

SRI SARADA COLLEGE FOR WOMEN

(AUTONOMOUS),

Reaccredited with 'A' Grade by NAAC

Affiliated to Periyar University

Fairlands, Salem- 636 016



DEPARTMENT OF BOTANY

B.Sc. BOTANY

Syllabus

Sri Sarada College for Women (Autonomous), Salem-16
Department of Botany

Course Structure under CBCS
(For the students admitted from 2020 – 2021 onwards)

SEMESTER I					
Part	Course	Course Title	Code	Hrs/ week	Credits
I	Tamil/ Hindi/ Sanskrit	Tamil/ Hindi/ Sanskrit – I	20ULTC1/ 20ULHC1/ 20ULSC1	6	3
II	English	English – I	20ULEC1	6	3
III	Core – I	Plant Diversity – I	20UBOC1	5	6
	Core Practical – I	Practical – I	20UBOQC1	4	2
	Allied – I	Chemistry – I	20UBOAC1	3	3
	Allied Practical	Allied Chemistry Practical		2	-
IV	Skill Based –I	Nursery Raising Techniques	20UBOSQC1	2	2
	Extension Activity	Group Project based on Extension Activity	20UEXAC	1	1
V	<ul style="list-style-type: none"> • Articulation and Idea Fixation skills- 6 Hrs per semester (out of college hours – 1 credit extra) • Life Skills Promotion – 2 Hrs per semester (out of college hours – 1 credit extra) • Physical Fitness Practice – 35 Hrs per semester (out of college hours – 1 credit extra) 				
TOTAL				30	20 + 3*
SEMESTER II					
I	Tamil/ Hindi/ Sanskrit	Tamil/ Hindi/ Sanskrit – II	20ULTC2/ 20ULHC2/ 20ULSC2	6	3
II	English	English – II	20ULEC2	6	3
III	Core – II	Plant Anatomy and Embryology	20UBOC2	5	5
	Core Practical – II	Practical – II	20UBOQC2	4	2
	Allied – I	Chemistry – II	20UBOAC2	3	3
	Allied Practical	Allied Chemistry Practical	20UBOQC1	2	2
IV	Skill Based –II (Practical)	Home Gardening and Floriculture	20UBOSQC2	2	2
	Environmental Studies	Group Project based on Environmental Studies	20UEVSC	2	2
V	<ul style="list-style-type: none"> • Articulation and Idea Fixation skills- 6 Hrs per semester (out of college hours – 1 credit extra) • Life Skills Promotion – 2 Hrs per semester (out of college hours – 1 credit extra) • Physical Fitness Practice – 35 Hrs per semester (out of college hours – 1 credit extra) • Certificate Course – 25 Hrs (out of college hours – 1 credit extra) 				
TOTAL				30	22 + 4*

**Course Structure under CBCS
(For the students admitted from 2019 – 2020 onwards)**

SEMESTER III

Part	Course	Course Title	Code	Hrs/week	Credits
I	Tamil/ Hindi/ Sanskrit	Tamil/ Hindi/ Sanskrit – III	19ULTC3/ 19ULHC3/ 19ULSC3	6	3
II	English	English – III	19ULEC3	6	3
III	Core – III	Plant Diversity – II	19UBOC3	5	5
	Core Practical – III	Practical – III	19UBOQC3	4	2
	Allied – II	Zoology – I	19UBOAC3	3	3
	Allied Practical	Allied Zoology Practical		2	-
IV	Skill Based –III	Analytical Techniques in Plant Science	19UBOSQC3	2	2
	Non Major Elective - I		19UBONEC1	2	2
V	<ul style="list-style-type: none"> • Articulation and Idea Fixation skills- 6 Hrs per semester (out of college hours – 1 credit extra) • Life Skills Promotion – 2 Hrs per semester (out of college hours – 1 credit extra) • Physical Fitness Practice – 35 Hrs per semester (out of college hours – 1 credit extra) 				
TOTAL				30	20 + 3*

