

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd.u/s 3 of UGC Act 1956)
Re- accredited with 'A' Grade by NAAC. Recognised by UGC Under Section 12 B
Coimbatore 641 043, Tamil Nadu, India

B. Sc. Botany
(With Language & English for 4 Semesters)

Programme Specific Outcomes

1. Knowledge of plants through the study of the diversity of plants.
2. Understand the core concepts of Botany, the nature of science and its application to everyday problems and significant botanical achievements
3. Obtain technical skills like dissection of plants from lower to higher forms, identification of plants and field study of flora
4. Knowledge on Mushroom cultivation, Organic farming, Herbal cosmetics, Medicinal plants facilitating more employment opportunities
5. Acquires theoretical knowledge on basic concepts of microbes, plant structure, its function and evolution

Scheme of Instruction & Examination
(For students admitted from 2018-19 & onwards)

<i>Part</i>	<i>Subject Code</i>	<i>Name of paper/component</i>	<i>Hours of Instruction/we</i>		<i>Scheme of examination</i>				
			<i>Theory</i>	<i>Practicals</i>	<i>Duration of exam</i>	<i>CIA</i>	<i>CE</i>	<i>Total</i>	<i>Credit</i>
First Semester									
I	18BLT001/ 18BLH001/ 18BLF001	Tamil - Ilakkiyam I- IlakkanamIlakkiyavaralaru /Hindi –Prose and non-detailed texts /French-I	5	-	3	50	50	100	4
II	18BLE001	English Language for Communication - I	5	-	3	50	50	100	4
Core Courses									
III	18BBOC01	Microbiology	4	-	3	50	50	100	3
	18BBOC02	Algae, Fungi and Lichens	5	-	3	50	50	100	4
	18BBOC03	Practicals I – Microbiology, Algae, Fungi and Lichens	-	3	3	50	50	100	2
	18BBOI01	Discipline specific Elective Course DSE-I Non-Chordates and Chordates (Zoology)	4		3	50	50	100	3
	18BBOI02	DSE-IPracticals I - Non-Chordates and Chordates (Zoology)		3	3	50	50	100	2
		Games	-	1	-	-	-	-	-

Second Semester									
I	18BLT002/ 18BLH002/ 18BLF002	Tamil Ilakkiyam II- IlakkanamIlakkiyavaralaru - /Hindi – Grammar, Translation and General Essay/ French-II	5	-	3	50	50	100	4
II	18BLE002	English Language for Communication – II	5	-	3	50	50	100	4
III		<i>Core Courses</i>							
	18BBOC04	Bryophyta and Pteridophyta	5	-	3	50	50	100	4
	18BBOC05	Gymnosperms and Palaeobotany	4	-	3	50	50	100	3
	18BBOC06	Practicals II – Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany	-	3	3	50	50	100	2
	18BBOI 03	Discipline specific Elective Course DSE-II Developmental Zoology and Animal Physiology (Zoology)	4	-	3	50	50	100	3
	18BBOI 04	DSE-II Developmental Zoology and Animal Physiology Practicals II (Zoology)	-	3	3	50	50	100	2
	Games	-	1	-	-	-	-	-	
Third Semester									
I	18BLT003/ 18BLH003/ 18BLF003	Tamil – Ilakkiyam III- IlakkanamIlakkiyavaralaru /Hindi – Ancient and modern Poetry /French-III	5	-	3	50	50	100	4
II	18BLE003	English Language for Communication-III	5	-	3	50	50	100	4
III		<i>Core Courses</i>							
	18BBOC07	Plant Morphology	5	-	3	50	50	100	3
	18BBOC08	Taxonomy of Angiosperms	5	-	3	50	50	100	4
	18BBOC09	Practicals III – Plant Morphology and Taxonomy of Angiosperms	-	5	3	50	50	100	2
	18BBOI 05	Discipline specific Elective Course DSE-III Computer Application for Botany (Botany)	2	3	3	50	50	100	4
Fourth Semester									
I	18BLT004/ 18BLH004/ 18BLF004	Tamil – Ilakkiyam IV-Ilakkanam Ilakkiyavaralaru /Hindi Introduction to Functional Hindi and Journalism/French- IV	5	-	3	50	50	100	4
II	18BLE004	English Language for Communication –IV	5	-	3	50	50	100	4
III		<i>Core Courses</i>							
	18BBOC10	Cell Biology	5	-	3	50	50	100	3
	18BBOC11	Anatomy and Embryology	5	-	3	50	50	100	4

	18BBOC12	Practicals IV- Cell Biology, Anatomy and Embryology	-	3	3	50	50	100	2
	18BBOI 06	Discipline specific Elective Course DSE-IV Chemistry theory for Botany (Chemistry)	4	-	3	50	50	100	3
	18BBOI 07	Chemistry Practicals for Botany (Chemistry)	-	3	3	50	50	100	2
Project during Summer Vacation									
Fifth Semester									
III		<i>Core Courses</i>							
	18BBOC13	Genetics	5	-	3	50	50	100	3
	18BBOC14	Plant Breeding and Seed Technology	5	-	3	50	50	100	3
	18BBOC15	Plant Pathology	5	-	3	50	50	100	3
	18BBOC16	Plant Physiology and Biometrics	5	-	3	50	50	100	3
	18BBOC17	Practicals V - Genetics, Plant Breeding, Seed Technology, Plant pathology and Plant Physiology	-	5	3	50	50	100	2
	18BBOC18	Organic Farming (Self study)	1	-	3	100	-	100	4
	18BBOC19	Botany (Computer based test)	-	-	1	-	100	100	2
	18BBOC20	Project				100	-	100	4
		Generic Elective Course	2	-	3	100	-	100	2
Sixth Semester									
		<i>Core Courses</i>							
III	18BBOC21	Plant Biochemistry	5	-	3	50	50	100	3
	18BBOC22	Plant Biotechnology	5	-	3	50	50	100	3
	18BBOC23	Molecular Biology	5	-	3	50	50	100	3
	18BBOC24	Plant Genetic Engineering	5	-	3	50	50	100	3
	18BBOC25	Phytogeography, Evolution and Bioinformatics	5	-	3	50	50	100	3
	18BBOC26	Practicals VI - Plant Biochemistry, Plant Biotechnology, Phytogeography, Evolution and Bioinformatics	-	3	3	50	50	100	2
Total Credits									130

PART IV Components						
A. Ability Enhancement Courses						
I. Ability Enhancement Compulsory Courses (AECC)						
2	15BAES01	Environmental Studies (Foundation Course)	4		Remarks	4
5	17BSCS01	Communication Skills	3	-	Remarks	2
6	17BSSS02	Soft Skills	3	-	Remarks	2
II. Skill Enhancement Courses (SEC)						
3		Value Added Course (from a basket of choices offered)	40 hours duration		Remarks	2
4		Co-curricular courses Add on certificate / Quantitive Aptitude /Certificate Courses - Gandhian studies/Ambedkar Studies / Women Studies/General awareness/Verbal and Non Verbal Reasoning/ General Awareness/ others as per list	Varied duration		Remarks	2
B. Extra-Curricular Course						
1-6	15BXNC01-06/ 15BXNS01-06/ 17BXSP01-06	NCC/ NSS/Sports (representing the Institute)	-	-	Remarks	6
Total credits						18

Total credits to earn the degree

1. Part I, II & III components 130
 2. Part IV components 18

Total 148 credits

Others Courses offered by the Department

- **Discipline Specific Electives**

1. 18BZOI04 - DSE- I Diversification of Plants to B Sc. Zoology students during 3rd Semester
2. 18BZOI05 - DSE-I Practicals I Diversification of Plants to B Sc. Zoology students during 3rd Semester
3. 18BZOI06 - DSE- II Diversification of Angiosperms to B Sc. Zoology students during 4th Semester
4. 18BZOI07- DSE- II Practicals II-Diversification of Angiosperms to B Sc. Zoology students during 4th Semester

- **Generic Elective Course**

18BBOO01 Herbal Cosmetics

- **Value Added course**

18BBOV01- Mushroom cultivation

Microbiology

Semester I
18BBOC01

Hours of Instruction/week: 4
No. of credits: 3

Objectives: To enable the students:

1. To learn the nature, structure, industrial and other uses of microorganisms.
2. To gain knowledge in the field of usefulness and significance of microbes.
3. To study the different microbial pathogens and control measures.

Unit 1 Introduction

Historical outline of Microbiology and the scope of microbiology. Bacteria- Morphology, cell structure, classification, respiration and reproduction – Asexual – binary fission and sexual – types - Transformation, Transduction and Conjugation. Gram staining – gram +ve and gram -ve. Economic importance of Bacteria. **10**

Unit 2 Viruses

Introduction, Morphology of virus, classification of virus, general properties of virus and Reproduction – Lytic phase and Lysogenic phase, symptoms and causes of Acquired Immuno Deficiency Syndrome. Yeast – morphology, multiplication - budding. Economic importance of Yeast. **15**

Unit 3 Food Microbiology

Introduction to Microbial spoilage of foods, Symptoms of food poisoning, causes of food poisoning – inanimate and animate cause; methods of food preservation. Water-borne microbes, diseases – cholera – symptoms, causative organism and control measures; Typhoid – symptoms, causative organism and control measures. **10**

Unit 4 Soil and Agricultural Microbiology

Microbial flora of soil and their application. Biological Nitrogen fixation – Asymbiotic nitrogen fixers and symbiotic nitrogen fixers – Legume – *Rhizobium* symbiosis; nif genes Biofertilizers and biopesticides. **10**

Unit 5 Industrial microbiology

Introduction, Anaerobic and Aerobic process; Fermentation- ethyl alcohol production, wine production from grapes; Vaccines – Introduction to vaccines, production of Rabies vaccine; Antibiotics – Production of Penicillin and streptomycin; Bioremediation **15**

Total hours 60

Course outcomes:

1. To know the scope of microbiology
2. Knowledge about the various microbes present in the environment and their reproduction
3. Student will have a knowledge on the types of food poison and various preservative methods that can be followed to control poisoning
4. Knowledge about water-borne diseases help students to ensure cleanliness in the society
5. Student develop a knowledge on different microbial flora of soil, nitrogen fixing capacity and their use as biofertilizer
6. Knowledge on the industrial uses of microbes

Text book:

1. C.P. Bavej (2017). Textbook of Microbiology, Arya Publications.
2. P Chakraborty (2015). A Textbook Of Microbiology, New Central Book Agency
3. R C Dubey and D.K. Maheshwari (2013). A Textbook of Microbiology, S Chand, New Delhi

Reference books:

1. Ajit Kr.Banejee, Nirmala Banerjee. 2006. Fundamentals of Microbiology and Immunology. New Central Book Agency (P) LTD8/1 Chintamoni Das Lane, Kolkata
2. Joanne Willey and Linda Sherwood (2013). Prescott's Microbiology, McGraw-Hill Education
3. Dana M. Santos (2012). Recent Advances in Microbiology, Apple Academic Press

Algae, Fungi and Lichens

Semester I
18BBOC02

Hours of Instruction/week: 5
No. of credits: 4

Objectives: To enable the students.

1. To gain knowledge about the lower and primitive groups of plants.
2. To know about the evolutionary trends in plants.
3. To know about the causative organisms of various plant diseases and their control measures.

