

B.Sc. BOTANY

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	HRS / WEEK	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	14 U1LT1/LA1/ LF1/LH1/LU1	I	Language - I		6	3	40	60	100
	14 UCN1E1	II	English – I		6	3	40	60	100
	14UCH1A1:2	III	Allied I	Inorganic and Organic Chemistry	5	2	20	30	50
	14 UCH 1A1P	III	Allied I	Volumetric Analysis - Practical	3	2	20	30	50
	14 UBO 1C1	III	Core I	Algae, Fungi, Lichens and Bryophytes	2	2	20	30	50
	14 UBO 1C1P	III	Core I	Algae, Fungi, Lichens and Bryophytes - Practical	2	2	20	30	50
	14 UBO 1M1	III	Major Based Elective – I	Biological Techniques	3	3	40	60	100
14 UCN1VE	IV	Value Education	Value Education	3	3	40	60	100	
TOTAL					30	20	240	360	600
II	14 U2LT2/LA2/ LF2/LH2/LU2	I	Language - II		6	3	40	60	100
	14 UCN2E2	II	English – II		6	3	40	60	100
	14UCH2A2:2	III	Allied II	Bio Organic Chemistry	5	2	20	30	50
	14 UCH 2A2P	III	Allied II	Organic Analysis – Practical	2	2	20	30	50
	14 UBO 2C2	III	Core II	Pteridophytes, Gymnosperms and Paleobotany	2	2	20	30	50
	14 UBO 2C2P	III	Core II	Pteridophytes, Gymnosperms and Paleobotany - Practical	2	2	20	30	50
	14 UBO 2M2	III	Major Based Elective – II	Remote Sensing and Vegetation Analysis	3	3	40	60	100
	14 UBO 2N1	IV	Non-Major Elective – I #		2	2	40	60	100
14 UCN 2ES	IV	Environmental Studies	Environmental Studies	2	2	40	60	100	
TOTAL					30	21	280	420	700
III	14 U3LT3/LA3/ LF3/LH3/LU3	I	Language - III		6	3	40	60	100
	14 UCN3E3	II	English – III		6	3	40	60	100
	14 UZO 3A3	III	Allied III	Animal Structure and Function	4	2	20	30	50
	14 UZO 3A3P	III	Allied III	Invertebrata and Chordata – Practical	3	2	20	30	50
	14 UBO 3C3	III	Core III	Anatomy and Embryology	2	2	20	30	50
	14 UBO 3C3P	III	Core III	Anatomy and Embryology - Practical	2	2	20	30	50
	14 UBO 3M3	III	Major Based Elective - III	Plant Tissue Culture	3	3	40	60	100
	14 UBO 3N2	IV	Non-Major Elective – II #		2	2	40	60	100
	14UCN3S1	IV	Skill Based Elective - I	Soft Skills	2	2	40	60	100
TOTAL					30	21	280	420	700
IV	14 U4LT4/LA4/ LF4/LH4/LU4	I	Language - IV		6	3	40	60	100
	14 UCN4E4	II	English –IV		6	3	40	60	100
	14 UZO 4A4	III	Allied IV	Commercial Zoology	5	2	20	30	50
	14 UZO 4A4P	III	Allied IV	Animal Physiology and Commercial Zoology - Practical	3	2	20	30	50
	14 UBO 4C4	III	Core IV	Morphology and Taxonomy	4	4	40	60	100
	14 UBO 4C5P	III	Core V	Morphology and Taxonomy - Practical	4	4	40	60	100
	14 UBO 4S2	IV	Skill Based Elective - II	Biofertilizer Production	2	2	40	60	100
	14 U CN4EA	V	Extension Activities	NCC,NSS,etc.	-	2	-	-	-
	14 UBO 4EC1		Extra Credit – I	Plant Diseases	-	4*	-	100*	100*
14 UBO 4EC2		Extra Credit - II	Bio-fuels	-	4*	-	100*	100*	
TOTAL					30	22	240	360	600
V	14 UBO 5C6	III	Core VI	Cytology, Genetics and Evolution	5	4	40	60	100
	14 UBO 5C7	III	Core VII	Plant Physiology	4	4	40	60	100
	14 UBO 5C8	III	Core VIII	Biotechnology	4	4	40	60	100
	14 UBO 5C9	III	Core IX	Bioinformatics, Biostatistics and Computer Applications	4	4	40	60	100
	14 UBO 5C10P	III	Core X	Cytology, Genetics, Evolution And Plant Physiology – Practical	4	4	40	60	100
	14 UBO 5C11P	III	Core XI	Biotechnology, Biostatistics And Bioinformatics - Practical	4	4	40	60	100
	14 UBO 5M4	III	Major Based Elective - IV	Economic Botany	3	3	40	60	100
	14 UBO 5S3	IV	Skill Based Elective - III	Gardening	2	2	40	60	100
	14 UBO 5EC3		Extra Credit - III	Food and Dairy Microbiology	-	4*	-	100*	100*
TOTAL					30	29	320	480	800
VI	14 UBO 6C12	III	Core XII	Biochemistry and Biophysics	5	4	40	60	100
	14 UBO 6C13	III	Core XIII	Horticulture and Plant Breeding	5	4	40	60	100
	14 UBO 6C14	III	Core XIV	Ecology and Phytogeography	5	4	40	60	100
	14 UBO 6C15	III	Core XV	Microbiology and Immunology	4	4	40	60	100
	14 UBO 6C16P	III	Core XVI	Biochemistry, Biophysics, Horticulture And Plant Breeding – Practical	4	4	40	60	100
	14 UBO 6C17P	III	Core XVII	Microbiology, Immunology Ecology And Phytogeography - Practical	4	4	40	60	100
	14 UBO 6S4	IV	Skill Based Elective - IV	Organic Farming	2	2	40	60	100
	14 UCN 6GS	V	Gender Studies	Gender Studies	1	1	40	60	100
	14 UBO 6EC4		Extra Credit-IV	Global Warming	-	4*	-	100*	100*
TOTAL					30	27	320	480	800
GRAND TOTAL					180	140	1680	2520	4200

Non Major Elective Courses offered to the other Departments:

SEM	COURSE TITLE
II	Mushroom Cultivation
III	Medicinal Botany

* Not considered for Grand Total and CGPA

SEMESTER I: CORE I
ALGAE, FUNGI, LICHENS AND BRYOPHYTES

Course Code : 14UBO 1C1
Hours/Week : 2
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To learn about the lower and primitive groups of plants
- To understand the plant diversity and its economic uses

UNIT I 6 hours

Algae: General characteristics, Classification of algae (F.E. Fritsch), Cell structure of prokaryotic and eukaryotic algae, Various habitats of algae – terrestrial, aquatic – freshwater, marine.# Economic importance.#

UNIT II 6 hours

Structure and life cycle of the following genera: Cyanophyceae – *Oscillatoria*, Chlorophyceae – *Volvox*, Phaeophyceae –# *Ectocarpus*#.

UNIT III 6 hours

General characteristics, Classification of fungi (Alexopoulos and Mims), #Economic importance#. Structure and life cycle of the following genera: *Albugo*, *Puccinia*, *Lichens* – *Usnea*.

UNIT IV 6 hours

Plant pathology: Fungal disease – Tikka disease of groundnut, Bacterial disease – Citrus canker, Viral disease –# Tobacco mosaic virus.#

UNIT V 6 hours

Bryophytes: #General characters# – Classification (Rothmaler, 1951). Economic importance. A detailed study of structure, reproduction and life cycle of the following genera – *Riccia*

#.....#. Self Study portion

T.B -1 Annie Ragland, Algae and Bryophytes, Saras Publication, 2010.

T.B -2 Dube H.C. An introduction to fungi. Vikas Publishing House, 2005.

T.B -3 Vashishta B.R and A.K. Sinha, Fungi, 2005.

T.B -4 Annie Kumarasan, lichens, Saras Publication, 2010.

UNIT I Chapter – 1, 2 and 22. T.B -1

UNIT II Chapter – 3,6,15. T.B -1

UNIT III Chapter – 1,2,13 and 24. T.B -2

UNIT III Chapter – 1,6,14 and 20. T.B -2

UNIT IV Chapter – 15. T.B -3

UNIT V Chapter – 3,6,15. T.B -1

SEMESTER I: CORE I
ALGAE, FUNGI, LICHENS AND BRYOPHYTES - PRACTICAL

Course Code : 14UBO1C1P
Hours/Week : 2
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To learn identification of lower and primitive group of plants.
1. Study of Compound and Dissecting microscope.
 2. Make Micropreparation of vegetative and reproductive structures of the following types-
Oscillatoria, *Volvox*, *Oedogonium*, and *Ectocarpus*.
 3. Make micropreparation of vegetative and reproductive parts *Albugo*, *Puccinia*, Lichens – *Usnea*.
 4. Identify the diseases mentioned in the syllabus with respect to causal organism and symptoms.
Make micropreparations wherever necessary.
 5. Tikka disease, Bacterial disease, Citrus canker, Tobacco mosaic virus.
 6. Bryophytes – *Riccia*.
 7. Botanical tour for algal collection and submission of field report.