SEMESTER IV

I	Tamil/ Hindi/ Sanskrit	Tamil/ Hindi/ Sanskrit – IV	19ULTC4/ 19ULHC4/ 19ULSC4	6	3
II	English	English – IV	19ULEC4	6	3
III	Core – IV	Microbiology	19UBOC4	4	4
	Elective – I	Plant Biotechnology/ Agricultural Microbiology	19UBOEC1/ 19UBOESC1	5	5
	Allied – II	Zoology – II	19UBOAC4	3	3
	Allied Practical	Allied Zoology Practical	19UBOQC2	2	2
	Skill Based –IV (Practical)	Laboratory Techniques in Applied Biology	19UBOSQC4	2	2
IV	Non Major Elective - II		19UBONEC2	2	2
V	<ul style="list-style-type: none"> • Articulation and Idea Fixation skills- 6 Hrs per semester (out of college hours – 1 credit extra) • Life Skills Promotion – 2 Hrs per semester (out of college hours – 1 credit extra) • Physical Fitness Practice – 35 Hrs per semester (out of college hours – 1 credit extra) 				
TOTAL				30	24+ 3*

**Course Structure under CBCS
(For the students admitted from 2018 – 2019 onwards)**

SEMESTER V

III	Core – V	Cytology and Evolution	18UBOC5	5	5
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	Core- VI	Morphology and Taxonomy of Angiosperms	18UBOC6	6	6
	Core – VII	Biochemistry and Biophysics	18UBOC7	5	5
	Elective – II	Biostatistics and Bioinformatics/ Bioinstrumentation	18UBOEC2/ 18UBOESC2	5	5
	Core Practical - IV	Practical – IV	18UBOQC4	6	3
IV	Non Major Skill Based – I		18UBONSC1	2	2
	Value Education		18UVENC	1	-
V	<ul style="list-style-type: none"> • Life Skills Promotion – 2 Hrs per semester (out of college hours – 1 credit extra) • Physical Fitness Practice – 35 Hrs per semester (out of college hours – 1 credit extra) • Certificate Course – 25 Hrs (out of college hours – 1 credit extra) 				
TOTAL				30	26+ 3*
SEMESTER VI					
III	Core – VIII	Plant Physiology	18UBOC8	6	6
	Core- IX	Genetics and Plant Breeding	18UBOC9	5	5
	Core – X	Ecology and Plant Geography	18UBOC10	5	5
	Elective – III	Genetic Engineering/ Plant Protection	18UBOEC3/ 18UBOESC3	5	5
	Core Practical – V	Practical – V	18UBOQC5	6	3
IV	Non Major Skill Based - II		18UBONSC2	2	2
	Value Education		18UVENC	1	2
V	<ul style="list-style-type: none"> • Life Skills Promotion – 2 Hrs per semester (out of college hours – 1 credit extra) • Physical Fitness Practice – 35 Hrs per semester (out of college hours – 1 credit extra) 				
TOTAL				30	28+ 2*

GRAND TOTAL - 140+18*

- Free and open source software (FOSS) – 2 Hrs per semester (out of college hours)

Department of Botany
Programme Title : B. Sc. Botany

Programme Outcomes

- PO1: To develop skilled and efficient professionals who can effectively cater to the growing demands of plant based industries
- PO2: To acquire diverse knowledge to earn advanced degrees for the changing needs.
- PO3: To broaden the students' horizon in research organizations, herbal product companies, biotechnology industries and related disciplines for the betterment of the society.
- PO4: To face entrance and competitive examinations to pursue their career in state and national departments as an individual or in groups.
- PO5: To favour the graduates as entrepreneurs in developing and marketing products using modern technology for human needs.

Programme Specific Objectives

- PSO1: To provide knowledge about various plant groups from primitive to highly evolved in order to develop critical thinking.
- PSO2: To create awareness on applications of different plants in various industries through field and industrial visits.
- PSO3: To promote the potential as an entrepreneur and to equip the students with skills related lab to land based studies in order to become an effective citizenship.
- PSO4: To teach students about the ethical approach towards the conservation and sustainable use of plants
- PSO5: To create foundation for further studies in Botany and facilitate the students as self- directed for taking up and shaping a successful career in Botany.

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – I

Credit – 5

Total Hrs: 75

Plant Diversity I (20UBOC1)

(With effect from 2019-2020 onwards)

Course Objectives : The course aims

- To understand the fundamentals of plant kingdom.
- To study the structure and reproduction of lower plants.
- To study the commercial importance of lower group of plants such as Algae, Fungi and Lichen.
- To understand the relationship between Algae and Fungi forming Lichen.
- To differentiate disease causing microbes (pathogens) from beneficial and cause diseases in plants under plant pathology.