Unit 1 Algae

General Characteristics of Thallophyta – algae, systematic position, occurrence, vegetative cell structure, pigmentation, food reserves and reproduction of Cyanophyceae - *Oscillatoria*. Chlorophyceae - *Chlamydomonas*, *Chlorella*, *Volvox* and *Oedogonium*

20

Unit 2 Algae

Systematic position, occurrence, vegetative cell structure, pigmentation, food reserves and methods of reproduction of the following genera: Phaeophyceae - *Vaucheria*, *Ectocarpus* and Rhodophyceae - *Polysiphonia*. Economic importance of Algae.

20

Unit 3 Fungi

Classification of fungi (*C.J. Alexopoulos*). Systematic position, occurrence, vegetative cell structure and reproduction of the following genera- Myxomycetes - *Plasmodiophora*, Phycomycetes - *Albugo* and Ascomycetes - *Penicillium*.

15

Unit 4 Fungi

Systematic position, occurrence, vegetative cell structure and reproduction of the following genera: Basidiomycetes - *Polyporus*, *Puccinia* and Deuteromycetes - *Fusarium*. Economic importance of fungi.

10

Unit 5 Lichens

Lichens- Occurrence, classification of lichens - Crustose, foliose and fruticose lichens. Internal structure of lichen thallus – Homeomerous and Heteromerous lichens. Reproduction – vegetative, asexual and sexual; fruiting body of lichens - Apothecium, Economic importance of lichens.

10

Total hours

75

Course outcomes

1. Identification of Algae, Fungi and Lichen biodiversity based on their structure and reproduction.
2. Identification of causative organism of infected plant tissues based on morphology.
3. Knowledge on use of algae as biofertilizer, single cell protein, biofuel and so on.
4. Knowledge on use of Fungi as antibiotic, in fermentation process and so on
5. Knowledge on the economic importance of algae and fungi

Text books:

1. Singh, M.P. and A.K. Sharma. (2002). Text Book of Botany. Anmol publication PVT, LTD. New Delhi.
2. John Webster and S. Roland Weber (2007). Introduction to Fungi. Cambridge University Press, New York
3. Awasthi A.K. (2015). Textbook of Algae S Chand, New Delhi
4. N Arumugam, Annie Ragland and V Kumaresan (2014). Algae Fungi Bryophytes and Plant Pathology, Saras Publication

Reference books:

1. Mehrotra, R.S. and Aneja. (2003). An Introduction to Mycology. New age International (P) Ltd publishers.
2. Gupta S K, Malik. A and Bux F (2017) Algal Biofuels, Springer International Publishing
3. Jens H. Petersen (2013) The Kingdom of Fungi, Princeton University Press

Practicals I- Microbiology, Algae, Fungi and Lichens

Semester I
18BBOC03

Hours of Instruction/week: 3
No. of credits: 2

Unit 1 : Microbiology

Preparation of Media- Potato Dextrose Agar, Growth of Microorganisms from infected tissue 10

Unit 2 : Algae 10

Oscillatoria, Chlamydomonas, Volvox, Chlorella and Oedogonium

Unit 3 : Algae 10

Vaucheria, Ectocarpus and Polysiphonia

Unit 4 : Fungi 10

Plasmodiophora, Albugo and Penicillium, Polyporus, Puccinia and Fusarium

Unit 5: Lichens 5

Internal structures, Apothecium,

Total hours 45

Course outcomes:

1. Familiarize with the morphological and systematic knowledge about different plant groups.
2. Ability to identify lower forms of plants such as algae and fungi
3. Gain knowledge to differentiate pathogenic and non-pathogenic forms of algae and fungi
4. Identification of various types mentioned in the syllabus from fresh / preserved specimens and prepared slides.
5. Knowledge on the structure of lichens

Text Books:

1. B. P. Pandey (2010). *Modern Practical Botany Vol-IS*. Chand and Company LTD. Ram Nagar, New Delhi
2. Kumar, Ashok (2005). *A textbook of practical botany. Vol. I*. Rastogi Publications, Meerut
3. Ashok Bendre and Ashok Kumar (2009). *Practical Botany 1*. Rastogi Publications, Meerut

Reference books:

1. Henry H Dixon (2017) Practical Plant Biology: A Course of Elementary Lectures on the General Morphology and Physiology of Plants, Forgotten Books
2. Clive Koelling (2016) Plant Anatomy, Morphology and Physiology, Strawood Publishing House
3. Subhas Chandra Santra, Tara Pada Chatterjee and A. P. Das (2010) College Botany Practical: Volume I, New Central Book Agency

Bryophyta and Pteridophyta

Semester II
18BBOC04

Hours of Instruction/week: 5
No. of credits: 4

Objectives: To enable the students.

1. To gain knowledge about the lower and primitive groups of plants.
2. To know about the evolutionary trends in plants.
3. To understand the stelar evolution and seed formation habit in Pteridophytes

Unit 1 Bryophytes

Bryophytes- Classification, structure and reproduction of *Riccia* and *Marchantia*. 15

Unit 2 Bryophytes

Bryophytes- A detailed study on the structure and reproduction of the following genera:-
Porella, and *Anthoceros* 15

Unit 3 Pteridophytes

Pteridophytes- General account on the structure and reproduction of Psilopsida –
Psilotum, Lycopsida – *Lycopodium*, Sphenopsida– *Equisetum*. 15

Unit 4 Pteridophytes

Pteridophytes- External and internal morphology, spore producing organs, structure
and development of prothallus, sex organs, development of embryo in *Marsilea* 15

Unit 5 Pteridophytes

Pteridophytes- Stellar evolution, Heterospory and seed habit, Apospory and Apogamy 15

Total hours 75

Course outcomes:

1. Knowledge on the lower primitive groups of plants
2. Gain knowledge about structure (Morphology and anatomy) and reproduction of Bryophytes and Pteridophytes
3. Understand the phylogeny from Bryophytes
4. Understand the stellar evolution and seed formation habit in pteridophytes
5. knowledge about life cycles of Bryophytes and Pteridophytes

Text books:

1. Pandey, B.P. (2010). College Botany. S.Chand and Company LTD. Ram Nagar, New Delhi.
2. Johri, R.M. and Sandhya Sharma. (2009). Pteridophyta. Dominant publishers and Distributors, New Delhi.
3. Singh, M.P.andA.K.Sharma. (2010). Text Book of Botany, Anmol Publications (P) LTD. New Delhi.
4. Annie Ragland (2014), Algae and Bryophytes, Saras Publication

Reference books:

1. Ayesha Parveen (2018). Botany Paper-II Bryophytes, Pteridophytes, Gymnosperms and Paleobotany, SIA Publishers & Distributors Pvt Ltd
2. Gangulee H. C, Das K. S and Dutta C (2011). College Botany, Vol I, New Central Book Agency
3. Gangulee H. C, Das K. S and Dutta C (2011). College Botany, VolII, New Central Book Agency
4. E.V. Watson (2015). The Structure and Life of Bryophytes, Scientific Publishers-Jodhpur

Gymnosperms and Palaeobotany

Semester II

Hours of Instruction/week: 4

18BBOC05

No. of credits: 3

Objectives: To enable the students:

1. To gain knowledge about the present living seed plants.
2. To understand the salient features of naked seeded plants (Gymnosperms)
3. To know about fossils of ancient seed plants and their importance.

Unit 1 Gymnosperms

Introduction to Gymnosperms. Vegetative characteristics of Gymnosperms. Reproductive organ, Pollination & Fertilization, Embryogeny, Seed, Affinities of Gymnosperms, Classification, Comparison of Pteridophytes and Gymnosperms, Comparison of Angiosperms and Gymnosperms, Economic importance of Gymnosperms.

10

Unit 2 Cycadopsida and Coniferiopsida

General Characters, Classification of Cycadopsida and Coniferiopsida, Cycas – Distribution, External Morphology, Anatomy, Reproduction, Female reproduction organs, Pollination, Gametophytes, Fertilization, Embryogeny, Development of seed and its structure, Germination of seed, Alternation of Generation. Pinus – Distribution, External Morphology, Anatomy, Reproduction, Female reproduction organs, Pollination, Gametophytes, Fertilization, Embryogeny, Development of seed and its structure, Germination of seed, Alternation of Generation.

10

Unit 3 Gnetopsida

General Characters, Classification of Gnetopsida, Gnetum– Distribution, External Morphology, Anatomy, Reproduction, Female reproduction organs, Pollination, Gametophytes, Fertilization, Embryogeny, Development of seed and its structure, Germination of seed, Alternation of Generation.

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Unit 4 Palaeobotany

Introduction, types of Plant Fossils – Compressions, Impressions, Casts and Molds, Permineralizations. Techniques of fossil study, Important strata, Geological time scale, Geological history of Gymnosperms, elementary knowledge of the computation of the age of fossils and Radio-Carbon Dating, Analysis of fossils by scanning electron microscopy (SEM) and X-RAY energy dispersive spectroscopy (EDS).

10

Unit 5 Fossil forms

Characteristic feature of Psilophytales, Rhynia- Habit, Anatomy, Reproduction. Characteristic feature of Bennettitales, Williamsonia- Habit, Anatomy, Reproduction. Characteristic feature of Lepidodendrales, Lepidodendron- Habit, Anatomy, Reproduction.

10

Total hours

60

Course outcomes

1. Understand the salient features of naked seeded plants (Gymnosperms)
2. Learning the differences between ferns, gymnosperms and angiosperms
3. Gain knowledge about structure (Morphology and anatomy) and reproduction of Gymnosperms
4. Identify the importance of fossils and fossilization process
5. Obtain knowledge in various fossil forms

Text books:

1. Pandey, B.P. (2010). College Botany.S.Chand and Company LTD. Ram Nagar. New Delhi.
2. Bhatnagar, S.P. and Alok Moitra. (2009).Gymnosperms. New Age International (P) LTD, Publishers.
3. MuktaBhargava. (2010). Gymnosperm. Dominant publishers and Distributors, New Delhi.
4. Sambamurty, A.V.S.S. (2005). A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany, I K International Publishing House

Reference books:

1. Ayesha Parveen (2018). Botany Paper-II Bryophytes, Pteridophytes, Gymnosperms and Paleobotany, SIA Publishers & Distributors PvtLtd
2. Gangulee H. C, Das K. S and Dutta C (2011). College Botany, Vol I, New Central Book Agency
3. Gangulee H. C, Das K. S and Dutta C (2011). College Botany, Vol II, New Central Book Agency
4. Alain Vanderpoorten and Bernard Goffinet (2009). Introduction to Bryophytes, Cambridge University Press

Practicals II – Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany

Semester II
18BBOC06

Hours of Instruction/week: 3
No. of credits: 2

Unit 1: Bryophyta	10
<i>Riccia, Marchantia, Porella,</i>	
Unit 2: Bryophyta	10
<i>Anthoceros, Funaria,</i>	
Unit 3: Pteridophyta	10
<i>Psilotum, Lycopodium, Equisetum and Marsilea.</i>	
Unit 4: Gymnosperms	10
<i>Cycas, Pinus, Gnetum, Rhynia.</i>	
Unit 5 : Palaeobotany	5
<i>Lepidodendron and Williamsonia</i>	
Total hours	45

Course outcomes

1. Knowledge on the basic concept of different plant groups and their phylogeny.
2. Systematic knowledge about Bryophytes, Pteridophytes and Gymnosperms.
3. Ability to identify the different plant groups.
4. Gains knowledge on the anatomical features of the various form given in the syllabus.
5. Acquire knowledge on the fossil forms.