SEMESTER I: MAJOR BASED ELECTIVE – I BIOLOGICAL TECHNIQUES

Course Code : 14UBO1M1
Hours/Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn basic and necessary laboratory techniques and their principles and applications.

UNIT I 9 hours

Basic principles - operating mechanism and applications of autoclave, hot air oven, laminar air flow, pH meter and Incubator. General safety - personal safety, biological safety, chemical safety, #fire safety and waste disposal#.

UNIT II 9 hours

Basic principles and applications of spectroscopy- Basic principles, components and applications of calorimeter -# Basic principles of centrifuge and chromatography.#

UNIT III 9 hours

Techniques for proteins and nucleic acid: Electrophoresis- SDS PAGE, Agarose gel electrophoresis- Basic principles, components and #applications of transilluminator and gel doc#.

UNIT IV 9 hours

Advance biological techniques: #Basic principles of Polymerase chain reaction#- Southern blotting- Northern blotting- Western blotting.

UNIT V 9 hours

Cryopreservation- Basic principles and general methods- freezing of tissues, storage, thawing, reculture of frozen materials- #Vitrification#- Lyophilization.

#.....# **Self Study portion**

Text Books

T.B -1 R.C. Dubey, A text book of Biotechnology, S. Chand and Company Ltd. 2006.
T.B -2 Manipal Singh Shekhawat, Plant cell and tissue culture, Saras Publication, 2010.

UNIT I Chapter – 4. T.B -2
UNIT II Chapter – 3. T.B -1
UNIT II Chapter – 3. T.B -1
UNIT III Chapter – 3. T.B -1
UNIT IV Chapter – 3 and 6. T.B -1
UNIT V Chapter – 23. T.B -2

SEMESTER I: VALUE EDUCATION

Course Code : 14UCNIVE
Hours/Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Prescribed Common Syllabus for all the UG degree

SEMESTER II: CORE – II
PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Course Code : 14UBO2C2
Hours/Week : 2
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To learn the diversity of higher cryptogams and their evolution.
- To understand the usage of fossils to study past plant.

UNIT I

6 hours

Pteridophytes – History – origin of pteridophytes – general characters – classification (Sporne, 1970) – Stelar evolution - characters of the group Psilopsida, Lycopsidea, Spenopsida and Pteropsida – #Economic importance.#

UNIT II

6 hours

A detailed study of structure, reproduction and life cycle of the following genera – *Psilotum*, *Lycopodium*, *Equisetum*, *Adiantum* and *Marsilea*.

UNIT III

6 hours

Gymnosperms: #General characteristics# and classification of Gymnosperm. Characters of groups – Cycopsida, Coniferopsida and Gnetopsida. *Cycas*: Structure, reproduction and life history of the following genera - *Pinus*: Structure, reproduction and life history

UNIT IV

6 hours

Gnetum: Structure, reproduction and #life history#. Paleozoic gymnosperms – Fern-like habit - Evolution of seed in gymnosperms – Comparison of *Cycas* ovule with angiosperm ovule.

T.B -1 B.P. Pandey, College Botany, S. Chand and company Ltd, 1999.

T.B -2 P.C. Vasishta, A.K Sinha and Anil Kumar, S. Chand Publishing Company, 2011.

T.B -3 A. Arnold, Paleobotany, TATA Mc Graw Hill Publishing Company, 1947

T.B -4 A. Rashid, An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd.1999.

UNIT I	Chapter – 1,3,10. T.B -1
UNIT II	Chapter – 3,4,6,9. T.B -1
UNIT III	Chapter – 2,4. T.B -1
UNIT III	Chapter – 1,11,12,13,14 and16 . T.B -2
UNIT III	Chapter – 1,2,3,4 and 5. T.B -4
UNIT IV	Chapter – 1. T.B -1
UNIT IV	Chapter – 17. T.B -2
UNIT IV	Chapter – 2,3,4 and 5. T.B -4
UNIT V	Chapter – 1,9,10. T.B -1
UNIT V	Chapter – 2 and14. T.B -3

SEMESTER II: CORE – II
PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY - PRACTICAL

Course Code : 14UBO2C2P
Hours/Week : 2
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To learn the identification and description of specimens belonging to higher ctyptogams.
- To learn slide preparation techniques.

Pteridophytes

Study of morphology and anatomy of vegetative and reproductive parts of the following
Psilotum, Lycopodium, Equisetum, Adiantum and *Marsilea*.

Gymnosperms

Study of morphology and anatomy of the vegetative and reproductive parts of the following-
Cycas, Pinus and *Gnetum*.

Paleobotany

Study of internal morphology of *Rhynia, Lepidodendron, Lepidocarpus, Calamites* and
Williamsonia. (Extinct and fossil forms)

**SEMESTER II : MAJOR BASED ELECTIVE II
REMOTE SENSING AND VEGETATION ANALYSIS**

Course Code : 14UBO2M2
Hours/Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To understand basic principle of remote sensing.
- To understand the basic principles of vegetation analysis.

UNIT I

9 hours

Introduction to Remote Sensing – Satellites – Polar orbitary and Geostationary satellites – Pass time – Spectral signature – Data recovery – #Introduction to Geographical information system#.

UNIT II

9 hours

Arc view, Arc info, Map maker softwares – Application packages (Google Earth) – Introduction to Global Positioning System – #Tracking, Navigation, Measurements#.

UNIT III

9 hours

Vegetation – Landscape – Landscape elements – Standard methods of vegetation sampling – Line transect, Belt transect, Plot method, Quadrat method – Database structure using simple softwares – #Application of Microsoft Excel#.

UNIT IV

9 hours

Determination of minimum sample size – Species area curve – Diversity indices – Shannon Weiner's index, Simpson's Index – Similarity indices – Sorensen's Qualitative index, Sorensen's Quantitative index – #Alpha, Beta and Gamma levels of diversity#.

UNIT V

9 hours

Vegetation mapping – Basic map reading skills – Toposheets – Calculation of geocoordinates – decimal scale conversion – Digitization of maps – Supervised and Unsupervised classification of remote sensing data – Resolution and quality of maps – Construction, #Printing and publishing of vegetation maps#.

#.....# Self Study portion

Text Books:

T.B -1 Verbyla, L.D, Satellite Remote Sensing of natural resources. Lewis Publishers, 1995.

T.B -2 Kumarasamy, Remote Sensing, 2005.

T.B -3 Magurran, A.E., Ecological Diversity and Its Measurement. Blackwell Publishing Inc. 1988.

UNIT I	Chapter – 1 and 2. T.B -1
UNIT II	Chapter – 3 and 4. T.B -1
UNIT III	Chapter – 3 and 4. T.B -2
UNIT IV	Chapter – 3 and 4. T.B -2
UNIT V	Chapter – 1, 4 and 6. T.B -2

**SEMESTER II: NON-MAJOR ELECTIVE – I
MUSHROOM CULTIVATION**

Course Code : 14UBO2N1
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To understand biology of mushrooms and to develop skill of mushroom cultivation

UNIT I **6 hours**

Introduction: Mushroom – definition, importance, history of cultivation, habitat, collection, morphology and identification of edible and #poisonous mushrooms#.

UNIT II **6 hours**

Mushroom growing: Choice of growing systems – shelves, trays, material, growing in polythene bags, mushroom house,# composting, pasteurization#.

UNIT III **6 hours**

Spawn and spawning: Strains, containers, quantity of spawn to be used, spawning techniques, #casing#.

UNIT IV **6 hours**

Crop management: Air temperature, humidity, ventilation, air-bed ratio, watering, disposal of used compost, cropping period, insects and pests, #insecticides and their use#.

UNIT V **6 hours**

Picking, grading, packing and marketing; sanitation, economics of mushroom cultivation, food value, mushroom recipes. Cultivation of button, paddy straw and #oyster mushrooms.#

#.....# **Self Study portion**

Text Book:

T.B -1 Nita Bahl, Hand book of Mushroom, Oxford and IBH Publishing Co. Pvt. Ltd. 2005.

UNIT I	Chapter – 1 and 5. T.B -1
UNIT II	Chapter – 6. T.B -1
UNIT III	Chapter – 6. T.B -1
UNIT IV	Chapter – 6. T.B -1
UNIT V	Chapter – 7,8,9,10 and16. T.B -1

SEMESTER II: ENVIRONMENTAL STUDIES

Course Code : 14UCN2ES
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Prescribed Common syllabus for all the UG degree

**SEMESTER III: CORE III
ANATOMY AND EMBRYOLOGY**

Course Code : 14UBO3C3
Hours/Week : 2
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To learn the basic principles of internal organization of plant body.
- To understand the processes of plant morphogenesis.

UNIT I

6 hours

Plant tissue- classification, Meristems, definition- Classification of meristems- apical meristems and lateral meristems -intercalary meristem- apical cell theory, Tunica – Carpus and Histogen theory Permanent tissue – simple - Parenchyma, #collenchyma and sclerenchyma#.

UNIT II

6 hours

Epidermal Tissue system, stomatal types, complex permanent tissue: Xylem – components, Ontogeny and Phylogeny; Phloem – Components, Ontogeny and Phylogeny. #Laticifer types#.