Unit I

No. of Hours: 15

An outline classification of Algae – (G.W. Prescott 1969). Thallus organization, reproduction, life cycle of patterns and economic importance of Algae. A detailed study of structure, reproduction and life cycle of the following genus (development excluded).

Cyanophyta – *Oscillatoria, Nostoc*

Unit – II

No. of Hours: 15

A detailed study of structure, reproduction and the life cycle of the following genera (development excluded)

Chlorophyta – *Volvox, Ulva, Oedogonium, Caulerpa.*

Charophyta – *Chara*

Unit – III

No. of Hours: 15

A detailed study of structure, reproduction and life cycle of the following genera (development excluded)

Phaeophyta - *Sargassum*

Bacillariophyta - *Diatoms - Navicula*

Rhodophyta - *Polysiphonia*

Unit – IV

No. of Hours: 15

An outline classification of fungi (Alexopoulos and Mims, 1978). Economic importance of fungi. A study of the structure and reproduction of the following genera (development excluded).

Oomycetes - *Albugo*

Ascomycetes - *Saccharomyces*

Basidiomycetes - *Puccinia* and *Agaricus*

Unit – V

No. of Hours: 15

Causal organisms, symptoms and control measures of the following - Red rot of sugarcane, Blast of rice, Leaf spot of Tikka disease of groundnut and Citrus Canker . Structure and reproduction of Lichen - Crustose, Foliose and Fruticose. Economic importance of Lichen.

Books for Study:

1. Srivastava, H.N. 2004. *Algae*. Pradeep Publications. (Unit I,II&III)
2. Srivastava, H.N. 2004. *Fungi*. Pradeep Publications.(Unit IV&V)

Books for Reference:

1. Bold, H.C. and Wynne, M.J.1978. *Introduction to the Algae*, Prentice-Hall, New Jersey.
2. Fritsch, F.E. 1945. *The Structure and Reproduction in Algae*, Cambridge University Press.
3. Kumar, H.D. 1990. *Introductory Phycology*. East-West Press Pvt. Ltd.
4. Sharma, O.P. 1992. *Text book of Thallophytes*. Tata McGraw Hill Publishing Company Ltd.
5. Smith, G.M. 1955. *Cryptogamic Botany* Vol-I, McGraw Hill Publishing Company Ltd.
6. Alexopoulos, C.J., Mims, C.S., Blackwell, M. 1996. *Introductory Mycology*. Wiley. NY.
7. Sharma, O.P. 2004. *Text book of Thallophyta*. Tata McGraw – Hill, Publishing Company Ltd.

Web Resources:

<https://diatom.ansp.org>

<https://www.nature.com/articles/nmicrobiol2017120>

<https://www.psalgae.org/> algal-web.links/#general links.

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of lower plants.	K1

CO2	Study of structure and reproduction of Algae, Fungi and Lichens.	K2
CO3	Acquire knowledge on commercial importance of lower group of plants.	K3
CO4	Familiarize disease causing microbes in plants.	K3

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	L	L	L	M	L	L	L	S
CO2	L	M	L	M	S	L	M	M	L	S
CO3	S	S	S	L	M	M	S	L	S	M
CO4	M	S	L	L	S	L	S	S	S	M

L – Low; M – Medium; S- Strong

Syllabus for B.Sc., Botany Main

2 Hrs/ Week

Semester – I

Credit – 2

Total Hrs: 30 Skill Based I (Practical): Nursery Raising Techniques (20UBOSQC1)

(With effect from 2019-2020 onwards)

Course Objectives : The course aims

- To emphasize the basic principles and practices in nursery raising.
- To impart knowledge about various propagation technique.
- To know how the nurseries provide growers a head on start on plant production.

Syllabus

- Garden tools – Spade, Fork, Garden knife, Secateurs, Shears, Toppers, Pruning saw, Watering can.
- Preparation of nursery bed – Containers and field
- Preparation of soil mixture
- Raising of seedlings
- Techniques in propagation –
 - (i) Cutting – Soft wood and Hard wood
 - (ii) Layering – Ground - Simple, Compound and Air Layering
 - (iii) Grafting – Cleft and Whip
 - (iv) Budding – T- budding and Patch
 - (v) Pruning – Pinching and Disbudding

Books for Study:

1. Kumaresan, V., 2016. *Horticulture*, Saras Publication, Nagercoil.
2. Kumar, N. 2010. *Introduction to Horticulture*, Rajalakshmi Publications, Nagercoil, Kanyakumari.

