. (2^{nd} ed.). London: Oxford University Press.

Robert. F.(2003). Molecular Biology. (2^{nd} ed.). New Delhi: McGraw Hill Publishers.

Semester VI
Major Core X: Plant Physiology and Metabolism
Sub. Code: BC1763

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	5	75	100

Objectives

To understand biological, and physiological activities of plant cells.

To integrate and interconnect plant physiological knowledge in agriculture, forestry, environmental science and genetics.

Unit I

Plant-water Relations: Importance of water- imbibitions, diffusion, osmosis and plasmolysis. Concepts of water potential and its components. Transpiration and its significance, guttation. Factors affecting transpiration.

Unit II

Mineral Nutrition: Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Ascent of sap. Mechanism SPAC Concept. Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps, root pressure theory. Hydroponics

Unit III

Photosynthesis: Ultrastructure of chloroplast, Photosynthetic pigments structure; Photosystem I and II, reaction centre, antenna molecules; Electron transport (cyclic and non cyclic) and photophosphorylation; C3, C4 and CAM pathways of carbon fixation; Photorespiration.

Unit IV

Respiration: Ultrastructure of mitochondria, Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, GS-GOGAT pathway. Nitrogen metabolism**:** Biological nitrogen fixation; Nitrate and ammonia assimilation.

Unit V

Plant Growth Regulators: Growth, Growth curve, Physiological roles of Auxin, Gibberellin, Abscisic acid and Ethylene. Photoperiodism (SDP, LDP, Day neutral plants); Vernalization, Phytochrome.

Text Book

Jain V. K. (2006). *Fundamentals of Plant Physiology*. New Delhi: S. Chand and Company Ltd.

1. Taiz, L., Zeiger, E., Moller, I.M. and Murphy. (2015). *Plant Physiology and Developmen*t. (6th ed.). USA: A Sinauer Associates Inc.

2. Hopkins, W.G., Huner, N.P. (2009). *Introduction to Plant Physiology*. (4th ed.) U.S.A: John Wiley and Sons.
3. Bajracharya D. (1999). *Experiments in Plant Physiology- A Laboratory Manual*. New Delhi: Narosa Publishing House.

4. Pandey K.K and Sinha B.K, (1988). *Plant Physiology.* New Delhi: Vikas Publications.

Semester VI
Elective IV (a): Marine Botany
Sub. Code: BC1764

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	4	75	100

Objectives

To understand the different adaptations (morphological, physical, conduct) of living beings in the marine environment.

To recognize the marine pollution and conservation methods.

Unit I

Classification of marine habitat – pelagic, neritic and oceanic province, benthic – zonation – shore environment – muddy, rocky and sandy, waves and tides deep sea bottom – pelagic deposits. Oceanography: Marine environment - physical and chemical properties of sea water.

Unit II

Marine biodiversity – phytoplankton, Zooplankton,marine bacteria, marine fungi, seaweeds and sea grasses. Threats and conservation of seaweeds and sea grasses.

Unit III

Marine products: traditional uses - human food and agriculture. Marine colloids and hydrocolloids – Agar–agar, algin, alginates, carrageenan, diatomite. Marine bioactive compounds from mangroves, seaweeds and seagrasses.

Unit IV

Marine pollution: Pollution due to heavy metals - radioactive wastes, thermal, algal blooms and oil spills – possible remedies – oil eating bacteria – GMO and pollution abatement.

Mangroves – present status and stresses on mangroves, regeneration of mangroves, coral reefs – ecology, species interaction, economic importance and conservations.

Text Book

Newell and R.C Newell. (1977). *Marine Plankton- A Practical Guide.* U.K.: Hutchinson and Co Ltd.

Reference Books

Clinton.J.Dawes. (1981). *Marine Botany*. New York: John Wiley and Sons.

Tait, R.V. (2013). *Elements of Marine Ecology*. U.K.: Butterworth and co (Publisher) Ltd.

Pringsheim, E.G. (2016) *Pure Cultures of Algae*. New York: Hafner Publishing Company.

Sinha, P.C. (1998). *Marine Pollution*. New Delhi: Anmol Publications Pvt. Ltd.

Semester VI

Elective IV (b): Organic Farming

Sub. Code: BC1765

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	4	60	100

Objectives

To sensitize the need and generating knowledge and skill on various organic farming practice 2. To carry out organic agricultural farming and retailing it.