UNIT III

6 hours

Primary structure of root, stem and leaf in dicots and monocots. Secondary growth - normal in stem and root-annual rings – heart wood, sapwood, Periderm formation Anomalous secondary growth in dicot stems- *Nyctanthes* and *Boerhaavia* and monocot stem-*Dracaena*. #Nodal anatomy uni and trilacunar types#.

UNIT IV

6 hours

Development of anther. Microsporogenesis; Microgametogenesis; Ultrastructure of pollen wall-structure and development of ovule, megasporogenesis, Megagametogenesis (*Polygonum*-#type of embryo-sac development), Fertilization#.

UNIT V

6 hours

Endosperm-Nuclear, cellular, helobial and Ruminant types. Development of embryo – dicot and Monocot. Basic concepts of apomixis, apospory, #Polyembryony and Parthenogenesis#.

#.....# **Self Study portion**

Text Books:

T.B -1 Sanjay Kumar Singh, Text Book of Plant Anatomy, Campus Books, 2005.

T.B -1 Plant Anatomy and Embryology, S.N. Pandey and Ajanta Chand, Vikas Publishing house Pvt. Ltd. 2007.

UNIT I	Chapter – 4. T.B -1
UNIT I	Chapter – 4. T.B -2
UNIT II	Chapter – 5. T.B -1
UNIT II	Chapter – 5. T.B -2
UNIT III	Chapter – 16. T.B -1
UNIT III	Chapter – 10. T.B -2
UNIT IV	Chapter – 2 and 3. T.B -2
UNIT V	Chapter – 9. T.B -2

SEMESTER III: CORE III
ANATOMY AND EMBRYOLOGY - PRACTICAL

Course Code : 14UBO3C3P
Hours/Week : 2
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To observe internal organization of plant body.
- To observe the stages of plant morphogenesis.

Anatomy:

1. Preparation of Transverse Sections of the following plant parts to observe and record the internal structure.
2. Monocot and Dicot stem
3. Monocot and Dicot leaf
4. Normal secondary thickening in Dicot stem.
5. Anamalous secondary thickening in *Dracaena*, *Nyctanthes* and *Boerhaavia* stems.
6. Nodal anatomy-uni-& trilacunar.

Embryology:

1. T.S. of anther (young and mature)
2. Pollen types
3. L.S. of ovule
4. Types of ovules - orthotropous and anatropous.
5. Dicot Embryo Dissection.

**SEMESTER III : MAJOR BASED ELECTIVE III
PLANT TISSUE CULTURE**

Course Code : 14UBO3M3
Hours/Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To understand the organization and functioning of tissue culture laboratory
- To learn techniques of plant tissue culture.

UNIT I 9 hours

Introduction - History of plant culture - Laboratory organization - #Tools and techniques of plant tissue culture.#

UNIT II 9 hours

Sterilization- methods of sterilization- medium and its preparation- Plant Growth Regulators (PGR), Macro & Micro nutrients, Vitamins and its role in tissue culture. #Inoculation - Methodology & precautions#.

UNIT III 9 hours

Culture initiation- Explant- Totipotency- Dedifferentiation- Redifferentiation- Various types of culture- Callus culture, Cell culture, Anther culture, Meristem culture. #Organogenesis- Direct & Indirect#.

UNIT IV 9 hours

Micropropagation- Methods of micro propagation, somatic embryogenesis- Plant protoplast- Isolation, culture and Somatic hybridization - Somaclonal variation. Secondary plant products- Secondary metabolites of plants, origin, factors affecting the production in culture, #elicitors and roots.#

UNIT V 9 hours

Bio-transformation- Bio reactor- Cell immobilization- Synthetic seed technology, Importance and application of tissue culture- impacts on industry, forestry,# agriculture and horticulture.#

#....# Self Study portion

Text Books:

T.B -1 Mahipal Shingh Shekawat, Plant cell and Tissue culture, Saras Publication, 2010.

T.B -2 R. C. Dubey A text book of Biotechnology, S. Chand and Company, 2006.

T.B -3 Kalyan Kumar De, Plant tissue culture, New central book agency, 2008.

UNIT I	Chapter – 2. T.B -1
UNIT I	Chapter – 1 and 2. T.B -2
UNIT I	Chapter – 1. T.B -3
UNIT II	Chapter – 3. T.B -1
UNIT II	Chapter – 6 and 7. T.B -2
UNIT II	Chapter – 1. T.B -3
UNIT III	Chapter – 4. T.B -1
UNIT III	Chapter – 8 and 9. T.B -2
UNIT III	Chapter – 2,3,7,9,10 and 11. T.B -3
UNIT IV	Chapter – 5. T.B -1
UNIT IV	Chapter – 10,12,18 and 24. T.B -2
UNIT IV	Chapter – 12. T.B -3
UNIT V	Chapter – 7 and 8. T.B -1
UNIT V	Chapter – 13. T.B -3

**SEMESTER II: NON-MAJOR ELECTIVE – II
MEDICINAL BOTANY**

Course Code : 14UBO3N2
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn about medicinal use of plants.
- To learn the principles of pharmacognosy.

UNIT I

6 hours

Importance and Relevance of Herbal drugs in Indian system of Medicine, Pharmacognosy – Aim and scope: Branches of Pharmacognosy – Phytochemicals – Reserve materials: #Secretory materials: Excretory materials#.

UNIT II

6 hours

Medicinal gardening – Gardens in the hills and plains: House gardens, plants for gardening – Poisonous plants – Types of plant poison: action of poisons: #treatments for poisons; their toxicity and action#.

UNIT III

6 hours

Adulteration of crude drugs and its detection – methods of adulteration; types of adulteration. Medicinal plants of export values; Rejuvenating herbs; #Medicinal uses of Non-flowering plants#.

UNIT IV

6 hours

Botanical description and active principles of Root drugs, Rhizomes woods and #bark drugs #(Two examples for each plant organs).

UNIT V

6 hours

#Botanical description and active principles of leaves,# flowers, fruits, seeds and entire plants as drugs.

#.....# **Self Study portion**

Text Books:

T.B -1 A. Roseline, Pharmacognosy, MJP Publishers, 2011.

T.B -2 An introduction to medical botany and pharmacognosy, Emkay Publication, 2004.

UNIT I Chapter – 1. T.B -1

UNIT I Chapter – 1 and 14. T.B -2

UNIT II Chapter – 3. T.B -2

UNIT III Chapter – 15. T.B -1

UNIT IV Chapter – 13 and 14. T.B -2

UNIT V Chapter – 7,8,9,10,11 and 12. T.B -2

SEMESTER III : SKILL BASED ELECTIVE - I
SOFT SKILLS

Course Code : 14UCN3S1
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Prescribed Common syllabus for all the UG degree

**SEMESTER IV: CORE IV
MORPHOLOGY AND TAXONOMY**

Course Code : 14UBO4C4
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn the description of external morphology of higher plants.
- To learn the basic and applied aspects of plant identification and classification.

UNIT I: 12 hours

Morphology: Phyllotaxy – Inflorescence types – Description of floral parts (Calyx, Corolla, Androecium and Gynoecium) – Floral diagram – Floral formula – #Outline classification of fruits#.

UNIT II: 12 hours

System of classification: #Artificial system#, Natural system, Phylogenetic system: Bentham and Hooker system of classification – Engler and Prantl’s system of classification.

UNIT III: 12 hours

Binomial Nomenclature – International Code of Botanical Nomenclature (ICBN) – Rules of ICBN – preparation and management of Herbarium – Botanical survey of India (BSI) – Taxonomy in relation to cytology – #Taxonomy in relation to phytochemistry#.

UNIT IV: 12 hours

Detailed study on salient features, description, distribution and economic importance of the families: Annonaceae, Capparidaceae, Rutaceae, Fabaceae, Caesalpinaceae, Apocynaceae, Mimosaceae, Myrtaceae, Cucurbitaceae, #Apiaceae #.

UNIT V: 12 hours

Rubiaceae, Asteraceae, Apocyanaceae, Asclepidaceae, Solanaceae, Acanthaceae, Verbinaceae, Euphorbiaceae, Orchidaceae, #Liliaceae and Poaceae#.

#.....# Self Study Portion.

Text Books:

T.B -1 Annie Regland and Kumaresan, Angiosperms, Saras Publication, Nagercoil, 2013.
T.B -2 B.P. Pandey, Taxonomy of Angiosperms, S. Chand and Company Ltd, New Delhi, 1999.

UNIT I Chapter –5 and 6. T.B -1
UNIT II Chapter – 2. T.B -1
UNIT III Chapter – 3,4 and 8. T.B -1
UNIT IV Chapter – 12,14,18,20,27,30,34 and 48. T.B -2
UNIT V Chapter – 22,23,24,26,27,29,30,33 and 34. T.B -2

SEMESTER IV: CORE V
MORPHOLOGY AND TAXONOMY - PRACTICAL

Course Code : 14UBO4C5P
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To learn the practical description of morphology of plant specimens.
- To learn identification and description of plant families.

Morphology:

1. Phyllotaxy types
2. Types of inflorescence – Raceme, Cyme, Mixed and special
3. L.S. of Dicot flower-Hypogynous/Epigenous
4. Mounting of floral parts
5. Construction of floral diagram and floral formula.