Books for Reference:

1. George Acquaaah, 2002. *Horticulture – Principles and Practices*, 2nd edition, Prentice – Hall of India Pvt. Ltd., New Delhi.
2. Deena Beverley, 2004. *Practical Gardening*, Paragon Publishers, bath BAI IHE, UK.
3. ManibhushanRao, K. 2005. *Text book of Horticulture*, Second Edition, Macmillan Publications, New Delhi.

Web Resources:

<https://www.nature.com> > hortres > about

<https://vfic.tanu.edu> > about > concepts

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic principle and practices in nursery raising.	K3
CO2	Do various propagation techniques.	K4
CO3	Start up for plant propagation.	K4

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	M	S	S	M	S	S
CO2	S	S	S	S	M	S	S	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S

L - Low; M - Medium; S – Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – II

Credit – 5

Total Hrs: 75

Plant Anatomy and Embryology (20UBOC2)

(With effect from 2019-2020 onwards)

Course Objectives : The course aims

- To know basic concepts of cell and Tissue system and their organization in higher plants.
- To differentiate dicot plants and their growth pattern from monocot plants.
- To understand the abnormal (anomalous) secondary growth in higher plants as well as wound healing and Abscission processes.
- To study and differentiate ovules and its types.
- To know the importance of polyembryony and development pattern in higher plants.

Syllabus

Unit I

No. of Hours: 15

Meristem - Definition, classification and theories of shoot and root apex – Apical cell theory, Histogen theory, Tunica corpus theory and Mantle core concept.

Tissues – Simple permanent – parenchyma, collenchyma, sclerenchyma, complex permanent tissues – xylem and phloem. Types of vascular bundles, Secretory tissues – laticiferous tissues.

Unit II

No. of Hours: 15

Primary Structure – root, stem and leaf of dicots and monocots. Types of stomata. Normal secondary growth in dicot root and stem – secondary xylem – axial system and ray system, annual rings, Heart wood and sap wood, tyloses, secondary phloem.

Unit III

No. of Hours: 15

Anomalous secondary growth in Dicot stem (*Bignonia*, *Boerhaavia* and *Nyctanthes*) and Monocot stem (*Dracaena*). Abscission and wound healing. Nodal Anatomy – Unilacunar, trilacunar and multilacunar node.

Unit IV

No. of Hours: 15

Structure of mature anther, microsporogenesis. Structure of ovule, Megasporogenesis. Types of ovules - Monosporic (*Polygonum*), Bisporic (*Allium*) and Tetrasporic (*Peperomia*).

Unit V**No. of Hours: 15**

Double fertilization, endosperm, types – cellular, nuclear, helobial and ruminant. Haustoria and its functions. Embryo development in Monocots (*Luzula* type) and Dicots (*Crucifer* type), Apomixis and Polyembryony.

Books for Study:

1. Pandey, S.N. and Chadha, A. 2006 (Reprint Edition). *Plant Anatomy*. S. Chand and Co. (For Unit I, II & III)
2. Annie Ragland and Kumaresan, V. 2010. *Developmental Botany and Experimental Embryology*. Saras Publication, Nagercoil. (For Unit IV &V)

Books for Reference:

1. J. Eames and L.H. Mac Daniels. 1953. *An Introduction to Plant Anatomy*. McGraw Hill Book Company.
2. Cutter E.G. 1969. *Plant Anatomy* – Part I and II Edition – Wesley Publishers.
3. Maheswari. P. 1971. *An Introduction to the Embryology of Angiosperms*. Tata McGraw Hill Pub. Co. Ltd.
4. Esau. K. 1985. *Plant Anatomy*. Wiely Eastern Pvt. Ltd.
5. Fahn. A. 1987. *Plant Anatomy*. Pergamon Press.
6. Bhojwani, S.S and Bhat Nagar, S.P. 2009. *The Embryology of Angiosperms*. Vikas Publishing House (P) Ltd. New Delhi

Web Resources:

<https://catalog.princeton.edu> >

<https://searchworks.stanford.edu> >

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the organization of cell and tissue system in higher plants.	K1
CO2	Differentiate internal structure of dicot plants from monocots.	K2
CO3	Acquire knowledge on anomalous secondary growth in higher plants.	K3
CO4	Unravelling the enigma starting from microsporogenesis and	K4

	megasporogenesis.	
CO5	Familiarize the mode of embryo development in dicots and monocots.	K4

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	L	M	S	M	L	S	S
CO2	S	S	M	L	M	S	S	L	S	L
CO3	M	S	S	M	S	S	S	M	S	S
CO4	S	S	S	L	S	S	L	L	M	S
CO5	S	S	S	M	S	S	S	L	S	S

L – Low; M – Medium; S- Strong

Syllabus for B.Sc., Botany Main

2 Hrs/ Week

Semester – II

Credit – 2

Total Hrs : 30

Skill Based II (Practical) - Home Gardening and Floriculture (20UBOSQC2)

(With effect from 2019-2020 onwards)

Course Objectives : The course aims

- To provide basic knowledge about various types of garden.
- To impart the importance of organic manuring.
- To inculcate career opportunities and self-entrepreneurial skills.

Syllabus

- Training on establishment of various types of garden
 - (i) Herbal garden (Medicinal plants)
 - (ii) Terrace garden
 - (iii) Kitchen garden
 - (iv) Ornamental garden
 - (v) Bottle garden
- Bonsai
- Protocol for preparing organic manure
- Display of flowers – Floral designing – Circular, Triangular, Line and Holiday arrangements
- Flower projects for the home – Greeting card; Gift card; Gift tag & Family album
- Bouquet making

Books for Study:

1. ManibhushanRao, K. 2005. *Text book of Horticulture*, Second Edition, Macmillan Publications, New Delhi.
2. Kumar, N. 2010. *Introduction to Horticulture*, Rajalakshmi Publications, Nagercoil, Kanyakumari.
3. Kumaresan, V., 2016. *Horticulture*, Saras Publication, Nagercoil.

Books for Reference:

1. Jane Newdick, Veevers-Carter, M. 1993. *The Complete Flower Arranger*, Colour Library Books, Singapore.
2. Charles Griner, 1995. *Floriculture Designing and Merchandizing*, DelmerPublishers™, New York.
3. Joanna Sheen, 1995. *Flower projects for the Home*, Premier editions, London.

Web Resources:

<https://okcareertech.org>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Apply basic knowledge on various types of garden.	K3
CO2	Elucidate the fundamental principle and utilize the elements of home gardening.	K4
CO3	Enhance career opportunities in home gardening.	K4

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	M	S	S	S	S	S
CO2	S	S	S	S	M	S	S	S	S	S
CO3	S	S	S	S	M	S	S	S	S	S

L – Low; M – Medium; S- Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – III

Credit – 5

Total Hrs: 75

Plant Diversity - II (19UBOC3)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To understand the basics of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany.
- To study the structure, reproduction and life history of plants.
- To highlight the importance of Bryophytes, Pteridophytes and Gymnosperms in the plant kingdom.

Syllabus

Unit I

No. of Hours: 15

Bryophytes – General characters and classification (Pruskauer and Reimer, 1954). A detailed study of the structure and life history of the following genera. (Excluding the developmental stages)

Marchantia and *Polytrichum*

Unit II

No. of Hours: 15

Pteridophytes – General characters and classification (Reimer's, 1958). Eusporangiate and Leptosporangiate development. Homospory, heterospory and seed habit. Embryo development – endoscopic and exoscopic, apogamy, apospory and parthenogenesis. Stellar evolution.

Unit III

No. of Hours: 15

A detailed study of the structure and life history of the following genera (excluding the developmental stages)

Lycopodium, *Selaginella* and *Equisetum*

Unit IV

No. of Hours: 15

A detailed study of the structure and life history of the following genera (excluding the developmental stages)

Adiantum and *Marsilea*

Fossils, Fossilization, Dating of Fossil – Carbon dating method, Geological time scale. Study of form genera – *Rhynia*.