Unit I

Organic Farming- Introduction, A legacy of damaged soils. Retail chemicals farming made cheap and easy. Contamination of food products by pesticides and chemicals. Threat to biodiversity. Present status of organic farming in India

Unit II

Soil: Assessment of soil, Fertility of soil, Importance of organic matter, Water retentivity and aeration of soil, Soil pH, Soil reclamation.

Unit III

Balanced Nutrient Supply- Sources of nutrients for organic farming. FYM, Rural Compost, City Compost, Oil cakes, Animal waste, Bio-fertilizer and Vermicompost.

Nutrient content of the above source (data chart).

Green manure, Liquid manure (Panchagavya)

Unit IV

Plants: Choosing the right crop for the environment, Best management practices for organic farming

Types of farming – Definition, Concepts and benefits – Pure Organic Farming, Integrated Organic system (Combination of organic and inorganic) and mixed farming

Unit V

Pest Management – Integrated pest and disease management. Organic pesticides, Bio-pesticides, Feasibility of complete dependence of organic sources.

Required management practices for organic farming certification

Text Book

Arun K. Sharma. (2005). *Handbook of Organic Farming*. India: Agrobios

Reference Books:

Charles.A. Francis. (2009). *Organic Farming – The ecological System*. U.S.A: Book and Multimedia Publishing Committee.

Lockeretz, W. (2007). *Organic Farming – An international History*. U.K.: Cornwell Press

Dilip Nandwani. (2016) *Organic Farming for Sustainable Agriculture*. Switzerland: Springer International Publishing,

Mukesh Gupta. (2004). *Organic Agriculture Development in India*. Jaipur: ABD Publishers.

Ann Larkin Hansen. (2010). *The Organic Farming Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm*. Massachusetts: Storey Publishing

Semester VI
Elective IV (c): Ecotourism
Sub. Code: BC1766

No. of Hours per Week	Credits	Total No. of Hours	Marks
5	4	75	100

Objectives

To highlight the need for sustainable tourism.
To be aware about the role of various movements in the protection of nature and natural resources.

Unit I

Definition, introduction and scope. Classification of tourism: religion tourism, cultural tourism, heritage tourism, monumental tourism, adventure tourism, mass tourism, consumptive and non consumptive tourism.

Unit II

Interesting Eco-Tourism Places - global, national, regional (any five in each category). Eco circuit of Western Ghats. Identification of nature based ecotourism. Maintenance of ecological centers.

Unit III

Ecotourism opportunities - dam sites, waterfalls, mangroves, bird sanctuaries, pilgrim tourism, forest area, parks, sacred groves, beaches, wildlife sanctuaries and national parks.

Unit IV

Impact of Ecotourism: Economical, socio-cultural and environmental impacts. Ecotourism and education. Ecotourism related organizations. Ecotourism research. Disasters and ecotourism. Coastal management activities related to ecotourism. Need for sustainable tourism.

Unit V

Infra structural facilities for ecotourism. Funding agencies- government, private Legislations to be followed, Strategies to maintain these areas in an ecological sustainable way.

Text Books

Dasman RF (1968). *Environmental Conservation*: John Wiley and Sons, New York.
Jadhav and Bhosale*. Environmental Protection and Laws*, V.M. Himalaya publishing House.

Reference Books

Mukherjee N (2008) *Ecotourim and sustainable Development*. Cybetech Publications, NewDelhi

Prabhas Chandra (2003) *Global Ecotourism*, Kaniskha Publishers, New Delhi.

Sinha, P.C (2003) *Encyclopedia of Ecotourism*, Volume I, II and III, Anmol Publications Pvt. Ltd., New Delhi.

Weaver DB (2001) *The Encyclopedia of Ecotourism*, CABI Publishing, U.K.

Major Practical V
Taxonomy and Economic Botany and Biochemistry and Biophysics
Sub Code: BC17P5

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	-	100

Objectives

To enable the students to identify and to know the economic importance of plants.

To quantitatively estimate the different plant biomolecules.