Taxonomy:

1. Detailed study of the plants belonging to the families mentioned in theory.
2. Compulsory botanical tour for minimum of **three days**.
3. Submission of 30 herbarium sheets and tour report for (10 +5) **15 marks**.

**SEMESTER IV: SKILL BASED ELECTIVE – II
BIOFERTILIZER PRODUCTION**

Course Code : 14UBO4S2
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To develop the skill on the biofertilizer production by using various microorganisms.

UNIT I

6 hours

Introduction, Historical and early developments, Sources of nitrogen and importance of biofertilizers. Definition and types of biofertilizers, #Contribution of biofertilizers in Agriculture#.

UNIT II

6 hours

Biofertilizer demand and production, facilities and equipments required, raw materials, evaluation and specification, strain selection, sterilization, #growth and fermentation#.

UNIT III

6 hours

Production technology: Major biofertilizers – *Rhizobium*, *Azospyrillum*, *Azotobacter*, blue-green algae, *Azolla*, P-solubilizing microorganisms, #*Mycorrhizae*#.

UNIT IV

6 hours

Standards and quality control, stages required, Quality control, #Standards of quality, testing #, tests required, quality control in some countries.

UNIT V

6 hours

Biofertilizer application technology: *Rhizobium*, *Azotobacter*, *Azospyrillum*, *Azolla*, Blue-green algae, *Mycorrhizae* and P-solubilizing microorganisms, #Extension, promotion and market development#.

Text Books

T.B -1 Motsara, M.R., Bhattacharya, P and Beena Srivastava, 1995.

UNIT I	Chapter – 1. T.B -1
UNIT II	Chapter – 4. T.B -1
UNIT III	Chapter – 8. T.B -1
UNIT IV	Chapter – 11. T.B -1
UNIT V	Chapter – 13 and 15. T.B -1

SEMESTER IV: EXTRA CREDIT – I
PLANT DISEASES

Course Code : 14UBO4EC1
Hours/Week : --
Credit : 4*

Max. Marks : 100*
Internal Marks : --
External Marks : 100*

Objective:

- To acquire basic knowledge of diseases and their cause in plants

UNIT I Plant pathology: Basic aspects of fungal diseases in plants – White rust of crucifers, Red rot of sugarcane.

UNIT II Paddy blast, Tikka disease of groundnut, Citrus canker, Little leaf of brinjal, Tobacco mosaic disease.

UNIT III Brief account of fungicide, pesticides, and bio-control measures: Bacterial, fungal, and viral biocontrol agents.

UNIT IV Plant microbe interactions – symbiotic, parasitic and endophytic interactions.

UNIT V Plant defense mechanisms – genes involved in defense mechanism – chitinase.

Text books

T.B -1 Asoke Kumar Sinha, Fundamentals of plant pathology, Kalyani Publishers, 2001.

T.B -2 Pandey, Plant Pathology, S. Chand and company Ltd, 2009.

T.B -3 Vashistha and Sinha, Fungi, S. Chand and company Ltd, 2008.

UNIT I	Chapter – 3. T.B -1
UNIT I	Chapter – 16, 21. T.B -2
UNIT II	Chapter – 4. T.B -1
UNIT II	Chapter – 14,17,23. T.B -2
UNIT III	Chapter – 6. T.B -1
UNIT III	Chapter – 11 and 13. T.B -3
UNIT IV	Chapter – 16. T.B -1
UNIT V	Chapter – 15. T.B -1
UNIT V	Chapter – 16, 21. T.B -2
UNIT IV	Chapter – 1. T.B -3

SEMESTER IV: EXTRA CREDIT – II
BIO-FUELS

Course Code : 14UBO4EC2
Hours/Week : --
Credit : 4*

Max. Marks : 100*
Internal Marks : --
External Marks : 100*

Objective

- To gain knowledge of alternative fuels with special reference to their biological sources.

UNIT I

12 hours

Energy and fossil fuel use-consequences of burning fossil fuels-Green house gases and global warming-Biological solid fuels-Gaseous biofuels-liquid biofuels to replace petrol-liquid biofuels to replace diesel

UNIT II

12 hours

Historical development of Bioethanol-corn ethanol technology- cellulosic ethanol-starch as a carbon substrate for bioethanol production-lignocellulosic biomass- ethanol as first generation biofuel-present status and future prospects.

UNIT III

12 hours

Biomass as energy source-wheat straw-paddy straw-corn stover-soft woods-sugarcane bagasse-cellulosic and hemicellulosic ethanol-lignin degrading enzymes.

UNIT IV

12 hours

Biodiesel-chemistry and production-feed stocks for biodiesel production-chemical principles of biodiesel production-plant oil biofuel-enzymatic production of biodiesel-lipases-production of biodiesel from waste lipids-vegetable oils- biodiesel composition-biodiesel from microalgae and microbes-microdiesel.

UNIT V

12 hours

Methanol-Glycerol-Butanol-acetone, butanol and ethanol, Biobutanol-Biogas production- Biohydrogen.

Text books

T.B -1 Kumar, H. D. General Ecology, Vikas Publishing House Pvt. Ltd Delhi, 1997.

T.B -2 Sharma, P. D. Ecology and Environment, Rastogi Publications, Meerut, India, 2000.

UNIT I	Chapter – 5. T.B -1
UNIT II	Chapter – 6.T.B -1
UNIT III	Chapter – 7. T.B -1
UNIT IV	Chapter – 3. T.B -1
UNIT V	Chapter – 4. T.B -1

**SEMESTER V: CORE VI
CYTOLOGY, GENETICS AND EVOLUTION**

Course Code : 14UBO5C6
Hours/Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn about the structure and function of eukaryotic plant cells
- To acquire basic knowledge of genetics and evolution.

UNIT I

15 hours

The Cell- history –Prokaryotic and Eukaryotic cells – comparison – Prokaryotic cell- Eukaryotic cell –cell wall- Plasma membrane – chemical composition- membrane function- Structure of the membrane – membrane models- Bilayer models- fluid mosaic model- Micellar models – cytoplasm – nucleus – nucleolus – nucleic acids- DNA – Molecular model of DNA structure –Mitochondria- Chloroplasts- chlorophylls- Endoplasmic reticulum – # Ribosomes- Golgi complex- vacuoles- Lysosomes – centrosomes - peroxisomes – Glyoxysomes#.

UNIT II

15 hours

Chromosomes – Structure of the chromosomes – centomere – Secondary constrictions – Chemical composition of Chromosomes – Chromosomes – Heterochromatin chromosome models – Polytene chromosomes – Lampbrush chromosomes – Supernumerary chromosomes. Genome in prokaryotes- the chromosomes of *E.coli* #Detailed structure of the chromosome – chromosomes of other bacteria – Genome of cyanobacteria – The viral genome. Polyploidy , Cell division – Amitosis, mitosis and meiosis#.

UNIT III

15 hours

Genetics – Introduction – Mendel's laws and principles – Deviation from Mendelian ratio – Lethality – Multiple factor hypothesis. Incomplete dominance – complementary factor – Epistasis – Multiple alleles – physical basis of heredity. Linkage and crossing over – mapping of chromosomes and genes – # Sex linkage in *Drosophilla* (eye color)- Cytoplasmic inheritance – Sex determination in *Drosophila* #.

UNIT IV

15 hours

Structural changes in chromosome – number and behavior – their genetic deficiencies – Duplication, Translocation, Inversion, Deletion. Polyploidy – types – gene action – Gene unit – cistron, recon, muton, codon, and operon. Gene mutation, physical and chemical mutagens. # Mutation rate and its role in evolution #.

UNIT V

15 hours

Concept of evolution – origin of life –Organic evidences – theories of organic evolution (Charles Darwin, Lamarck) – Modern synthetic theories.

#.....# **Self Study Portion**

Text Books

- T.B.1. Agarwal, V.K. Simplified Course in Genetics (B.Sc. Zoology), S. Chand & Co., New Delhi, 2000.
- T.B.2. Gardner, E.J. and Shusted, D.P. Principles of Genetics (7th Edn.,) John Wiley & sons, N.Y., Chichester, Brisbane, Toronto, Singapore, 1984.
- T.B.3. Gupta, P.K. Genetics, Rastogi Publishers, Meerut, India, 2000.
- T.B.4. Meyyan, R.P. Genetic & evolution, Saras Publication, Nagargoil, India, 2000.
- T.B.5. Sinott, E.W., L.C.Dunn and J. Dobshansky Principles of genetics (5th Edn.,) McGraw Hill Publishing Co., N.Y., Toronto, London, 1985.
- T.B.6. Sundara Rajan, S Cytology Anmol Publication, New Delhi, 2004.
- T.B.7. Shukla, R.S. and P.S. Chandel Cytogenetic, Evolution & Plant Breeding, S. Chand, NewDelhi, 1996.
- T.B.8. Verma, P.S. and V.K. Agarwal Concept of Evolution, S. Chand & Co., NewDelhi,1999.