Text Books:

1. Sundara S. Rajan (2003). Text book of Practical Botany. Anmol Publications, Pvt.Ltd. New Delhi.
2. Kumar, Ashok (2005). A textbook of Practical Botany. Vol. I. Rastogi Publications, Meerut
3. B. P. Pandey (2010). Modern *Practical Botany Vol-IS*. Chand Company LTD. Ram Nagar. New Delhi.

Reference Books

1. Ayesha Parveen. (2018). Botany Paper-II Bryophytes, Pteridophytes, Gymnosperms and Paleobotany, SIA Publishers & Distributors PvtLtd
2. Santra, Das and Chatterjee. (2010). College Botany Practical, Volume 2. New Central Book Agency (P) Limited
3. J. Wallis. (2013). Practical Botany Fifth Edition, Elsevier Ltd.

Plant Morphology

Semester III
18BBOC07

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students,

1. To know the structure and modifications of plant parts.
2. To gain knowledge about the reproductive system of plants.
3. To understand different types of germinations.

Unit 1 Structure of a flowering plant

Root system types -tap root and fibrous root. Modification of root- tuberous root –Conical- Carrot, Fusiform- Raddish, Napiform – Beet root, Fasciculated– Asparagus, Palmated- *Habenaria*, Storage- Sweet potato, Anchorage- *Pandanus*, Climbing- Pepper and Absorbing- *Phyllodendran*, Epiphytic- *Vanda*, Haustorial- *Cuscuta*, Floating- *Jussiaea*, Respiratory- *Avicennia* and Assimilatory- *Vanda*.

15

Unit 2 Shoot system

Shoot system- types of branching (monopodial and sympodial), twiners and climbers (tendrils, hooks and thorns). Modification stems-root stock, rhizome, corm, tuber and bulb. Aerial modification - cladodes and phylloclade. Leaf- shape and margin, arrangements- simple and compound, venation – reticulate and parallel, modifications- scale leaf, phyllode, leaf spine and leaf tendrils. Pitcher plant -Bladder wort and heterophylly.

15

Unit 3 Inflorescence

Inflorescence types- racemose, panicle, corymb, spike, spadix, umbel, capitulum, catkin, cymose, solitary, simple, dichasial, monochasial and polychasial. Special types- hypanthodium, verticillaster, cyathium, thyrus and fascicle. Flower symmetry- actinomorphic, zygomorphic. Aestivation- types, androecium, torus and gynoecium. Placentation- types.

15

Unit 4 Pollination and Fertilization

Pollination- types of pollination- Autogamy, allogamy, cleistogamous, hydrophily, anemophily, entomophily, ornithophily. Fertilization, types of fertilization, dichogamy, unisexuality, self-sterility, heterosytism. Types of Fruits- fleshy, aggregate, multiple, dry indehiscent and dry dehiscent fruits.

15

Unit 5 Seed

Seed-detailed structure of Dicot and monocot seeds, Endosperms-types: ruminant, perispermous, arillate and caruncle, process of formation of endosperm, Germination- types of germination- Epigeal (Bean), Hypogeal (Bengal gram) and Vivipary (*Avicennia*).

15

Total hours

75

Course Outcomes

1. Enables the student to identify and classify flowering plants.
2. Investigate the structure of various flowering plants
3. Gain knowledge on modification and special features of different parts of plants
4. Identification of g plant families using morphological terminology
5. Application f pollination technology in plant breeding technique
6. Application of knowledge gained on seed germination to future research.

Text books:

1. Shubhrata. R. Mishra. (2009). Morphology of plants. Discovery publishing house, New Delhi.
2. Singh, M.P. and A.K.Sharma. (2007). Text Book of Botany. Anmol publications PVT.LTD, New Delhi.
3. Rajini Sharma. (2004). An Introduction to Plant morphology. Campus Books International, 4831/24,Prehladstreet, Ansari Road, Darya Ganj, New Delhi.
4. Verma. V. (2010). Botany, Ane Books Pvt. Ltd. New Delhi.

Reference books:

1. Satish Kumar Sinha, (2012). Encyclopedia on Morphology of Angiosperm, Publisher: Oxford Book Company.
2. SundaraRajan. S. (2008). Practical manual of plant morphology. Anmol publications Pvt.Ltd, NewDelhi.
3. Clive Koelling, (2016). Plant Anatomy, Morphology and Physiogy, Publisher: Syrawood Publishing House.

Taxonomy of Angiosperms

Semester III
18BBOC08

Hours of Instruction/week: 5
No. of credits: 4

Objectives:

1. To know the principles of classification of flowering plants.
2. To know about the economic value of plants.
3. To understand relation between families

Unit 1 Classification

Objective and scope of taxonomy. Systems of angiosperm classification and its merits and demerits – Linnaeus (Artificial system of classification), Bentham and Hooker (natural system of classification), Engler and Prantl (Phylogenetic system of classification) and Takhtajan (Current system of classification), Angiospermic Phylogenetic Classification (APG-III). **15**

Unit 2 Taxonomic Hierarchy

Keys to the families, genera and species, methods – Rules and recommendations of ICBN. type methods – Holotype, Isotype Paratype, Lectotype, Neotype, and Syntype. Field Herbarium techniques. Importance of herbarium. Herbaria in India. **15**

Unit 3 Polypetalae

Systematic, salient features, characters and economic importance of the following families: Dicot - Polypetalae: Annonaceae, Capparidaceae, Rutaceae, Malvaceae, Rhamnaceae, Leguminosae and Apiaceae. **15**

Unit 4 Gamopetalae

Systematic, salient features, characters and economic importance of the following families: Asteraceae, Rubiaceae, Asclepiadaceae, Acanthaceae, Verbenaceae and Lamiaceae, **20**

Unit 5 Monochlamydeae & Monocot

Systematic, salient features, characters and economic importance of the following families: Monochlamydeae- Amaranthaceae, Aristolochiaceae and Euphorbiaceae. Monocot- Orchidaceae, Liliaceae and Poaceae. **10**

Total hours 75

Course outcomes:

1. Gain knowledge of vascular plants and their classification.
2. Obtain knowledge on the techniques of identifying plants.
3. Enable the students to naming and preserving plants.
4. Gain knowledge about description of plants.
5. Understand the relationship between families.
6. Understand the economic importance of different plants

Text books:

1. B. P. Pandey(2014). Taxonomy of Angiosperm. S. Chand & company Ltd New Delhi.
2. Sharma, O.P., (2011). Plant Taxonomy. Tata McGraw Hill Publishers Company. New Delhi.
3. B. P. Pandey (2014). Economic Botany. S. Chand & company Ltd. New Delhi.

Reference books:

1. Singh, G. (2009). Plant systematic: an integrated approach. Science Pub Inc.
2. Tod F. Stuessy. (2009). Plant Taxonomy, The Systematic Evaluation of Comparative Data, second edition, Columbia University Press.
3. David J. Mabberley. (2017).Mabberley's Plant-book, A Portable Dictionary of Plants, their Classification and Uses, 4th Edition, Academic.

Practicals III – Plant Morphology and Taxonomy of Angiosperms

Semester III
18BBOC09

Hours of Instruction/week: 5
No. of credits: 2

<p>Unit 1: Root system – root modifications, Shoot system – Stem modification, Leaf types, modification, Parts of flower</p>	15	C o u r s e O u t c o m e s:	
<p>Unit 2 : Inflorescence -Types, Fruit- Fleshy and Dry fruits, Germination: Epigeal and Hypogeal</p>	15		
<p>Unit 4 : Taxonomy</p> <p>Technical description of the morphology of flowers and its parts.</p>	15		
<p>Unit 3: Economic Botany</p> <p>Identification of plant products of economic value as given in the syllabus</p>	25		
<p>Unit 5:Herbarium</p> <p>Submission of 25 Herbarium specimens with herbarium data, Field trips to various places to study the plants and their habitat.</p>	5		
Total hours		75	1. F ami liar ize wit h the mo rph olo

gical and systematic knowledge about different plant groups.

2. Provides skill in structural characteristics of various plant parts.
3. Acquires knowledge on economically important plant parts
4. Basic concepts of Plant Systematics and its Role in Classification.
5. Apply the taxonomic principles for preparing Herbarium.

Text Books

1. R K Sinha (2010). Practical Taxonomy of Angiosperms I.K. International Publishing House Pvt. Limited,
2. Kumar, Ashok (2005). A textbook of practical botany.Vol. I.Rastogi Publications, Meerut
3. Ashok Bendre and Ashok Kumar (2009). Practical Botany 1.Rastogi Publications, Meerut

Reference books:

1. R. K. Sinha (2010). Practical Taxonomy of Angiosperms, I.K. International Publishing House Pvt. Limited.
2. Judith Winston (2012). Describing Species: Practical Taxonomic Procedure for Biologists Columbia University Press, New York.
3. Henry H Dixon (2017) Practical Plant Biology: A Course of Elementary Lectures on the General Morphology and Physiology of Plants, Forgotten Books
4. Clive Koelling (2016) Plant Anatomy, Morphology and Physiology, Strawood Publishing House

Discipline Specific Elective
DSE-III Computer Application for Botany

Semester III
18BBOI05

Hours of Instruction/week: 5
No. of credits: 4

Objectives:

1. To enhance basic knowledge on computers and its fundamentals
2. To develop conceptual understanding of MS office and Internet
3. To Create presentations with tables, charts and animation

Unit 1 Introduction to Computers

Types of Computers- Characteristics of Computers- Classification of Digital Computer System: Micro Computers- Mini Computers- Mainframes- Super Computers- Computer Networks- LAN and WAN. Components and functions of Computer: Central Processing Unit- Computer Architecture. **15**

Unit 2 The Peripheral Devices

Memory units- Auxiliary storage devices: Magnetic tape- Hard and Floppy disk- Input devices- Output devices- Computer Software- Operating system: Function of OS- Classification of OS. **15**

Unit 3 Window explorer and Ms Word

Working with Window explorer- My Documents- My Computer- Recycle Bin- Open, Close, Resize, Minimize, Move and customize Windows- Start Menu, Searching for files- Move, Copy, Save, Name, Rename, Delete and Backup files and folders Windows Help: Search, Help Online. **15**

Ms Word- Word processing Software- Create Documents- Format and Organize Text- Word with graphics- Picture, Objects, Charts and Tabs. Tables- Applying special text, Paragraph and Document formats.