Unit V**No. of Hours: 15**

Gymnosperms - General characters and classification (Sporne, 1962). A detailed study of the structure and life history of the following genera (excluding the developmental stages)

Cycas and *Gnetum*

Books for Study:

1. Sri Vastava, H.N. 2004. *Bryophyta*. Pradeep Publications. (Unit I)
2. Sri Vastava, H.N. 2004. *Pteridophyta*, Pradeep Publications. (Unit II & III)
3. Srivastava, H.N. 2004. *Gymnosperms*. Pradeep Publications New Delhi. (Unit V)

Books for Reference:

1. Parihar, N.S. 1967. *An Introduction to Embryophyta, Bryophyta*. Vol. I. Central Book Depot.
2. Smith, G.M. 1955. *Cryptogamic Botany* Vol-II. McGraw Hill.
3. Vashista, B.R. 1991. *Bryophyta*. S. Chand and Company Ltd. Ram Nagar, New Delhi.
4. Bower, F.O 1963. *The Ferns* Vol. I, II and III. Cambridge University Press.
5. Eames, A.J. 1936. *Morphology of Lower Vascular Plants*. McGraw Hill.
6. Parihar, N.S. 1967. *An Introduction to Embryophyta, Pteridodphyta*. Vol-II. Central Book Depot.
7. Vashishta, P.C.1987. *Vascular Cryptogams Pteridophyta*. S. Chand & Company Ltd. Ram Nagar, New Delhi.
8. Vashishta, P.C, Sinha, A.K. and Anil Kumar, 2006. *Gymnosperms*. S. Chand & Company Ltd. Ram Nagar, New Delhi.
9. Vashishta. P.C. 1999. *Gymnosperms*. S. Chand and Company Ltd. Ram Nagar, New Delhi.
10. Gangulee and Kar. 1999. *College Botany* Vol. II. Revised Edition S.Chand and Company Ltd. Ram Nagar, New Delhi.

Web Resources:

<https://www.ikbooks.com>

<https://www.askiitans.com>

Course Outcomes (CO):

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on fundamentals of Bryophytes.	K1

CO2	Elucidate the general characters of Pteridophytes.	K2
CO3	Illustrate Cryptogams and Phanerogams.	K2
CO4	Understand the fossil and fossilization.	K3
CO5	Analyse the phylogenetic aspects of Gymnosperms.	K4

Mapping of COs with POs

POs & PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	S	L	S	S	S	S	S	S	S
CO2	L	M	L	S	S	M	M	S	S	S
CO3	L	S	L	M	S	L	S	M	S	S
CO4	M	S	M	L	M	M	L	L	L	S
CO5	M	M	S	L	M	S	M	M	M	S

L – Low; M – Medium; S – Strong

Syllabus for B.Sc., Zoology Main

3 Hrs/ Week

Semester – III

Credit – 3

Total Hrs: 45

Allied Botany – I (Morphology, Taxonomy, Anatomy and Embryology) (19UZOAC3)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To study the morphology of the plant parts.
- To study the characters and economic importance of selected families.
- To understand the internal structure of various plant parts.
- To acquire knowledge about the reproductive parts of plants.

Syllabus

Unit I

No. of Hours: 9

Morphology of Angiosperms – Root and Stem – structure and types. Leaves – stipules, phyllotaxy, venation and types – simple, compound (modifications excluded).

Unit II

No. of Hours: 9

Inflorescence – types – Racemose, Cymose and Special Types. Flower – Parts of the flower – calyx, corolla, androecium and gynoecium. Fruit – Fleshy and dry fruits.

Unit III

No. of Hours: 9

Taxonomy - Outline of Bentham and Hooker's system of classification. A detailed study of the range of characters in the following families - Annonaceae, Rutaceae, Cucurbitaceae, Rubiaceae, Amarantaceae and Poaceae.

Unit IV

No. of Hours: 9

Anatomy – Introduction, Meristem - classification and types: Tissues - Simple Permanent tissues; Complex tissues (A brief outline of xylem and phloem), Primary (Dicot and Monocot) and Secondary (Dicot) structures of stem and root (excluding anomalous). Leaf – dicotyledon (*Hibiscus*, *Nerium*) and monocotyledon (Grass).

Unit V

No. of Hours: 9

Embryology - Structure of Anther - Microsporangium, Male gametophyte, Structure of Ovule - Megasporangium, female gametophyte, dicot embryo – *Capsella bursa-pastoris* (development excluded).