UNIT I	Chapter – 2. T.B.6; Chapter – 1, T.B.3
UNIT II	Chapter – 4-6 T.B -5
UNIT III	Chapter – 5-7 T.B.3, Chapter – 1 T.B.6
UNIT IV	Chapter – 3. T.B.7
UNIT V	Chapter – 4. T.B. 8

**SEMESTER V: CORE VII
PLANT PHYSIOLOGY**

Course Code : 14UBO5C7
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To understand the basic aspects of plant-water relations.
- To understand the basic functions of metabolism.
- To understand the process of regulation of growth in plants.

UNIT I	12 hours
Water relations of plants – # Imbibitions, Diffusion #, Osmosis, Plasmolysis – Translocation of water - Absorption of water – Mechanisms of water absorption.	
UNIT II	12 hours
# Ascent of sap – Transpiration # – Factors affecting transpiration - Role of major and minor elements, mineral deficiency symptoms – Mechanism of translocation inorganic and organic solutes.	
UNIT III	12 hours
Photo synthesis – Mechanism of photosynthesis – C ₃ cycle, C ₄ cycle, difference between C ₃ and C ₄ plants C ₂ cycle and CAM pathway – # Factors affecting photosynthesis#.	
UNIT IV	12 hours
Respiration – Mechanism of respiration Glycolysis – Kreb’s cycle – Electron Transport system – Factors affecting respiration, #Nitrogen cycle#.	
UNIT V	12 hours
Plant growth and growth regulators – #Plant growth- Growth cure# – Growth regulators- Auxins, Gibberellins and Cytokinins – Physiology of flowering - Photoperiodism – vernalization and senescence.	

#.....# **Self Study Portion**

Text Books

T.B -1 V. K. Jain , Fundamentals of Plant Physiology, S. Chand and company Ltd New Delhi 2000.

T.B -2 Annie Ragland, K Rajkumar, K. Rajarathinam and N. Arumugam, Plant functions , Saras publication, Nagercoil, 2014.

UNIT I	Chapter – 3,4. T.B -1
UNIT I	Chapter – 2. T.B -2
UNIT II	Chapter – 5,6,8 and 15. T.B -1
UNIT II	Chapter – 4,5,6 and 8. T.B -2
UNIT III	Chapter – 11. T.B -1
UNIT III	Chapter – 9. T.B -2
UNIT IV	Chapter – 9 and 16. T.B -1
UNIT IV	Chapter – 10 and 11. T.B -2
UNIT V	Chapter – 17,18 and 19. T.B -1
UNIT V	Chapter – 12 and 13. T.B -2

**SEMESTER V : CORE VIII
BIOTECHNOLOGY**

Course Code : 14UBO5C8
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To understand the basic and applied aspects of biotechnology.
- To learn the basics of r-DNA technology

UNIT I

12 hours

History of Biotechnology - Definition - Traditional and Modern. Biotechnology as an interdisciplinary area, global impact and current excitement (health care, agriculture, genomics, #proteomics#.

UNIT II

12 hours

Vectors and their applications: Cloning vectors – pUC, pBR322 - Agrobacterium based vectors – Binary and cointegrated vectors – GUS and GFP assays – Marker assisted selections – # Herbicide and antibiotic resistance markers #.

UNIT III

12 hours

r-DNA technology: Isolation of RNA – Reverse Transcription PCR – cDNA collections – rDNA technology - Enzymes involved – Restriction enzymes – types – exonucleases and endonucleases – #Ligases#.

UNIT IV

12 hours

Plant genome organization: Functional organization (nuclear, chloroplast and mitochondria) - physical nature of gene – (promoters, enhancers, transcription factors – (zinc finger and Lusine zipper models) and their # applications in modern Biotechnology #.

UNIT V

12 hours

Gene Silencing in plants: Transcriptional and Post - Transcriptional Gene Silencing (TGS & PTGS) – RNAi in general – Flower colour modulations with RNAi – # Delay of fruit ripening #.

#.....#

Self Study Portion

Text Book

T.B -1 Bernard R Glick Jack J Pasterank, Molecular Biotechnology, American Society for Microbiology; 4th Edition 2010.

T.B -2 R.C. Dubey, Text book of Biotechnology, S. Chand publication, 2010.

T.B -3 C. B. Nirmala, G Rajalakishmi and Chandakarthick, Plant Biotechnology, MJP Publication, 2009.

T.B -4 H.D. Kumar, Modern concept of Biotechnology, Vikas Publiation, 1998.

UNIT I	Chapter – 1. T.B -1
UNIT III	Chapter – 1,4 and 5. T.B -1
UNIT IV	Chapter – 1,4 and 5. T.B -1
UNIT II	Chapter – 4,5 and 6. T.B -2
UNIT V	Chapter – 1,2 and 3. T.B -3
UNIT V	Chapter – 5. T.B -4

SEMESTER V: CORE IX
BIOINFORMATICS, BIOSTATISTICS AND COMPUTER APPLICATIONS

Course Code : 14UBO5C9
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective :

- To learn the basics and application of information technology in biology
- To learn about the statistical applications in biology.

UNIT I

12 hours

Biostatistics – Definition - sampling techniques – data – types, collection, approximation, classification and tabulation - logarithms. - Frequency distribution – Diagrammatic and graphical representation of data (Line, Bar, Histogram, Frequency Polygon, Curve, Pie chart).

UNIT II

12 hours

Measures of central tendency – mean, median and mode - Measures of dispersion – range, variance, standard deviation – Theories of probability – Students t-test, chi square test for goodness of fit, #statistical error # (definition and types only).

UNIT III

12 hours

Bioinformatics - an overview - definition and history; Internet in bioinformatics; Biological databases: # sequence database # - nucleic acid and protein database. Online tools for Botanical identification of plants (brief introduction to BIOTIK, MANGROVE)

UNIT IV

12 hours

Structure database – PDB; specialized database, literature database; file formats of genbank, Swissprot, PDB, NCBI data model, #data retrieval using *entrez* #.

UNIT V

12 hours

Biological Sequence analysis - Pair wise sequence comparison - Sequence queries against biological databases - BLAST and FASTA - Multiple sequence alignments - Phylogenetic alignment. Protein structure visualization tools - RasMol, # Swiss PDB Viewer#.

#.....#

Self Study Portion

Text Books

1. Khan, I.A. and Khanum, A. Fundamentals of Biostatistics. Vikas Publications, Hyderabad, 1994.
2. Gurumani, N, An introduction to Biostatistics, MJP Publication. 2005.
3. Palanichamy, S. and Manoharan, M. Statistical Methods for Biologists, Paramount Publications, Palani. 1990.
4. Akash saxena, Sunil Chauhan and Kratika Gupta Fundamentals of Computer. Laxmi publications, 2006.
5. Mani, K. and N. Viyaraj, Bioinformatics for beginners, Kalaikathir Achchagam, Coimbatore, India. 2002.

UNIT I Chapter – 1 - 3. T.B.1
UNIT II Chapter – 4 - 6. T.B -2
UNIT II Chapter – 7, T.B.3
UNIT III Chapter – 4 – 6. T.B.4
UNIT IV Chapter – 1-2, T.B.5
UNIT V Chapter – 3-5, T.B.5

SEMESTER V: CORE X
CYTOLOGY, GENETICS, EVOLUTION AND PLANT PHYSIOLOGY - PRACTICAL

Course Code : 14UBO5C10P
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn the techniques and experiments related to cytology, genetics, evolution and physiology of plants.

Cytology

1. Squash and Smear techniques- Onion root tip and Rheo flower buds.
2. Histochemical staining of DNA & RNA

Genetics and Evolution

1. Working out problems related to Genetics theory
2. Identification of the Era to which the fossil form belongs to.

Plant physiology

1. Determination of osmotic pressure of Onion/Rheo leaf.
2. Effect of light intensity on transpiration using Ganong's Potometer.
3. Determination of stomatal frequency and estimation of transpiration rate.
4. Determination of photosynthetic rate in water plants under different CO₂ concentrations.
5. Measurement of oxygen evolution under different coloured lights using Wilmott's bubbler.
6. Measurement of respiration rate using germinating seeds/flower buds with simple respiroscope.

SEMESTER V: CORE XI
BIOTECHNOLOGY, BIOSTATISTICS AND BIOINFORMATICS - PRACTICAL

Course Code : 14UBO5C11P
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn the techniques and experiments related to biotechnology, bioinformatics and biostatistics.

Biotechnology

1. Isolation of plant genomic DNA (Demonstration only).
2. Isolation of plasmid DNA (Demonstration only).
3. Agarose Gel Electrophoresis (Demonstration only).
4. Construction of plasmid vector restriction map.

Biostatistics and Bioinformatics

1. Collection and tabulation of data (Continuous and discrete)
2. Construction of Histogram, Frequency polygon, Frequency curve.
3. Construction of Bar diagrams, Pie charts.
4. An introduction to literature databases (PubMed)
5. An introduction to Search engine (Google)
6. An introduction to basic biological sequence databases and their access
7. Introduction to FASTA, BLAST.