Unit 4 MS Excel and MS PowerPoint

Spreadsheet Software- Creating and enhancing a worksheet- Construct Formulas and charts- Manage multiple worksheets in a Workbook- Using Excel Functions and tables. MS PowerPoint- Presentation Software- Getting started- Formatting a Presentation- Graphics- Presenting data using tables, charts and animation. **15**

Unit 5 Internet

Working with Internet- Connecting to the Internet Hardware, Software and ISPs-search engines-search strategies, Web Portals- Mail: compose and send a message. Reply to a message- Working with email attachments. **15**

Total hours 75

Course outcomes:

1. Understand the history of computers
2. Understand the various peripheral devices in a computer
3. Apply the knowledge of ms word
4. Calculations of various types using formulas in MS excel
5. Creating presentations with tables, charts and animation
6. Acquire basic knowledge about internet and can create mails

Text books:

1. Gary B. Shelly, Steven M. Freund, Misty E. Vermaat. (2013). Introduction to Computers. (Eighth Edition), Nicole Pinard Publishers, USA.
2. Sanjay Saxena. (2011). MS Office 2007. in a Nutshell, Vikas Publishing House, New Delhi.
3. Mark Levene. (2011). An Introduction to Search Engines and Web Navigation. (Second Edition). John Wiley & Sons Inc., Publications. New Jersey

Reference books:

1. Anita Goel (2010). Computer Fundamentals, Pearson, New Delhi
2. V. Rajaraman, N. Adabala, (2015). Fundamentals of Computers, PHI Learning Pvt. Lt. New Delhi.
3. FaitheWempen. (2014). Computing Fundamentals: Introduction to Computers. John Wiley & Sons, Inc., Indianapolis, Indiana.

Cell Biology

Semester IV
18BBOC10

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

1. To resolve some of the mysteries of the living cell making the discipline of the living cell fascinating.
2. To understand the external membranous structure and function of living cell.
3. To gain knowledge about the primary functional organelles of plant cell.

Unit 1 Cell Wall and membrane structure

Cell- Electron microscopic structure of prokaryotic and Eukaryotic cell. Cell Wall- Structure- primary, secondary and tertiary middle lamella, chemical composition and functions. Plasma membrane –structure (Fluid Mosaic Model) and functions. Cytoplasm - chemical and physical nature.

15

Unit 2 Cell Organells

Structure and functions of Plastids- Chloroplast, Detailed structure and functions of Mitochondria ,Golgi complex, Ribosome - occurrence ultra structure chemical composition and functions. Types -Mitochondrial and chloroplast ribosomes. Endoplasmic reticulum - agranular and granular, vacuole, peroxisomes and Lysosomes.

15

Unit 3 Nucleus

Nucleus - occurrence, number, shape, position, chemical composition and ultra structure and functions, Nuclear envelope- Nuclear membrane, Perinuclear space, nuclear pore, annulus, Central granule, fibrous lamina and functions. Nucleolus-structure and function.

15

Unit 4 Chromosome

Chromosome- number, size, Structure of chromosome at molecular level and chemical composition, types of chromosomes - euchromatin, heterochromatin, Chromosome models, chromosome proteins, centromere, giant chromosome- lampbrush chromosomes and Polytene .Functions of chromosomes

15

Unit 5 Cell cycle

Cell Birth: Cell cycle- Interphase-G1 phase, S phase and G2 phase. Mitosis- Prophase, Metaphase, Anaphase, Telophase. Meiosis –definition, Meiosis- I and Meiosis-II, Cell Death: Necrosis and Apoptosis. Amitosis. Significance of Cell division.

15

Total hours

75

Course outcomes:

1. Resolve some of the mysteries of the living cell making the discipline of the living cell fascinating.
2. Understand the external membranous structure and function of living cell.
3. Gain knowledge about the primary functional organelles of plant cell.
4. Understand the basis of genetic hereditary at cellular level.
5. Acquire knowledge on the process of life through cell cycle.
6. Understand the basic functions and pathways inside cell

Text books:

1. G. P. Gupta (2015). Plant Cell Biology, Discovery Publishing Pvt.Ltd
2. P S Verma and V K Agarwal (2016). Cell Biology (Cytology, Biomolecules and Molecular Biology) Publisher S. Chand
3. Arumugam, N. 2014.Cell Biology. Saras Publications, Nagercoil

Reference books:

1. George Plopper (2016). Principles of Cell Biology, Jones & Barlett Learning, Burlington.
2. José M. Estevez (2014). Plant Cell Expansion (Methods in Molecular Biology) Springer Nature
3. William V Dashek and Marcia Harrison (2010). Plant Cell Biology, CRC Press

Anatomy and Embryology

Semester IV
18BBOC11

Hours of Instruction/week: 5
No. of credits: 4

Objectives: To enable the students

1. To understand the internal structure of plant parts and their variations in developmental stages.
2. To know the details about the recent trends in the development of plants.
3. Identify and compare structural differences among different taxa of angiosperm

Unit 1 Tissue and Root, Shoot and leaf systems

The Tissue–Meristem tissues- Apical meristem- stem apex, Root apex- Classification, Theories- apical cell theory, Histogen theory, Tunica corpus theory, Permanent tissues- Simple tissues- Parenchyma, Collenchyma and Sclerenchyma and complex tissue- Xylem, Phloem, Secretory tissues- Glandular and Laticiferous tissues, Structure, anatomy of dicot and monocot stem, root and leaf, differences between dicot and monocot stem, root and leaf

15

Unit 2 Secondary growth

Secondary structure of root- and stem- cambium, cork cambium, interfascicular cambium, secondary phloem, secondary xylem, Annual rings- sap wood and heart wood. Anomalous secondary growth in *Dracaena*, *Boerhavia*, *Nyctanthus* and *Beta vulgaris*.

15

Unit 3 Gametophytes

Microsporangium – structure and development of male gametophyte, Megasporangium – structure and development of female gametophyte – types of ovule, structure and functions of embryo sac, types mature embryo sac- monosporic- Oenothera type, polygonum type, bisporic- Allium type, Endymion type, tetrasporic- Peperomia, Peanea, Drusa, Fritilaria, Plumbagella, Plumbago and Adoxa type.

10

Unit 4 Fertilization

Fertilization- Pollen tube entry towards micropyle, style, embryo sac double fertilization, Triple fusion, Endosperm– Structure and development, types of endosperm- Nuclear endosperm, Cellular endosperm, and Helobial endosperm. Cytology and functions of endosperm.

20

Unit 5 Embryogeny

Structure and development of embryo, dicot embryo development - Crucifer- *Capsella bursa pastoris*, Asterad type- *Lactuca sativa*, Solanad type- *Nicotiana tobaccum*, Chenopodium type- *Chenopodium bonus henricus*, Caryophyllad type- *Sagina procumbens*. Monocot embryo development- *Najas lacerata*.

15

Total hours 75

Course outcomes

1. Gain knowledge about plant cells, tissues and their functions.
2. Identify and compare internal structural differences among different taxa of angiosperm.
3. Understand the secondary growth patterns of root and stem.
4. Know the structure and development of male and female gametophyte.
5. Gain knowledge about process of fertilization.
6. To compare the functions and morphological characters of monocot and dicot embryos.

Text books :

1. Rajni Sharma. (2004). An Introduction to Plant Anatomy. Campus Book.
2. Clive Koelling (2016). Plant Anatomy, Morphology and Physiology, Strawood Publishing House
3. S K Singh (2006). Textbook of Plant Anatomy, Campus Books International

Reference books:

1. Julia Rothman (2014). Nature Anatomy, Storey Publishing LLC
2. Annie Ragland (2014). Plant Anatomy and Microtechniques Saras Publication
3. Majumdar M (2011). Plant Anatomy, Book Rix, Advanced Biology.
4. Charles B. Beck (2010). An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century Cambridge University Press

Practicals IV- Cell Biology, Anatomy and Embryology

Semester IV
18BBOC12

Hours of Instruction/week: 3
No. of credits: 2

Unit 1 : Cell Biology

Ultra structure of plant cell, cell organelles – chloroplast, mitochondria, ribosomes, endoplasmic reticulum and golgi complex, nucleus **10**

Unit 2 : Cell Biology **10**

Smear preparation- identification of different stages of cell division (mitosis & meiosis)

Unit 3 Anatomy **10**

Tissues- Simple, complex and secretory, Sectioning of Plant material for primary structures covered in the syllabus

Unit 4 : Embryology **5**

Sectioning of Plant material for secondary and anomalous structures covered in the syllabus

Unit 5 : Embryology **10**

Dissection of embryo, T. S of Anther, types of ovule, Dicot embryo

Total hours **45**

Course outcomes:

1. Understand the external membranous structure and function of living cell
2. Understand the secondary growth patterns of root and stem.
3. Understand the secondary growth anomalous structures in plants
4. Know the structure and development of male and female gametophyte
5. Compare the functions and morphological characters of monocot and dicot embryos.

Text books:

1. Rajni Sharma. (2004). An Introduction to Plant Anatomy. Campus Book.
2. Clive Koelling (2016). Plant Anatomy, Morphology and Physiology, Strawood Publishing House.
3. J. Wallis (2013) Practical Botany Fifth Edition, Elsevier Ltd.

Reference Books:

1. Debarati Das (2017). Essential Practical Handbook Of Cell Biology & Genetics, Biometry, Academic publishers, Kolkata
2. Samantha Granger (2015). Recent Developments in Cell Biology, Volume 1, Callisto Reference
3. William V Dashekandand Marcia Harrison (2009). Plant Cell Biology, Science publishers.
4. Julia Rothman (2014). Nature Anatomy, Storey Publishing LLC
5. Annie Ragland (2014). Plant Anatomy and Microtechniques Saras Publication

Genetics

Semester V
18BBOC13

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

1. To understand the basic principles of genetics.
2. To know about the factual information of modern researchers.
3. To learn about the principles of breeding.

Unit 1 Mendelism

Mendel Laws: Law of Dominance and Law of Segregation of alleles – Monohybrid cross (Eg: Garden Pea plant breeding of Tall and Dwarf plant), back cross and test cross Law of Independent Assortment – Dihybrid cross (parent with yellow round seeds crossed with green wrinkled), Trihybrid Ratios (fork line method: Tall Yellow Round characters crossed with dwarf green wrinkled) and Modifications of Mendel Ratios. **15**

Unit 2 Interaction of factors

Complementary factor, supplementary factor, epistasis, inhibitory factors, duplicate factor, polygenic inheritance, lethal factor, incomplete dominance and pleiotropic effect **15**

Unit 3 Molecular Genetics

Sex determination in plants, molecular Genetics- mutation – introduction, characteristics, types – substitution, Insertion, Deletion and Frameshift mutations. Factors inducing mutation and mutagens. **20**

Unit 4 Chromosome abberations

Introduction, aneuploidy (Monosomic, Trisomic, Tetrasomic and Nullisomic), euploidy (Monoploidy, Haploidy and Polyploidy – Autopolyploidy and Allopolyploidy), artificial induction of polyploidy and significance of polyploidy **10**

Unit 5 Modern Concept of Genes

Introduction, definition of gene, codon, Triplet codes, initiation codon, termination codon, non sense codon, anticodon, degeneracy and identification of genetic material. **15**

Total hours 75

Course outcomes:

1. Provides knowledge on the basic principles of Genetics
2. Analyse the quantification of heritable traits in families and populations
3. Understand the genetic mechanisms and provides insight into cellular and molecular mechanisms.
4. Understand the role of genetic mechanisms in evolution
5. Knowledge on the modern concept of genes.