Taxonomy and Economic Botany

Identification of commonly available Leaf, Inflorescence and Fruit types
Technical description of plant parts, including floral parts (L.S. of flower, floral diagram and floral formula) with reference to the families prescribed in theory.
Identification of the plant specimens with reference to their families following the Bentham & Hooker's classification.
Survey of locally available plant species belonging to the families prescribed in the syllabus
Taxonomic field trip under supervision and submission of 10 photographs. Field note book to be submitted for external evaluation.
Study of various modifications and record of economically important products from the members of the families prescribed in the syllabus.
Submission and Record note book, Photographs and Field note book

Biochemistry and Biophysics

Verification of Beer's law
Quantitative estimation of soluble starch by Colorimetry (Iodine-Test Method)
Quantitative estimation of insoluble starch by gravimetric method
Quantitative estimation of sugar by Colorimetry (Phenol - Sulfuric Acid method)
Quantitative estimation of proteins in plant samples. (Lowry's method)
Titration of weak acid against strong base
Preparation of Buffers
Separation of dye mixture by circular paper chromatography
Spotters –a. Instruments – Colorimeter, pH meter
b. Enzyme model - Lock and Key, Koshland's induced fit
model c. Effect of pH on enzyme activity
d. Effect of substrate concentration on enzyme action
Fluorescence
Phosphorescence
Demonstration
Qualitative estimation of Glucose (Benedict's Test)
Qualitative estimation of Starch (Iodine Test)
Qualitative estimation of Protein (Biuret Test)
Qualitative estimation of Lipid (Sudan III Test)

Major Practical - VI

Genetics, Biostatisticsand Bioinformatics & Biotechnology and Molecular Biology

Sub. Code: BC17P6

No. of Hours per Week	Credits	Total No. of Hours	Marks
4	2	60	100

Objectives

1. To solve genetics problem that involve monohybrid, dihybrid and interaction of genes.
   To establish linkages with international resources in biotechnology information.
   Eg. Databases.
   To develop understanding of techniques for tissue culture and cell culture.

Genetics and Biostatistics and Bioinformatics

To prepare root tip squash of onion and to identify the various stages of mitosis.
Solving genetic problems related to monohybrid, dihybrid ratio and interaction of genes (minimum of six problems in each topic).
Finding out mean, median, mode and standard deviation for the given data.
Problems using Chi-square test.
Study of models showing

- DNA structure and replication
- Linkage and crossing over
- Mutation

Biotechnology and Molecular Biology

Sterilization techniques
Preparation of MS medium
Meristem culture
Demonstration:
PCR Technique
Southern and Northern Blotting Technique.
Spotters:
Photos/models/instruments
Anther culture, Pollen culture and protoplast fusion. Vectors/Plasmids
Southern and Northern Blotting Technique.
Methods of direct gene transfer –Microinjection andShort Gun Method Transgenic plants – Bt-cotton and Golden Rice

Semester VI
Major Practical VII
Microbiology and Plant Pathology & Plant Physiology and Metabolism
Sub. Code: BC17P7

No. of Hours per Week	Credits	Total No. of Hours	Marks
2	2	30	100

Objectives

To identify the plant pathogens and the diseases caused by them.

To build up the knowledge in pertinent plant physiological process.

Microbiology and Plant Pathology

Demonstration/Spotters

Sterilization - autoclave, pressure cooker, laminar air flow, sprit lamp, inoculation needle.

Ultrastructure of Bacteria and Bacteriophage

Plant pathology specimens

- Citrus Canker
- Bunchy top of Banana
- Tikka disease of Groundnut
- Red Rot of Sugarcane
- Late Blight of Potato

Demonstration only

- Bacterial culture(plate, slant).
- Gram's staining of bacteria.
- Analysis of milk – Dye reduction test.
- Detection of Coliform bacteria in water samples.

Dairy farm visit.

Plant Physiology and Metabolism

Imbibition – by direct weighing method

Plasmolysis – Onion Peel

Determination of water potential by Chardakov's method.

Determination of water absorption and transpiration ratio.

Rate of photosynthesis under varying concentration of CO_2

Effect of quality of light on evolution of O_2 during photosynthesis -colour filters.

Quantification of plant pigments by spectrophotometric method.

Respiration- R.Q using Ganong's respirometer.

Demonstration only

Imbibition - Dialatometer

Tissue tension

Suction due to transpiration

Khune's fermentation

Growth – Arc auxanometer

- Phototropism
- Clinostat.