**SEMESTER V: MAJOR BASED ELECTIVE – IV
ECONOMIC BOTANY**

Course Code : 14UBO5M4
Hours/Week : 3
Credit : 3

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective :

- To learn about economic uses of plants

UNIT I	Economic Botany- Introduction: Introduction, # Food plants #, Plant products of industrial value, Medicinal plants and drugs, Food adjuncts, Lower plants in economic botany.	12 hours
UNIT II	Cereals and millets: Cereals-History and uses of Rice, Wheat, Maize Barley, Oat and Rey. Millets - History and uses of Sorghum, Pearl Millet and Italian millet.	12 hours
UNIT III	Legumes, nuts and vegetables: Legumes-History and uses of Soybean, Black gram and Green gram. Nuts-History, cultivation and uses of Coconut and Cashew nut, Vegetables - Underground Root vegetables variety and uses of Sweet potato and Bet root., Stem vegetables Potato and Onion. #Herbage vegetables history, variety and uses of Cabbage and Cauliflower, Fruit vegetables history, variety and uses of Tomato and Brinjal#.	12 hours
UNIT IV	Fruits: tropical fruits cultivation and uses of Mango, Citrus, Banana, Guava, Papaya and Sapota.	12 hours
UNIT V	Gums and resins: Biological source, chemical constituents and uses of the following- Acacia gum, Guar gum, Sterculia gum, Resins- Capsicum, # Asafetida and Benzoin #.	12 hours

#.....# **Self Study Portion**

Text Books

1. Gupta, S.K. & Kaushik, M.P. An Introduction to Economic Botany K. Nath and Co., Meerut, India, 1973.
2. Verma, V. A Text Book of Economic Botany, Emkay Publications, New Delhi, 1974.
3. Sen. S. Economic botany, New Central Book Agency, Calcutta, 1992.
4. Ashok Bendre & Ashok Kumar Economic Botany, Rastogi Publications, Meerut, India. (1998-99).
5. Pandey, B.P. Economic Botany, S. Chand and Co., New Delhi, 2000.

UNIT I	TB1: Chapter – 2 & 3
UNIT II	TB2: Chapter – 3 - 5
UNIT III	TB3: Chapter – 4
UNIT IV	TB4: Chapter – 5
UNIT V	TB5: Chapter – 5

**SEMESTER V: SKILL BASED ELECTIVE – III
GARDENING**

Course Code : 14UBO5S3
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn about basic and applied aspects of gardening.

UNIT I 6 hours

Garden and its parts – Hedges – Edges – Tress – Flowers beds – Lawn – Shrubs – Climbers and Creepers – Paths Arches – Pergola – Rockery – Carpet beds – Topiary – #Trophy Green house #.

UNIT II 6 hours

Formal gardens – Informal gardens - planning a garden.

UNIT III 6 hours

Garden plants – Annuals – Biennials – Perennials – Shrubs – Tress – Climbers – Succulents – Cacti – Ferns – #Gymnosperm – plants – orchids#.

UNIT IV 6 hours

Garden implements and tools. Spade – Sprayer – Rose garden – Pruning scissors – Digging Fork – Garden rake – #Tiller – Pick axe#.

UNIT V 6 hours

Irrigation and manuring – Factors determining irrigation – System of Irrigation – Importance of organic manures – #Chemical fertilizers – Methods of application#.

#.....# Self Study Portion

Text Books:

T.B -1 V. Kumarsan, Horticulture and Plant breeding, Saras Publication, 2009.

T.B -2 Pratibha P Trivedi, Home Gardening, Indian council of Agricultural Research, New Delhi, 1983.

T.B -3 K. Bose and Bhattacharjee, Garden Plants, Oxford and IBH Publishing and Co.1998.

UNIT I	Chapter – 2. T.B -1
UNIT I	Chapter –1, 2 and 3. T.B -3
UNIT II	Chapter – 2. T.B -2
UNIT II	Chapter – 3. T.B -1
UNIT III	Chapter – 4. T.B -1
UNIT III	Chapter – 4. T.B -2
UNIT IV	Chapter – 5. T.B -1
UNIT V	Chapter – 7,8. T.B -1

SEMESTER V: EXTRA CREDIT- III
FOOD AND DAIRY MICROBIOLOGY

Course Code : 14UBO5EC3
Hours/Week : --
Credit : 4*

Max. Marks : 100*
Internal Marks : --
External Marks :100*

Objective:

- To learn the basic and applied aspect of food and dairy industry with respect to microbiology.

UNIT I **12 hours**

Importance of microorganisms in food microbiology - mold yeast and bacteria - General characteristics classification & importance. Food as a substrate for micro organisms -. Micro organisms important in food microbiology; Molds, yeasts and bacteria - General Characteristics - Classification and importance.

UNIT II **12 hours**

Principles of food preservation - Asepsis - Removal of micro organisms, anaerobic conditions - High temperature - Low temperature - Drying - Food addiives.

UNIT III **12 hours**

Contamination and spoilage - Cereals, sugar products, vegetables and fruits, meat and meat products, milk and milk products - Fish and sea food - Poultry, Spoilage of canned foods.

UNIT IV **12 hours**

Food borne infections and intoxications - bacterial, non -bacterial - Food borne disease outbreaks - Laboratory testing - preventing measures - Food sanitation - plant sanitation - Employees' health standards - waste treatment and disposal - quality control.

UNIT V **12 hours**

Food fermentations : Bread cheese, vinegar, fermented vegetables, fermented daffy products. Spoilage and defects of fermented daily products - oriental fermented foods.

Text Books

T.B -1 Wc.Frazier, Food Microbiology, McGraw Hill NY 1988.

UNIT I	Chapter – 2. T.B -1
UNIT II	Chapter – 5,6,7,8 and 9. T.B -1
UNIT III	Chapter – 10,11,12,13,14,15,16,17 and18. T.B -1
UNIT IV	Chapter – 23,24,25,26 and 27. T.B -1
UNIT V	Chapter – 21. T.B -1

**SEMESTER VI: CORE XII
BIOCHEMISTRY AND BIOPHYSICS**

Course Code : 14UBO6C12
Hours/Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:

- To learn about basic principles of chemical and physical aspects of biology.

UNIT I **15 hours**
Biochemistry: Physico-chemical forces acting on the living body - Definition of pH-its determination. # Buffers # and electrolytes and their functions.

UNIT II **15 hours**
Elementary treatment of fractionation of biological materials - chromatography, #centrifugation#, dialysis, electrophoresis.

UNIT III **15 hours**
A brief treatment of the chemistry of the following primary plant products – carbohydrates (sugars), starch, cellulose; Lipids (triglycerides, fats); # proteins - primary, secondary and tertiary structure #.

UNIT IV **15 hours**
Biophysics – physical forces, chemical bonds and their biological significance - Light diffraction - # biological effects of ionizing radiations #.

UNIT V **15 hours**
Basic principles of spectroscopy - thermodynamics – laws, enthalpy, entropy and free energy - # electron transfer processes #.
#.....# **Self study portion**

Text Books

- T.B.1. Jain, J.L. Jain, S and Jain, N, Fundamentals of Biochemistry. S. Chand and Company Ltd., New Delhi, 2008.
T.B.2. Srivastava, H.S, Elements of Biochemistry, Rastogi Publications, Meerut, India, 1990.
T.B.3. Veerakumari, L, Biochemistry, MJP Publishers, Chennai, 2004.
T.B.4. Stryer, L, Biochemistry, W. H. Freeman and Co., New York, San Francisco, 1989.
T.B.5. Ragland, A and Arumugam, N, 2000. Biochemistry Biophysics, Saras Publications, Nagercoil, Tamil Nadu.
T.B.6. Narayanan, P. 2000 Essentials of Biophysics, New Age International Publishers (P) Ltd., New Delhi, Calcutta, Chennai, Mumbai.

UNIT I	Chapter – 2. T.B -1
UNIT II	Chapter – 5,6,7,8 and 9. T.B -1
UNIT III	Chapter – 10,11,12,13,14,15,16,17 and18. T.B -1
UNIT IV	Chapter – 23,24,25,26 and 27. T.B -1
UNIT V	Chapter – 21. T.B -1

SEMESTER VI: CORE XIII
HORTICULTURE AND PLANT BREEDING

Course Code : 14UBO6C13
Hours/Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To understand the basic principles of horticulture
- To learn the applied aspects in breeding of plants.

UNIT I

15 hours

Horticulture: Values of Horticulture - Classification of horticultural crops – Kinds of soil and soil fertility - organic, inorganic and biofertilizers - methods of application - irrigation systems - common garden pests and diseases. #Methods for controlling pest and diseases#.

UNIT II

15 hours

Plant propagation methods - cutting, layering, grafting, budding, stock and scion relationship, micropropagation - uses of plant growth regulators in horticulture - cultivation practice -coconut, banana and #mango#.

UNIT III

15 hours

Landscape gardening and # important principles in laying out a garden # – Garden types and components – Lawn making - Kitchen garden, Indoor garden, Hanging pots, baskets – Cultivation of commercial flowers - roses, jasmines, chrysanthemum and ikbana.

UNIT IV

15 hours

Breeding: Basic principles in plant breeding- # selection of characters # - selfing and crossing techniques – methods of selection of superior strains-bulk and pedigree methods of selection.