Text books:

1. P.S.Verma and V.K.Agarwal. (2009). Genetics.S.Chand and Company LTD., Ram nagar, New Delhi.
2. Tyagi I D (2014) Plant Breeding and Genetics at a glance, Jain Brothers
3. George Acquaah (2012) Principles of Plant Genetics and Breeding, Wiley-Blackwell

Reference books:

1. William Lochhead (2010), An Introduction to Heredity and Genetics; A Study of the Modern Biological Laws and Theories Relating Animal & Plant BreedingNabu Press
2. B.D.Singh.(2009) . Plant breeding principles and methods.Kalyani publishers, New Delhi.
3. Ben Davies (2018) Plant Genetics Callisto Reference

Plant Breeding and Seed Technology

Semester V
18BBOC14

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

1. To learn and understand the importance of plant breeding
2. To know about the selection methods and crop improvement
3. To know the seed formation and certification process

Unit 1 Plant Breeding

History and objectives of plant breeding; shifting cultivation. Centres of Domestication, Centres of Redomestication, Centre of origin of cultivated plants, Vavilov theory. Consultative group for international Agricultural Research. Research Centres- IBPGR, NBPGR, germplasm collection and seed bank. Agro-climatic based crops- Sugarcane, Paddy and cotton, **10**

Unit 2 Breeding techniques

Pollination and its types, Selection–mass selection, pure line selection, clonal selection, emasculation, bagging, collection of pollens, crossing over with reference to methodology and their application. Inbreeding depression –effects of inbreeding. Heterosis - genetic basis of heterosis – theories explaining heterosis. **15**

Unit 3 Crop improvement

Methods of hybridization- pedigree method, bulk method, backcross method–procedure, merits and demerits of the above breeding methods. Molecular markers (assisted plant). Breeding for desirable characters –biotic and abiotic resistance **10**

Unit 4 Seed technology

Seed formation. Seed morphology and structural details of Dicot (Castor) and Monocot (Paddy) seeds. Seed sampling- Method of sampling, Seed Purity, Seed Germination –Standard Germination Test. Seed dormancy. Seed viability – T2 test embryo excision method. Importance Seed moisture– methods of moisture determination basic methods. seed storage- botanicals used in seed storage **20**

Unit 5 Seed Certification and Propagation

Seed certification – objectives – fundamental concepts of seed certification, classes of seed: Breeder's seed, certified seed. Seed analysis – Tagging of seedlings – field standards. Methods of Direct and Indirect Seedling Production in Nurseries and Transplantation. Propagation through specialized underground structures –Corm, Tuber, Sucker, Bulb, Bulbil, Rhizome; Vegetative Propagation –Cutting, Layering, rafting and Budding. Value added products – Onion, Potato, Coconut and Carrot. **20**

Total hours 75

Course Outcomes:

1. Enhance knowledge on plant improvement through breeding aspects
2. Gain knowledge about selection methods and their application
3. Demonstrate the different crop improvement methods
4. Explain the seed formation and seed germination technique
5. Know the seed certification methods
6. Understand different types of seed production

Text books:

1. Jack Brown and Peter D.S. Caligari(2008).An Introduction to Plant Breeding.Blackwell Publishing, Australia
2. B.D. Singh (2011). A Text Book of Plant Breeding.Kalyani Publishers, New Delhi.
3. Rattan Lal Agarwal. Second Edition (2008).Seed Technology .Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
4. Vanangamudi, K. (2013). Seed Science and Technology. New India Publishing Agency, New Delhi

Reference books:

1. J. Derek Bewley, Michael Black, Peter Halmer (2006).The Encyclopedia of Seeds: Science, Technology and Uses. CABI
2. Aluizio Borém, Roberto Fritsche-Neto (2014). Biotechnology and Plant Breeding: Applications and Approaches for Developing. Academic Press, Elsevier Publications.
3. Rajeev K. Varshney, Manish Roorkiwal, Mark E. Sorrells (2017) .Genomic Selection for Crop Improvement: New Molecular Breeding Strategies Springer International Publishing

Plant Pathology

Semester V
18BBOC15

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

- To ensure the basic understanding of pathogenesis in plant
- To Impart Information on the various types of plant disease
- To enrich the knowledge on the causative organisms of various plant diseases and their control measures.

Unit 1 Plant Pathology

Introduction, agents of infections and non- infectious plant diseases: Virus, Bacteria, Fungi - Aphids-Leaf hoppers- Nematodes as plant pathogens- Effect of Environment on plant diseases -temperature, moisture and soil fertility. Parasitic flowering plant. **15**

Unit 2 Classification of plant diseases

Classification -Based on their occurrence and major causal agent, Morphological symptoms: Necrosis (rot, canker, damping off, rust, wilt, spot and blight), Hypoplasia (variegation, chlorosis, mosaic, stunting, vein clearing and rosetting) and Hyperplasia (galls, curl, intumescence, hairy root and witches broom). **15**

Unit 3 Plant Diseases

Disease, casual organisms, symptoms and control measures of - Citrus Canker, Bacterial Blight of Cotton, Tikka disease of Groundnut, Blast disease of paddy, leaf roll disease of potato, leaf curl of papaya and Yellow vein mosaic of Bhendi. Red rot of sugarcane. **15**

Unit 4 Plant Diseases

Disease, casual organisms, symptoms and control measures of - Little leaf of Brinjal, Sandal spike, leaf spot of cucumber, Wilt disease of gram, Wart disease of potato, White rust of Crucifers, Loose Smut of Wheat and Club rot of crucifers. **15**

Unit 5 Management of Plant diseases

Prevention-Avoidance of pathogens-Exclusion of inoculums, plant quarantine organization in India -Eradication of inoculums by treating soil, seeds and plants. Different types of spraying and dusting. Elimination of pathogens. Cure - Chemotherapy -production - use of disease resistant hosts and inheritance of resistance. **15**

Total hours 75

Course outcome

1. Identify the different types of infectious and non -infectious agents
2. Classify the various types of symptoms
3. Understand plant diseases and its control measures
4. Gain knowledge about quarantine organizations and its laws
5. Identify the causal organisms based on their symptoms
6. Gain knowledge on organic and inorganic control measures and disease resistant host

Text books :

1. Mehrotra, R.S. and Ashok Agarwal. (2013). Plant Pathology. Tata McGraw hill Publishing Company, New Delhi.
2. Bilgrami, K.S. &H.C. Dube (2010) A text book of Modern Plant Pathology – Vikas Publishing House (P) Ltd., New Delhi
3. Y. Dyakovand V.Dzhavakhiya (2007) Comprehensive and Molecular Phytopathology, Elsevier

Reference books:

1. Mehrotra R.S. and AshokaAgarwal. (2010). Plant Pathology. TATA McGraw
2. Richard Strange, N. (2003). Introduction to Plant Pathology.Wiley Publication.
3. Philip Stewart and Sabine Globig (2011) Phytopathology in Plants, Apple Academic Press.

Plant Physiology and Biometrics

Semester V
18BBOC16

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students

1. To gain knowledge about recent advance in the field of plant physiology.
2. To know about the biochemical and metabolic aspects of plants.
3. To learn the methods of data collection and the application of statistics in solving biological problems.

Unit 1 Absorption and Transpiration

Absorption- Definition, Mechanism, Active absorption and Passive absorption. Transpiration -Classification, Mechanism of stomatal opening (theories) Significance of Transpiration, Guttation. Ascent of Sap - Definition, Path of ascent of sap, Mechanism-Vital and Physical force theories. 15

Unit 2 Photosynthesis

Photosynthesis- Significance- Red drop- Emerson's enhancement Effect. Mechanism- Pigment system I and II, Dark reaction or Calvin cycle (C_3 Pathway), C_4 Pathway, CAM Pathways 15

Unit 3 Respiration

Respiration -Introduction, mechanism, Glycolysis (EMP Pathway) Fermentation, Aerobic oxidation of Pyruvic acid or Krebs's cycle – Significance. Pentose - Phosphate pathway and its significance. Photorespiration and Respiratory quotient. 15

Unit 4 Plant Growth and Photomorphogenesis

Plant growth - Plant growth regulators (auxins, gibberellins, and cytokinins) - Practical application. Photoperiodism- Definition, Short day plants, Long day plants, Day neutral Plants, Photoperiodic induction. Vernalization: Definition, Mechanism, Phasic development theory and Hormonal Theory, Devernalization and Practical utility of vernalization. Plant movements -Geotropism, Phototropism, Thigmotropism. 15

Unit 5 Bio statistics

Biostatistics - Data, Types and methods of collection of Data, Sampling techniques, Frequency distribution. Presentation of Data –Tabulation, Parts of Table, Types of table, Graphic representation of data, Histogram, Frequency curve, Frequency polygon and Ogives. Analysis of data–Arithmetic Mean, Median and Mode. Measures of dispersion – Standard Deviation and standard error. 15

Total hours 75

Course outcomes:

1. Understand the various functions of plants.
2. Gain knowledge about the various aspects of physiological processes in plants
3. Gain knowledge on biochemical and metabolic aspects of plants.
4. To study the hormonal and induction patterns in plants.
5. Understand the physiology behind flowering and fruiting
6. Knowledge on methods of data collection and the application of statistics in solving biological problems.

Text books:

1. S.K.Verma. (2010). A Textbook of Plant Physiology and Biochemistry, S.Chand and Company LTD., Ram nagar, New Delhi.
2. Kochhar (2016). Plant physiology- Theory and applications. Cambridge India.
3. Annie Ragland, Rajakumar and Jayakumar Rajarathnam (2014). Plant physiology, Saras Publication
4. Bernard (2015) Fundamentals of Biostatistics Cengage Learning Custom Publishing

Reference books:

1. G. S. R. Murti, G. S. Siroli and K.K.Upreti. (2006). Glossary of Plant Physiology. Daya Publishing house, Delhi.
2. Dipak Kumar Kar (Author). Soma Halder. (2010), Plant Breeding Biometry Biotechnology. New Central Book Agency.
3. Lincoln Taiz, Eduardo Zeiger, Ian M. Moller, and Angus Murphy (2015) *Plant Physiology and Development*, Sixth Edition , Sinauer Associates, Oxford University

Practicals V- Genetics, Plant Breeding, Seed Technology, Plant Pathology and Plant Physiology

Semester V
18BBOC17

Hours of Instruction/week: 5
No. of credits: 2

Unit 1 : Genetics

Problems on Dihybrid, Trihybrid and interaction of factors. Smear preparations - Stage of all divisions in Meiosis and Mitosis. **15**

Unit 2 Plant Breeding **15**

Floral biology of cotton and Maize ,Emasculation, cross pollination

Unit 3 : Seed Technology

Testing of seed viability using 2, 3, 5-triphenyl tetrazolium chloride (TTC)., Demonstration of seed dressing using fungicides to control plant diseases, Estimation of amylase activity of germinating seeds (Qualitatively), Pollen viability test using Evan's blue staining. (Hibiscus) **15**

Unit 4: Plant pathology **15**

Identification of diseases in Citrus, Cotton, Paddy, Potato, Bhendi , Papaya, Brinjal, Ground nut, Wheat and crucifers

Unit 4 : Plant Physiology

Relationship between Transpiration and Absorption, Ganong's Potometer, Farmer's Photometer, Wilmott's Bubbler, , Determination of R.Q using Ganong's Respirometer, Kuhne's Fermentation vessel, Effect of Gibbere llic acid on plant growth **15**

Total hours **75**

Course outcomes:

1. Knowledge on Basic concepts of Mendel
2. Practical knowledge on different crop improvement methods
3. Understand different types of seed production
4. Acquires knowledge on seed germination technique
5. Ability to identify different pathogens from diseased plants
6. To gain knowledge about the various aspects of physiological processes in plants

Text Books

1. K. R. Aneja (2003) Experiments in *Microbiology, Plant Pathology* and Biotechnology. New age international publishers
2. P. Gunasekaran –2007 Laboratory Manual in Microbiology. New age international publishers
3. Sankar Apurba Sastry and Bhat Sandhya K (2017) Essentials of Practical Microbiology, JP Medical Ltd

Reference books:

1. S Sadasivam, A. Manickam (2002) Biochemical methods. New age international publishers
2. P.S. Verma and V.K. Agarwal. (2009). Genetics. S.Chand and Company LTD., Ram nagar, New Delhi.
3. J. Wallis (2013) Practical Botany Fifth Edition, Elsevier Ltd.