UNIT V

15 hours

Back crossing-in breeding depression and heterosis- Induced polyploidy in plant breeding, role of auto and allopolyploidy - # Parasexual hybridization #.

Text Books

T.B -1 V. Kumaresan, Horticulture and plant breeding, Saras Publication, 2009.
T.B -2 R.W. Allard, Principles of plant breeding, John Wiley and sons. Inc. 1960.

UNIT I	Chapter –7,8 and 9. T.B -1
UNIT II	Chapter – 6 and 13. T.B -1
UNIT III	Chapter – 3,9,20,22, and 24. T.B -1
UNIT IV	Chapter – 1 and 6. T.B -1
UNIT IV	Chapter – 6 and 12,13,14. T.B -2
UNIT V	Chapter – 6 and 8. T.B -1
UNIT V	Chapter – 28 and 32. T.B -2

**SEMESTER VI: CORE XIV
ECOLOGY AND PHYTOGEOGRAPHY**

Course Code : 14UBO6C14
Hours/Week : 5
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn the basic aspects of environment with respect to biology
- To understand the distribution of plants with respect to geography of earth.

UNIT I 15 hours

General Ecology - Autecology-Definition, Ecological life history of species. Synecology-Definition, community composition, Raunkier's biological spectrum.
Plant environment-climatic, # edaphic and biotic factors # (Effects of grazing and browsing by animals, Effects of human activities on vegetation).

UNIT II 15 hours

Ecosystem: Definition, structure of Ecosystem, components of ecosystem, # Function of Ecosystem#. Energy and its flow in Ecosystem (grassland). Food chain, Food web, Ecological pyramid.

UNIT III 15 hours

Vegetation – Units of vegetation- formation, association, fasciations, Consociation, Migration, ecesis, Colonization methods of study of vegetation-species area curve, line transect. General trends of succession- migration, colonization. Hydrosere and Xerosere. #Morphological and anatomical features of plants and their correlation to the habitat factors#.

UNIT IV 15 hours

Environmental Pollution-Pollution and its control-Air Pollution: Causes of Air pollution-suspended particulate matter, Acid rain, Radiation pollution, Noise pollution, Thermal pollution-Soil Pollution: Industrial effluents, agricultural pollution, plant residues, insecticides, pesticides, fungicides, herbicides. # Biological treatment of wastes and pollutants- solid waste disposal treatment of liquid waste #.

UNIT V 15 hours

Phytogeography - Climate of India and its climatic zones, Botanical regions of India-Vegetational types of Tamil Nadu, Evergreen, Deciduous, Scrub & Mangrove. # Endemism & Endemics (neo and paleo) #.

#.....# Self Study Portion

Text Books

T.B -1 Mohan P. Arora, Ecology, Himalaya Publishing House, 2004.

T.B -2 Muneeswaran, Plant Ecology and Phytogeography, Agoston Book House, 1984.

T.B -3 R.S. Shukla and P.S. Chandel Plant ecology and soil science, Chand and company Ltd, 1998.

UNIT I	Chapter –1. T.B -1
UNIT I	Chapter –1,3,4,5. T.B -2
UNIT I	Chapter –3,4. T.B -3
UNIT II	Chapter –7. T.B -1
UNIT II	Chapter –6. T.B -3
UNIT IV	Chapter –11. T.B -2
UNIT V	Chapter –8. T.B -1

**SEMESTER VI: CORE XV
MICROBIOLOGY AND IMMUNOLOGY**

Course Code : 14UBO6C15
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn about the basic and applied aspects biology of microbes.
- To understand the immune system and its functions.

UNIT I

12 hours

Functional anatomy of Prokaryotic cells. Cell size, shape and arrangement of bacterial cells. Brief outline of Flagella, Axial filaments and pili. # Cell wall – Composition and characteristics #.

UNIT II

12 hours

Structures internal to the cell wall – Plasma (Cytoplasmic) membrane, Movement of Materials across, # Membranes, Cytoplasm, Nuclear area, Ribosomes#.

UNIT III

12 hours

Viruses- General characteristics of Plant and animal viruses. Classification of viruses, isolation. Viral multiplications (Lytic cycle, Lysogenic cycle, Specialised transduction) # Prions and Virons #.

UNIT IV

12 hours

Immunology: Immune system-Historical perspective, Innate immunity; adaptive immunity. Antigen - types, general properties, # role played by Biological system in the immunogenicity#.

UNIT V

12 hours

Antibodies – Immunoglobulin structure and function, antigenic determinants on Immunoglobulin and immunoglobulin classes. # Antigen and Antibody interactions #.

#.....# **Self Study Portion**

Text Books

T.B -1 N. Arumugam, A. Mani, A.M. Selvaraj and L.M Naryanan, Microbiology, Saras Publication, 2011.

T.B -2 Dulsy Fatima and N. Arumugam, Immunology, Saras Publication, 2013.

UNIT I	Chapter –3. T.B -1
UNIT II	Chapter – 3. T.B -1
UNIT III	Chapter – 9. T.B -1
UNIT IV	Chapter – 1 and 2. T.B -2
UNIT V	Chapter – 7 and 8. T.B -2

SEMESTER VI – CORE XVI
BIOCHEMISTRY, BIOPHYSICS, HORTICULTURE AND PLANT BREEDING - PRACTICAL

Course Code : 14UBO6C16P
Hours/Week : 4
Credit : 4

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To learn to perform the experiments related to biological chemistry and physics.
- To learn the applied aspects of horticulture and plant propagation techniques.

Biochemistry and Biophysics

1. Colorimetric estimation of either sugar or starch.
2. Estimation of lipids.
3. Estimation of proteins.
4. Separation of plant pigments / amino acids by paper chromatography.
5. Measurement of pH of a solution using pH meter.

Horticulture and Plant breeding

6. Demonstration of grafting
7. Demonstration of budding
8. Demonstration of layering.
9. Spotters of garden implements
10. Performance of emasculation in *Cassia*.

SEMESTER VI – CORE XVII

MICROBIOLOGY, IMMUNOLOGY ECOLOGY AND PHYTOGEOGRAPHY - PRACTICAL

Course Code : 14UBO6C17P

Hours/Week : 4

Credit : 4

Max. Marks : 100

Internal Marks : 40

External Marks : 60

Objective:

- To learn the techniques and experiments of microbiology and immunology
- To learn the basic observation and interpretation methods of ecology.

Microbiology and immunology:

1. Isolation of microbes from soil-serial dilution and plating.
2. Gram's staining of Bacteria found in Curd, Root-Nodules.
3. Growth Curve of Bacteria.
4. Isolation of Rhizobium from root-nodules of Legumes.
5. Racket Immuno Electrophoresis (demonstration only)

Ecology and Phytogeography:

6. Study of morphological and anatomical features of hydrophytes and xerophytes.
7. Study of morphological features of epiphytes, parasites and halophytes.
8. Determination of minimum size of the quadrat by species area curve method.
9. Random sampling – frequency, estimation.
10. Determination of soil and water pH from different environment.
11. Estimation of Carbonate, bicarbonate.
12. Estimation of Chloride.
13. Estimation of Total dissolved solids.

SEMESTER VI: SKILL BASED ELECTIVE – IV
ORGANIC FARMING

Course Code : 14UBO6S4
Hours/Week : 2
Credit : 2

Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objective:

- To understand organic farming practices and to learn how to produce organic products.

UNIT I **6 hours**
History of organic farming – adverse effect of chemical fertilizers and #modern agricultural practices#.

UNIT II **6 hours**
Agricultural pollution – soil pollution – fertilizer pollution and #pesticidal pollution #.

UNIT III **6 hours**
Traditional additives for organic farming – bulky organic manures – green manuring – types of biofertilizers – #vermicompost#.

UNIT IV **6 hours**
Biogas technologies for organic farming – composition of biogas slurry – #agronomic importance#.

UNIT V **6 hours**
Nutritional quality of organic agriculture – future trends in organic farming – # organic certification#.

#.....# **Self Study Portion**

Text Book

T.B -1Veeresh, G.K., Organic farming, Foundation Pvt Ltd. 2006.

UNIT I Chapter – 1 and 3. T.B -1
UNIT II Chapter – 6 and 9. T.B -1
UNIT III Chapter – 7. T.B -1
UNIT IV Chapter – 8. T.B -1
UNIT V Chapter – 5. T.B -1

**SEMESTER I: GENDER STUDIES
GENDER STUDIES**

**Course Code : 14UCN6GS
Hours/Week : 1
Credit : 1**

**Max. Marks : 100
Internal Marks : 40
External Marks : 60**

Prescribed common syllabus

**SEMESTER VI: EXTRA CREDIT-IV
GLOBAL WARMING**

Course Code : 14UBO6EC4
Hours/Week : --
Credit : 4*

Max. Marks : 100*
Internal Marks : --
External Marks :100*

Objective:

- To understand the global environmental changes.

UNIT I Global environmental changes – ice age and warm age – glaciations and deglaciation.

UNIT II Green house effect – green house gases – pollution as a source of green house gases

UNIT III
Carbon banking – carbon foot print – industrial, institutional, governmental policies and rules.

UNIT IV
Alternative fuels – biofuels – wind, solar, hydrothermal, geothermal sources of energy.

UNIT V Domestic and industrial sources of pollutants – Environmental education – participatory approach to reduce pollution.

Text Books

T.B.1. Sharma, P. D. Ecology and Environment, Rastogi Publications, Meerut, India, 2000.

T.B.2. Kumar, H. D. General Ecology, Vikas Publishing House Pvt. Ltd Delhi, 1997.

UNIT I	Chapter – 1 and 2. T.B -1
UNIT II	Chapter – 4 and 5. T.B -1
UNIT III	Chapter – 6. T.B -1
UNIT IV	Chapter – 8. T.B -2
UNIT V	Chapter – 5. T.B -2

SEMESTER III: ALLIED III
ALLIED BOTANY- I:
MORPHOLOGY, TAXONOMY, ANATOMY AND EMBRYOLOGY

Course Code : 14UBO3A3
Hours/Week : 4
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks :30

Objective:

- To learn about the external morphology, description and classification of higher plants
- To understand the internal morphology of higher plants and its morphogenesis.
-

UNIT I **12 hours**
Morphology- Phyllotaxy-Inflorescence types (Raceme, Cyme, Mixed and Special)
- Terminology of floral parts- floral diagram- #floral formula#.

UNIT II 12 hours
Taxonomy - Classification – Natural (Bentham and Hooker’s system) system, its merits and demerits -# Binomial Nomenclature#.

UNIT III **12 hours**
Detailed study on salient features, description, distribution and economic importance of the families: Annonaceae, Rutaceae, Fabaceae, Caesalpinaceae, Rubiaceae, Apocyanaceae, #Euphorbiaceae and Poaceae#.

UNIT IV **12 hours**
Anatomy: Meristems - classification and concepts-Primary structure of Root-
#Primary structure of Stem#.

UNIT V **12 hours**
Embryology: Structure and development of Anther- Microsporogenesis - Male gametophyte development - Structure, types and development of Ovule- Megasporogenesis - Female gametophyte development (Polygonum type). Endosperm (Nuclear, Cellular, Helobial and Ruminant) - #Development of Embryo - Dicot (Capsella)#.

#.....# **Self Study Portion**

Text Books

- T.B.1. Pandey, B.P. Taxonomy of Angiosperms S. Chand and Co (p) Ltd. New Delhi, 1999.
- T.B.2. Rendle, A.B. The classification of Flowering plants Vol. 1 and II, Vikas publishing house (P) Ltd. U.P., 1979.
- T.B.3. Vashista, P.C. Taxonomy of Angiosperms, S. Chand and Co. New Delhi, Jullunder, 1997.
- T.B.4. Panday, B.P. Plant Anatomy, S. Chand and Company Ltd, New Delhi, 2001.
- T.B.5. Vasista, P.C. A Text Book of Plant Anatomy, S. Nagin & co., Jullunder and New Delhi, 1987.
- T.B.6. Bhojwani, S.S. and Bhatnagar, S.P. The Embryology of Angiosperms (4th Edn.) Vikas Publishing House (P) Ltd., & UBS Publishers Distributors, New Delhi, 2000.
- T.B.7. Maheswari, P. Recent Advances in the Embryology of Angiosperms, International society of Plant Morphologists – Univof Delhi, 1973.

UNIT I	Chapter – 1 and 2. T.B.1
UNIT II	Chapter – 2 and 3. T.B.2
UNIT III	Chapter – 4-10 . T.B.2
UNIT III	Chapter – 8-11. T.B.3
UNIT IV	Chapter – 2 - 5. T.B.4
UNIT V	Chapter – 3-5. T.B -5

SEMESTER III: ALLIED III
ALLIED BOTANY – I PRACTICAL:
MORPHOLOGY, TAXONOMY, ANATOMY AND EMBRYOLOGY

Course Code : 14UBO3A3P
Hours/Week : 3
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

Objective:

- To learn the description of external and internal morphology of plants.
- To identify the plant families and their description.
- To study the development of plant body.

Morphology:

1. Phyllotaxy types
2. Types of inflorescence – Raceme, Cyme, Mixed and special
3. L.S. of Dicot flower-Hypogynous/ Epigenous
4. Mounting of floral parts
5. Construction of floral diagram and floral formula.

Taxonomy:

1. Detailed of study of the plants belonging to the families mentioned in theory.

Anatomy

1. Structure of Dicot stem
2. Structure of Monocot stem
3. Structure of Dicot root
4. Structure of Monocot root

Embryology

1. T.S. of anther – *Datura*
2. Structure of ovule
3. Isolation of Dicot embryo - *Tridax*

SEMESTER IV: ALLIED IV
ALLIED BOTANY- II:
THALLOPHYTES, BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS
AND PLANT PHYSIOLOGY

Course Code : 14UBO4A4
Hours/Week : 5
Credit : 2

Max. Marks : 50
Internal Marks : 20
External Marks : 30

UNIT I **15 hours**
Thallophytes : Algae: #General characters#, study of structure and life histories of the following genera – *Oscillatoria*, *Volvox*, *Oedogonium* and *Polysiphonia*

UNIT II **15 hours**
Fungi: Study of structure and reproduction of the following genera, *Albugo* and *Pencillium*. #Economic importance of fungi#.

UNIT III **15 hours**
Bryophytes, Pteridophytes and Gymnosperms, General characters of pteridophytes. - Bryophytes. Structure and life cycle of *Lycopodium*. #General characters' of Gymnosperms structure and life cycle of *Cycas*#.

UNIT IV **15 hours**
Plant physiology – Absorption of water – Ascent of sap – Transpiration - Specific role and symptoms of mineral elements. Growth Hormones Auxins, #Gibberellins and cytokinins#.

UNIT V **15 hours**
Photosynthesis – mechanism of photosynthesis – C₃ and C₄ cycle - Factors affecting photosynthesis – Respiration - mechanism of respiration - Glycolysis- Kreb's cycle – #Factors affecting Respiration#.

#.....# **Self study portion**

Text Books

- T.B.1. Gangulee, H.C & Kar A.K. College Botany Vol I and II, Books and Allied (Pvt.)Ltd., Calcutta,1980.
T.B.2. Vashistha,B.R. Botany for Degree students, Vol I and II Chand & Co, New Delhi, 1995.
T.B.3. Sharma,O.P. Text book of Algae. Tata McGraw Hill Publishing Co., Ltd., New Delhi, 1990.
T.B.4. Srivastava,N.N.Bryophyta. Pradeep Prakashnan, Meerut, India, 1996.
T.B.5. Sharma. O.P. Textbook of Pteridophyta, MacMillan India Ltd., New Delhi, Madras, 1990.
T.B.6. Sundara Rajan. S Introduction to Pteridophyta, New Age International Publishers Ltd., Wiley Eastern Ltd New Delhi. Madras 1994.
T.B.7. Vashista, P.C. Botany for Degree Students –Pteridophyta. S. Chand & Co., New Delhi, 1997.
T.B.8. Rasheed, A. An Introduction to Pteridophyta, Vikas Publishing Co., NewDelhi, 1999.
T.B.9. Chopra,G.W & Verma,Y. Gymnosperms, Pradeep Publications, Jalandhar,1988.
T.B.10. Vashista, P.C. Botany for Degree Students - Gymnosperms (2nd Edn.) S.Chand & Co., NewDelhi. 1996.
T.B.11. Sharma,O.P. Gymnosperms, Pragati Prakashan, Meerut, India, 1997.
T.B.12. Jain, V.K. Fundamentals of Plant Physiology, S.Chand & Co, New Delhi. 2000.
T.B.13. Pandey, S.N. 1991. Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.
T.B.14. Verma, V. Text book of Plant Physiology, Ane Books India, New Delhi. 2007.

UNIT I	Chapter – 1 - 2. T.B.1,
UNIT I	Chapter – 2 – 4. T.B.2
UNIT I	Chapter – 3 – 6. T.B.3
UNIT II	Chapter – 2 and 3. T.B.4
UNIT III	Chapter – 4. T.B.5
UNIT III	Chapter – 5. T.B.6
UNIT III	Chapter – 4-10 . T.B.7
UNIT III	Chapter – 5. T.B.8
UNIT III	Chapter – 6. T.B.9.
UNIT III	Chapter – 7. T.B.10.
UNIT III	Chapter – 8. T.B.11.
UNIT IV	Chapter – 2 - 5. T.B.4
UNIT V	Chapter – 3-5. T.B -13
UNIT V	Chapter – 5-8. T.B.14.

**SEMESTER IV: ALLIED IV
PRACTICAL FOR ALLIED VI
THALLOPHYTES, BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS
AND PLANT PHYSIOLOGY**

Course Code : 14UBO4A4P

Hours/Week : 3

Credit : 2

Max. Marks : 50

Internal Marks : 20

External Marks : 30

- A study of Genera; Spotter related to Photosynthesis included in the theory.
- Micro preparations of the types mentioned in syllabus (theory) Sectioning, staining and mounting of the plant materials mentioned in the syllabus (theory).
- Demonstrations and physiology experiments as mentioned in the syllabus (theory).
- Learning some of the techniques in Cytology, Embryology and Physiology.