Organic Farming (Self-study course)

**Semester V
18BBOC18**

**Hours of Instruction/week: 1
No. of credits: 4**

Objectives:

1. To maximize ecological productive efficiency
2. To adopt cost effective farming to bring equity of food price and wage.
3. To achieve an evergreen revolution in agriculture.

Unit 1 Soil

Soil – Profile, formation, Types , Soil fertility- micro (Calcium, Sulphur and macro 3
(Nitrogen, Phosphorus and Potassium) nutrients.

Unit 2 Green manuring

3

Definition, types of green manure- Insitu, leaf manuring, Benefits, Green Manure crops-
Azadiracta, Tephrosia, farming system- mulching, GM in Agroforestry

Unit 3 Agricultural wastes

Types – Crop residues, agro industrial waste- rice husk, baggasse, coir waste, Types of 3
manures, Utilization of agro waste.

Unit 4 Composting

Definition, classification- Aerobic, anaerobic and vermicompost, Preparation of compost, 3
importance of composting, factors affecting composting- oxygen, moisture, C:N ratio and
temperature.

Unit 5 Pest management

Physical and mechanical control, biological control, increasing the effectiveness of 3
biological control. merits and demerits of biological control.

Total hours 15

Course outcomes:

1. Know the role of macro and micro nutrients in plant growth and development
2. Gain the knowledge of different types of green manures
3. Understand recycling technique of organic materials
4. Know the importance of composting
5. Understand biological method of pest control
6. Understand the application of science to community

Text books:

1. Arun, K.S. (2007). A Hand Book of Organic Farming. Agrobios, India.
2. Trivedi, P.C. (2010) Organic farming for sustainable agriculture. Aavishkar, New Delhi
3. Bennett, H.H. (2004). Soil Conservation for sustainable development. Scientific Books suppliers. Delhi

Reference books:

1. Palaniappan, S. P. (2010) Organic farming theory and practice. Scientific, New Delhi.
2. Singh, A. (2014) Organic farming. Pointed publishers, New Delhi.
3. Philip Stewart and Sabine Globig (2011) Phytopathology in Plants, Apple Academic Press.

Plant Biochemistry

Semester VI
18BBOC21

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

1. To know about the recent trends in the plant biochemistry.
2. To know about the biochemical and metabolic aspects of plants.
3. To understand various basic physical and physiological principles of plants.

Unit 1 Carbohydrates

Introduction, Classification of carbohydrates, Monosaccharides – chemistry, isomerism, ring structure, some important reactions of monosaccharides; Disaccharides – classification and chemistry. Polysaccharides – classification and chemistry, Distinction between Mono-; Oligo- and Polysaccharides; significance of carbohydrates and metabolism of carbohydrates **15**

Unit 2 Lipids

Introduction, Classification of Lipids – Simple lipids, compound lipids, Classification of fatty acids, Properties of fats; Waxes; Phospholipids, Glycoproteins, Lipoproteins, importance of lipids; metabolism of lipids **15**

Unit 3 Amino Acids and Proteins

Structure, Classification and functions of amino acids - essential and non-essential amino acids. Proteins – characteristic features, classification of proteins; structure of protein – primary, secondary, tertiary and quaternary; simple and conjugated protein and synthesis of proteins **15**

Unit 4 Vitamins, Minerals and Enzymes

Vitamins – Introduction, general characteristics of vitamins, classification of vitamins – fat soluble vitamins – Vitamin A, D, E & K; water soluble vitamins – Vitamin B1, B6 & B12. Minerals – Introduction, properties, types of minerals – macro & micro minerals. Enzymes – Introduction, classification, properties, mode of action of enzymes, factors affecting enzyme activity. **15**

Unit 5 Plant secondary metabolite

Secondary metabolites – Introduction, Classification of secondary metabolites, Pathways for synthesizing secondary metabolites – Nucleoside diphosphate sugar pathway – cellulose; Shikimate – cinnamate pathway – lignin and mixed pathway – prenyl flavonoids, Function. **15**

Total hours 75

Course outcomes:

1. Knowledge on the basic structure and function of carbohydrates, lipids and proteins
2. Provides deep understanding of metabolic processes in plants
3. Knowledge on vitamins, minerals and enzymes
4. Gains knowledge on the role of different biosynthetic pathways in plant growth and development
5. Knowledge on the importance of secondary metabolites to plant growth

Text books:

1. Sathyanarayana. U. (2017). Biochemistry. Books & allied (P) LtdElsevier
2. Verma. S.K. (2005). A textbook of Plant physiology and Biochemistry. S.Chand and Company Ltd, Ram Nagar. New Delhi.
3. V. Arunkumar (2010) Plant Biochemistry APH Publishing Corporation
4. Bruce Albert (2014) Molecular Biology of the Cell, Garland Science

Reference books:

1. Ferrier (2017). Lippincott's Illustrated Reviews Biochemistry, Wolters Kluwer
2. Hans-Walter Heldt and Birgit Piechulla (2010). Plant Biochemistry, Academic Press
3. Buchnan. B.B. (2010). Biochemistry and Molecular Biology of Plants. IK International, Pai & Sons.

Plant Biotechnology

Semester VI
18BBOC22

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

1. To know about the recent trends in the crop improvement.
2. To know about the biochemical and metabolic aspects of plants.
3. To gain knowledge in tissue culture techniques

Unit 1 Tissue culture

Introduction, importance, basic requirements for tissue culture lab, nutrition media, 15
sterilization of glassware and explants, gelling agents (Agar-Agar, Agarose and Phytigel).

Unit 2 Growth regulators

Definition, types and their physiological effects (Auxin, Cytokinin, Gibberellins, ethylene 15
and Abscissic acid). Micropropagation – definition and methods (Meristem culture,
Organogenesis, Somatic embryogenesis).

Unit 3 Culture types

Crop improvement through Haploid Production- anther culture, embryo culture, Protoplast 15
culture - isolation (Enzyme treatment) and fusion (PEG method) and artificial seed.

Unit 4 Production of secondary metabolites

Cell suspension culture, bioreactors, batch and continuous culture only and hairy root culture. 15
Biofuels – Current developments

Unit 5 Transgenic plants

Types of gene transfer into plants and application of transgenics. 15

Total hours 75

Course outcome

1. Knowledge on aseptic conditions to be maintained in tissue culture lab and about the nutrient media used.
2. Knowledge on totipotency of a cell and their differentiation by using plant growth hormones
3. Knowledge on producing haploids
4. Knowledge on production of secondary metabolites
5. Knowledge on gene transfer techniques in plants

Text books:

1. Padamnabh Dwivedi. (2004). Plant Tissue culture. Scientific publishers, Jodhpur, India.
2. Agnes Ricroch, Surinder Chopra and Shelby Fleischer(2014) Plant Biotechnology, Springer International Publishing
3. Bhaskar. M. (2014). Horticulture and Plant Biotechnology. Manglam Publishers, New Delhi.

Reference books:

1. Ramawat. K.G. (2008). Plant Biotechnology. S. Chand & Co. New Delhi.
2. S. K. Gahlawat, K. Salar, P.Siwach, J S Duhan, S. Kumar, P.Kaur(2017). Plant Biotechnology: Recent Advancements and Developments, Springer Nature
3. Hossaina B M Sharif (2014). Plant Physiology and Biotechnology: Fundamental and Applied Research, Lambert Academic Publishing

Molecular Biology

Semester VI
18BBOC23

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students:

1. To gain recent knowledge about structure and components of Nucleic acid.
2. To know the enzymes involved in Molecular Biology.
3. To Know the mechanism of protein synthesis

Unit 1 DNA

Occurrence of DNA, Composition of DNA- Structure of Nucleotides, Chargaff's rule of DNA Composition, Structure of DNA- DNA Double helix (Watson and Cricks model), conformations of DNA double helix, Cellular DNA - Mitochondrial and Chloroplast DNA **15**

Unit 2 DNA replication

Replication in Prokaryotes - Semi conservative replication, DNA synthesis-semi discontinuous and bidirectional, Replication Enzymes- Nucleases, Polymerases and Ligases and Helicases, Replication in Eukaryotes, Inhibitors of DNA Replication, Cell cycle and DNA Replication **15**

Unit 3 RNA

Occurrence of RNA, Composition of RNA, Types of RNA, Ribosomal RNA (r-RNA)- Structure and function, transfer RNA (t-RNA)- Structure and function and messenger RNA (m-RNA)- Structure and function. **15**

Unit-4 Protein Synthesis

Overview of Protein Synthesis in *Escherichia coli*, Central Dogma, Transcription- definition, mechanism-initiation, elongation and termination, Translation- Definition, mechanism -initiation, elongation and termination. Inhibitors of Protein synthesis, Chaperones and protein folding, posttranslational modifications. **15**

Unit-5 DNA damage and repair

Consequences of DNA damage, Types of DNA damage, Mutation and its consequence on DNA damage, DNA repair - Base excision repair, Nucleotide excision repair, Mismatch repair and SOS repair. **15**

Total hours 75

Course outcomes:

1. Gain Knowledge on basic structure of Nucleic acids, their structure and occurrence in different cell organelles
2. Gain knowledge on DNA replication and the enzymes involved
3. Gain knowledge on types of RNA and their functions
4. Knowledge on the mechanism of protein synthesis
5. Students gain knowledge on DNA damage and repair mechanism
6. Able to gain knowledge on all aspects of nucleic acids and their function

Textbooks:

1. Mohan P.Arora and Chander Kanta. 2010. Molecular Biology. Himalaya publishing House, Mumbai, Delhi, Bangalore, Hyderabad.
2. Jeyanthi, G.P. 2009. Molecular Biology, MJP Publishers. Chennai.
3. Singh, M.P. and A.K.Sarma.2010. Text Book of Botany. Anmol Publications (P) LTD. New Delhi.

Reference books:

1. José M. Estevez (2014). Plant Cell Expansion (Methods in Molecular Biology) Springer Nature
2. Gordon Uno and Richard storey. 2010. Principle of Botany. McGraw Hill. New Delhi.
3. David R. Hyde. 2010. Genetics and Molecular Biology. Tata McGraw Hill. New Delhi

Plant Genetic Engineering

Semester VI
18BBOC24

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students

1. To gain recent knowledge about DNA, RNA and related technologies.
2. To highlight the recent advances in Biotechnology.
3. To resolve some of the mysteries of the living cell and making the discipline of Microbiology and Biotechnology fascinating.

Unit 1 Biotechnology

Scope, Construction of genomic DNA library and cDNA library, screening by colony hybridization, DNA sequencing-definition, Maxam and Gilbert's method and Sanger's dideoxy nucleotide method **15**

Unit 2 Transposable genetic elements

Bacterial transposable elements, IS elements. Types of transposons - composite transposons, complex transposons, Mechanism of Transposition, eukaryotic transposable elements- corn Ac-Ds elements and phenotypes produced by Ac-Ds elements. **15**

Unit 3 PCR

Definition, procedure, applications, DNA fingerprinting – definition, procedure, single and multi locus probe, micro and mini satellite (only definitions), applications of DNA fingerprinting. **15**

Unit 4 Recombinant DNA

Definition – restriction endonuclease enzymes, cloning vectors – definition, plasmids, cosmids and bacteriophages. Introduction of foreign DNA -Agrobacterium mediated gene transfer, artificial gene transfer - electroporation and micro injection technique, shot gun technique, identification and confirmation of foreign gene by southern blotting technique **15**

Unit 5 Electrophoresis

Electrophoresis- Principles and types- based on buffer system, based on media, PAGE- polyacrylamide gel electrophoresis, agarose gel electrophoresis, SDS-PAGE – sodium dodecyl sulphate polyacrylamide gel electrophoresis, procedure and applications. **15**

Total hours 75

Course outcomes:

1. Gain in-depth knowledge on genetic engineering
2. Gain knowledge on DNA sequences and their analysis
3. Knowledge on the use of various techniques used in genetic engineering
4. Knowledge on DNA finger-printing technology and their applications
5. Students gain knowledge on gene transfer technology
6. Able to gain knowledge on monoclonal antibodies

Text books:

1. Sathyanarayana, U. (2015). Biotechnology. Books and Allied (P) Ltd.
2. Plant Biotechnology Hand Book - NIIR board. (2006). Published by National Institute of Industrial Research, Delhi.
3. Ignacimuthu, S. I. (2004). Plant Biotechnology. Oxford and IBH publishers Co (P) Ltd, New Delhi.

Reference books:

1. C. Neal Stewart , Alisher Touraev, Vitaly Citovsky and Tzvi Tzfira (2011). Plant Transformation Technologies, Blackwell Publishing Ltd
2. Gahlawat, S.K., Salar, R.K., Siwach, P., Duhan, J.S., Kumar, S., Kaur, P. (2017). Plant Biotechnology: Recent Advancements and Developments, Springer Singapore
3. Hossaina B M Sharif (2014). Plant Physiology and Biotechnology: Fundamental and Applied Research, Lambert Academic Publishing

Phytogeography, Evolution and Bioinformatics

Semester VI
18BBOC25

Hours of Instruction/week: 5
No. of credits: 3

Objectives: To enable the students

1. To know the details about the evolutionary trends in the development of plants.
2. To know the application and management of biological data of bioinformatics.
3. To understand the significance of molecular evolution.

Unit 1 Phytogeography

Introduction, Botanical zones or Phytogeographical regions, continuous, discontinuous and endemic distribution. Climate of India (Cold, Hot, Rainy and retreating monsoons season) and climatic Zones of India (Wet, Intermediate, Dry and Arid Zone). Vegetation of India and Tamilnadu. Environmental monitoring - Plant indicators (Agriculture, groundwater, over-grazing, moisture, minerals, fires, pollution). Continental drift (Wegner's theory). **15**

Unit 2 Evolution

Origin and Evolution of life, Theories of Evolution. Theories, critical analysis, significance and examples of Lamarckism and Neo-Lamarckism, Darwinism and Neo Darwinism. Mutation Theory – Experiments and its significance. **15**

Unit 3 Genomics and Proteomics

Genomics - Structural, Functional and Comparative Genomics. Gene Prediction – Hidden Markov Model. Genetic and physical mapping of Genes, Gene expression analysis by cDNA micro arrays. Protein structure prediction – GOR, Chou-Fasman. PSSM, Application of proteomics in health sector. Drug Designing. **15**

Unit 4 Bioinformatics

Definition, History and scope of bioinformatics, Biological Databases – Specialized Genome Databases (SGD and TIGR), Nucleic Acid Databases (NCBI, DDBJ and EMBL), Protein Databases (Swissprot, PIR), Structure Databases (CATH and SCOP) **15**

Unit 5 Alignment Tools

Alignment Tool - Pairwise alignment (BLAST and FASTA) and multiple alignment (Clustal W). Algorithm (Needleman and Wunsch algorithm, Smith-Waterman algorithm). Phylogenetic Analysis – Distance and Parsimony methods. Rooted and Unrooted trees, PHYLIP. **15**

Total hours 75

Course outcomes:

1. Understand the relationship between systematics and biogeography
2. Exposure of plant forms with regards to evolution.
3. Understand the various bioinformatics tools
4. Analyze sequence alignments using various bioinformatics tools
5. Analyze the phylogenetic alignment using tools
6. Understand the basic knowledge of genomics
7. Analyze the protein structure and its prediction

Text books:

1. P.D. Sharma. 2010. Environmental Biology (Second Edition). Rastogi Publications, U.P, India
2. Harisha.S. (2010). Fundamentals of Bioinformatics.I.K. International Publishing House Pvt. Ltd. New Delhi, India.
3. Charlie Hodgman, T., Andrew French and David R. Westhead.(2010). Bioinformatics - Instant Notes-. Taylor and Francis. UK.
4. Ignacimuthu, S. (2013). Basic Bioinformatics. Alpha Science International Limited, New Delhi.

Reference books:

1. Rastogi, S.C., NamitaMendiratta and ParagRastogi.(2013). Bioinformatics method and applications (Genomics, Proeomics and Drug discovery). Fourth edition. Prentice Hall Of India Pvt. Ltd .,New Delhi.
2. Arthur M. Lesk. (2014). Introduction to Bioinformatics.(Fourth Edition) Oxford, UK.
3. Ruchi Singh. (2015). Bioinformatics : Genomics and Proteomics. Vikas Publishing House. Noida, India.

Practicals VI - Plant Biochemistry, Plant Biotechnology, Phytogeography, Evolution and Bioinformatics

Semester VI
18BBOC26

Hours of Instruction/week: 3
No. of credits: 2

Unit 1 : Plant Biochemistry

Analysis of chlorophyll pigments using Paper chromatography , Determination of carbohydrates, aminoacids and protein.Preliminary screening of secondary metabolites (alkaloids and flavonoids). **10**

Unit 2 : Plant Biotechnology **10**

.Demonstration on Gel Electrophoresis

Unit 3 : Phytogeography

Analysis of Soil samples (moisture, pH and EC) **5**

Unit 4 : Evolution

Demonstration of Evolutionary theories discussed in the syllabus **10**

Unit 5 : Bioinformatics

Alignment of nucleic acid sequences using BLAST alignment tool, Protein Structure prediction using RASMOL **10**

Total hours **45**

Course outcomes

1. Analyze the biochemical components from plant sample
2. Knowledge on the application aspects of Biotechnology
3. Knowledge on various soil parameters
4. Helps to understand evolutionary theories.
5. Analyze the nuclei acid, sequence alignment and protein structure prediction

Text Books:

1. S Sadasivam, A. Manickam (2002). Biochemical methods.New age international publishers
2. B.D. Singh (2011). A Text Book of Plant Breeding. Kalyani Publishers, New Delhi.

3. Rattan Lal Agarwal. Second Edition (2008). Seed Technology .Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
4. Dipak Kumar Kar and Soma Halder (2010). Plant Breeding Biometry Biotechnology, New Central Book Agency

Reference books:

1. S. Mirajkar, P. Kale, Prashant Shingote (2016) *Practical Manual for Plant Physiology and Biochemistry*, LAP Lambert Academic Publishing
2. J. Derek Bewley, Michael Black, Peter Halmer (2006). *The Encyclopedia of Seeds: Science, Technology and Uses*. CABI

Botany Department
Discipline Specific Elective
DSE-I Diversification of Plants

Semester III
18BZOI04

Hours of Instruction/week: 4
No. of credits: 3

Objectives: To enable the students.

1. To gain knowledge about the lower primitive groups of plants.
2. To know the structure and modifications of plant parts.
3. Gain knowledge on taxonomically important plants.

Unit 1 Algae

General classification of cryptogams. General features of Algae. Morphological, vegetative and reproductive features and life cycle of the following genera: *Oscillatoria* (Oscillatoriaceae), *Chlamydomonas* (Chlorophyceae), *Dictyota* (Dictyoteae) and *Polysiphonia* (Rhodophyceae). **10**

Unit 2 Fungi and Bryophytes

General classification and salient features of fungi. Morphological, vegetative and reproductive features and life cycle of the following genera: *Penicillium* (Trichocomaceae), *Saccharomyces* (Saccharomycetaceae). General classification and salient features of Bryophytes. Morphological, vegetative and reproductive features and life cycle of the following genera: *Riccia* (Ricciaceae) and *Polytrichum*. (Polytrichaceae) **10**

Unit 3 Pteridophytes and Gymnosperms

General classification and salient features of Pteridophytes. Morphological, anatomical and reproductive features and life cycle of the following genera: *Lycopodium* (Lycopodiaceae), *Adiantum* (Pteridaceae). General classification and salient features of Gymnosperms. Morphological, anatomical and reproductive features and life cycle of the following genera: *Cycas* (Cycadaceae). **10**

Unit 4 Morphology

Parts of a Flower. Fruit – fleshy, aggregate, multiple, dry indehiscent and dry dehiscent fruits. Epigeal germination (Bean) and Hypogeal germination (Paddy) and Vivipary. **15**

Unit 5 Taxonomy

Study of following families and their economic importance: Annonaceae, Rutaceae, Cucurbitaceae, Apiaceae, Asclepidaceae, Amaranthaceae, Euphorbiaceae and Poaceae. **15**

Total hours **60**

Course outcome

1. Obtain the knowledge on different classes of algae by studying one type species.
2. Obtain the knowledge on important genera of Fungi and Bryophytes.
3. Obtain the knowledge on important genera of Pteridophytes and Gymnosperms
4. Gain knowledge on morphology of reproductive structure of plant
5. Gain knowledge on taxonomically important plants.

Text books:

1. Singh, M.P. and A.K.Sharma. (2002) .Text Book Of Botany. Anmol publication PVT, LTD.
2. Shubhrata. R. Mishra. (2009). Morphology of plants. Discovery publishing house, New Delhi.
3. N Arumugam, Annie Ragland and V Kumaresan (2014) Algae Fungi Bryophytes and Plant Pathology, Saras Publication

Reference book:

1. J. Wallis (2013) Practical Botany Fifth Edition, Elsevier Ltd.
2. Ayesha Parveen (2018) Botany Paper-II Bryophytes, Pteridophytes, Gymnosperms and Paleobotany, SIA Publishers & Distributors Pvt Ltd
3. N Arumugam, Annie Ragland and V Kumaresan (2014) Algae Fungi Bryophytes and Plant Pathology, Saras Publication

Discipline Specific Elective
DSE- I Practicals I- Diversification of Plants

Semester III
18BZOI05

Hours of Instruction/week: 3
No. of credits: 2

Unit 1 : Bacteria & Algae A detailed study of the genus given in the syllabus	10
Unit 2:Fungi &Bryophytes A detailed study of the genus given in the syllabus	10
Unit 3: Pteridophytes and gymnosperm A detailed study of the genus given in the syllabus	5
Unit 4 Morphology Fruits and seed germination- Hypogeal and Epigeal	10
Unit 5 : Taxonomy Identification of the families.	10
Total hours	45

Course outcomes:

1. Ability to identify lower forms of plants such as algae and fungi
2. Systematic knowledge about bryophytes, pteridophytes and gymnosperms
3. Familiarize with the morphological and systematic knowledge about different plant groups.
4. Provides skill in structural and functional characteristics of various plant parts
5. Basic concepts of Plant Systematics and its Role in classification.

Text Books

1. Kumar, Ashok (2005) A textbook of Practical Botany. Vol. I. Rastogi Publications, Meerut
2. B. P. Pandey (2010) *Modern Practical Botany Vol-IS*. Chand Company LTD. Ram Nagar. New Delhi.
3. Awasthi A K (2015) Textbook of Algae S Chand, New Delhi

Reference books:

1. Sundara S. Rajan (2010) Textbook of Practical Botany. Anmol Publications, PVT.LTD.
2. R K Sinha (2010) Practical Taxonomy of Angiosperms I.K. International Publishing House Pvt. Limited,
3. B.P. Pandey (2007) Taxonomy of Angiosperms S. Chand Limited

Discipline Specific Elective
DSE- II Diversification of Angiosperms

Semester IV
18BZOI06

Hours of Instruction/week: 4
No. of credits: 3

Objectives: To enable the students:

1. To understand the various functions of plants.
2. To gain knowledge about recent advance in the field of plant physiology.
3. To learn and understand the importance of natural resources and their contribution to mankind.

Unit 1 Cell Biology and Embryology

Ultrstructure of Plant cell, Structure and functions of various cell organelles;-cell wall, mitochondria, chloroplast, gogi bodies, ribosomes, endoplasmic reticulum and nucleus. Structure of mature anther, structure of ovule and its types; Fertilization, structure of endosperm and its types. **15**

Unit 2 Anatomy

Simple-parenchyma, collenchyma and sclerenchyma and Complex tissues- xylem and phloem. Internal structure of stem, root and leaf of dicot (*Amaranthus*) and monocot (Sorgam) plants. **10**

Unit 3 Plant physiology

Water Absorption, Transpiration- types- stomatal, cuticular, and lenticular and mechanism of transpiration significance, Photosynthesis- Light and Dark reaction, C₃ and C₄, factors affecting photosynthesis, Respiration- Glycolysis, Krebs Cycle, photorespiration and fermentation- process and significance. **15**

Unit 4 Ecology

Ecosystem- Definition- Basic concepts of ecosystem, Ecological adaptations of plants- Xerophytes and Hydrophytes (Morphological and Anatomical). Pollution – Air and water pollution and its control measures. **10**

Unit 5 Genetics and Plant breeding

Mendalism, Monohybrid and Dihybrid crosses, Plant breeding- objectives, principles and methods, hybridization techniques, importance of plant breeding. **10**

Total hours **60**

Course outcomes:

1. Gain Knowledge on basic structure and functions of Plant cell organelles
2. Gain knowledge on structure and types of plant reproductive organs
3. Gain knowledge on anatomy of angiosperms
4. Knowledge on plant physiology
5. Students gain knowledge on plant classification based on their environment
6. gain knowledge on basic plant genetics and breeding

Text books:

1. Verma, V. (2010). Botany. Ane books Pvt. Ltd. New Delhi, India
2. Kochhar (2016). Plant physiology- Theory and applications. Cambridge India.
3. Henry H Dixon (2017) Practical Plant Biology: A Course of Elementary Lectures on the General Morphology and Physiology of Plants, Forgotten Books

Reference books:

1. Tyagi I D (2014) Plant Breeding and Genetics at a glance, Jain Brothers.
2. George Acquaah (2012) Principles of Plant Genetics and Breeding, Wiley-Blackwell
3. William V Dashek and Marcia Harrison (2010) Plant Cell Biology, CRC Press

Discipline Specific Elective

DSE-II Practicals - II Diversification of Angiosperms

Semester IV
18BZOI07

Hours of Instruction/week: 3
No. of credits: 2

Structure of anther, ovule, endosperm and dicot embryo.	10
Studies of T.S. of stem (Castor and Maize), root. (Bean and Canna) and Leaf (Sunflower and Grass)	10
Physiology: Experiments to demonstrate the physiological activities mentioned in the Syllabus.	10
Ecology: Hydrophytes and Xerophytes.	10
Genetics: Mono- and Di-hybrid crosses.	5
Total hours	45

Course outcomes:

1. Knowledge on the embryological stages of plants and their development
2. Analyze the anatomy in relation to basic structure of Plants
3. Acquire knowledge on physiological response of plants to various factors
4. Acquire knowledge on plant adaptations
5. Knowledge on Basic concepts of Mendel

Text Books:

1. S. SundaraRajan (2001) Practical Manual of Plant Ecology and Plant Physiology. Anmol Publications Pvt. Limited
2. S.K.Verma. (2010). A Textbook of Plant Physiology and Biochemistry, S.Chand and Company LTD., Ram nagar, New Delhi
3. V K Jain (2016) Fundamentals of Plant Physiology, S.Chand and Company LTD., Ram nagar, New Delhi.

Reference Books:

1. P.S.Verma and V.K.Agarwal. (2009). Genetics.S.Chand and Company LTD., Ram nagar, New Delhi.
2. J. Wallis (2013) Practical Botany Fifth Edition, Elsevier Ltd.
3. C. Philip Wheater, James R. Bell, Penny A. Cook (2011) Practical Field Ecology: A Project Guide, Wiley Black well Publications

Department of Botany
Generic Elective Course
Herbal Cosmetics

Semester V
18BBOO01

Hours of Instruction/week: 2
No. of credits: 2

Objectives:

1. To gain Knowledge about various types of herbals.
2. To enable the students to prepare herbal based products.
3. To help the students to prepare ecofriendly, cost effective herbal formulations.

Unit 1 Facial Cream

A General account on medicinal plants, cultivation and therapeutic uses of Turmeric (*Curcuma longa*), Onion (*Allium cepa*), Kathazhai (*Aloe vera*), Olive oil (*Oleaemropaea*) and Cucumber (*Cucumissativus*) and facial cream formulation. **6**

Unit 2 Prickly heat powder

Vettiver, sandal wood, mentha, marigold, maize starch, and Aloe vera gel and prickly heat powder formulation. **6**

Unit 3 Hair Growth Promoter

Hibiscus (*Eclipta alba*), Coconut oil (*Cocosnucifera*), Gingely oil (*Sesame indicum*), Podukuthazai (*Lippianodiflora*), Henna (*Lawsoniainermis*), Curry leaves (*Murrayakoenigi*) and hair oil formulation. **6**

Unit 4 Skin protection

Orange peels (*Citrus auranticum*), lemon (*Citrus medica*), Tagarai (*Cassia tora*), Kuppaimani (*Acalyphaindica*), Nutmeg (*Myristica fragrans*), Tulsi (*Ocimum sanctum*), Neem (*Azadirachtaindica*) and *Tridaxprocumbens* **6**

Unit 5 Neutraceuticals

Neutraceuticals - definition, advantages. *Solanumnigrum* (Manathakkali), *Psidiumguajava* (Guava), *Sesbaniagrandiflora*(Agathy), *Moringaolefera* (Moringa), *Punicagranatum* (Pomegranate) *Carica papaya* (Papaya), *Eugenia jambolina* (Noval), *Tribuluslanguginosus*(Nerungi), *Phyllanthusemblica* (Nelli). **6**

Total hours 30

Course outcomes:

1. Knowledge on cultivation and propagation techniques of herbal plants
2. Acquires knowledge on herbs and their usage in hair and skin protection
3. Knowledge on recognition, collection and preservation of medicinal plants.
4. Understands the biological effects of medicinal plants
5. Knowledge on possible application of medicinal plants and derivatives as health products, including the food and cosmetics sectors

Text books:

1. Devaraj, T.L. (2007). Speaking of Ayurvedic Herbal Cures, New Dawn Press, New Delhi, India.
2. LaxmiLal. (2010). Fruit Science objective fundamentals. Agro tech Publishers Academy, Udaipur, Rajasthan.
3. Dhiman, A.K. (2010). Sacred Plants and Their Medicinal Uses. Daya Publishing house, New Delhi.

Reference books

1. Singh, K. (2010). Medicinal Herbs and Spices. Avishkar Publishers, Jaipur, Rajasthan.
2. Dermot Farrell (2016) Herbal Medicine Dermot Farrell
3. Robert Morse (2013) The Detox Miracle Sourcebook: Raw Foods and Herbs for Complete Cellular Regeneration: The Ultimate Healing System, Kalindi Press

Department of Botany
Mushroom Cultivation
(Value Added Course)

Semester III
18BBOV01

Hours of Instruction: 40 hrs
No. of credits: 2

Objectives:

1. To understand the nutritive and medicinal value of mushrooms.
2. To study the method of cultivation of selected mushrooms.
3. To enable the students to start a cottage industries.

Unit 1 Mushrooms

Definition, external morphology and substrate specificity. **10**

Unit 2 Types of mushrooms

Milky straw, button and poisonous mushrooms, Nutritional value, medicinal value and advantages **5**

Unit 3 Cultivation methods

Paddy straw mushroom cultivation – bed method, polythene bag method and field cultivation. Oyster mushroom cultivation – substrate spawning, pretreatment of substrate spawning, maintenance of mushroom, cultivation of white button mushroom – substrate, spawning and harvesting. **10**

Unit 4 Disease control and storage

Blanching, steeping, sun drying, canning, pickling, freeze drying, short term and long term storage. **5**

Unit 5 Indian Mushrooms

Common Indian mushrooms, production level, economic return, foreign exchange from mushroom cultivation and International trade, Good Agricultural and Manufacturing practices. **10**

Total hours **40**

Course outcomes:

1. Enable the learner to get the nutritional and medicinal value of mushroom
2. Scientific data on mushroom and types of mushroom will be enlightened to the learners
3. Theoretical and practical understanding on the methods of cultivation of the selected mushrooms
4. Will emerge the learner as an entrepreneur in mushroom industry
5. Knowledge on possible application of mushrooms in medicines, health and food products.

Text Books:

1. Dey, S.C. (2010). Mushroom Growing. Agrobios. India.
2. Bhaskar. (2010). Floriculture and Plant Biotechnology. Manglam Publication.
3. Kaul, T.N. (2001). Biology and conservation of Mushrooms. Oxford & IBH Publishing Company Pvt Ltd. New Delhi.

Reference books:

1. Stephen Russell (2014) The Essential Guide to Cultivating Mushrooms: Simple and Advanced Techniques for Growing Shiitake, Oyster, Lion's Mane, and Maitake Mushrooms at Home Storey Publishing
2. Tradd Cotter (2014) Organic Mushroom Farming and Mycoremediation: Simple to Advanced and Experimental, Chelsea Green Publishing Co
3. W. C. Haycraft (2009) Mushroom Growing Today, Read Books