Books for Study:

1. Rao, K. N., Krishna Murthy, K.V. and Sudhakara, Rao G. 1993, *Ancillary Botany*, Viswanathan (Printers & Publishers) Pvt. Ltd, Chennai

Books for Reference:

1. Muneeswaran, A., 1983, *A Text Book of Botany*, 2nded, Brighton Book House, Chennai.
2. Gangulee, H.C and Kar, A.K. 2002. *College Botany*, Vol.II, Revised Edition, New Central Book Agency (P) Ltd., Kolkata.
3. Rasod, S. K., Sekar, T., 2004. *Allied Botany Paper II*, 1st ed., Popular Book Depot, Chennai.
4. Gangulee, H.C., Das, K.S. and C. Duta, 2007. *College Botany*, Vol.I, 6thed. New Central Book Agency (P) Ltd., Kolkata.
5. Annie Ragland, Kumaresan, V. & Arumugam, N. 2014. *Algae, Fungi, Bryophytes and Plant pathology*. Saras Publication, Nagercoil.

Web Resources:

www.freebookcentre.net/Biology/Botany-Books.html

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the morphology of vegetative parts of the plant.	K2
CO2	Understand the morphology of reproductive parts of the plant.	K2
CO3	Identify the angiosperm species with their Morphological, Taxonomical and Economical point of view.	K4
CO4	Illustrate the internal structure of various plant parts.	K3
CO5	Understand the reproductive structures of a plant.	K2

Syllabus for B.Sc., Botany Main

2 Hrs/ Week

Semester – III

Credit – 2

Total Hrs: 30

Skill Based III (Practical): Analytical techniques in Plant Science (19UBOSQC3)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To provide basic knowledge about analytical techniques used in plant science.
- To improve practical skills for higher studies.
- To inculcate lab-oriented skills among students.

Syllabus

- Safety guidelines – General guidelines for lab session (Good Laboratory practice - GLP)
- Guidelines for working with bacteria
- Universal precautions – Biosafety levels – I, II, III, IV
- Handling of microscopes – Light microscope, Dark field, Phase contrast; Microscope accessories – Micrometer, Camera Lucida and Ultrascope.
- Homogenizer (Mortar and Pestle), Magnetic stirrer, Vortex mixer, Bunsen Burner, Water Bath, Glass Distillation Apparatus
- Centrifuge and Spectrophotometry – Principles and working mechanism.

Books for Study:

1. Rajan, S., Selvi Christy, R. 2015. *Experimental Procedures in Life Sciences*, Anjanaa Book house Publishers, Chennai.

Books for Reference:

1. Kalaichelvan, P.T., 2008. *Microbiology and Biotechnology – A laboratory manual*, MJP Publishers, Chennai.
2. Sadasivam, S., Manickam, A. 2008. *Biochemical Methods*, 3rd edition, New age international (P) Ltd., Publishers, New Delhi.

Web Resources:

<https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf>

<https://elte.prompt.hu/sites/default/files/tananyagok/PracticalMicrobiology/book.pdf>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Inculcate the habit of safety guidelines for working with microorganisms.	K1
CO2	Handle the laboratory equipment.	K1
CO3	Acquire the lab oriented skills.	K4
CO4	Understand the usage of instruments employed in plant science research.	K4

Mapping of COs with POs and PSOs

POs&PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	M	L	L	S	L	S
CO2	L	S	M	S	L	L	L	S	L	S
CO3	L	S	S	S	L	L	L	S	L	S
CO4	S	S	S	S	S	L	L	S	L	S

L – Low; M – Medium; S - Strong

Syllabus for II B.A./ B.Sc./ B.Com. (For Non - Major Students)

2 Hrs/ Week

Semester – III

Credit – 2

Total Hrs: 30

Non Major Elective I: Horticulture (19UBONEC1)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To incorporate the principles and practices of horticulture.
- To provide knowledge of the propagation techniques.
- To create an aesthetic value among students.
- To offer immense scope for growing horticultural plants.
- To highlight the value of cultivating horticultural crops.

Syllabus

Unit I

No. of Hours: 6

Introduction, divisions and scope of Horticulture, A brief knowledge of ornamental plants - annuals, biennials and perennials.

Unit II

No. of Hours: 6

Propagation techniques – Cuttage and its types - root cuttings, stem cuttings – herbaceous, soft wood, semi-hard wood, hard wood cuttings, leaf and leaf bud cuttings. Layering and its types – ground layering – tip, simple, compound, trench, mound layering and air layering.

Unit III

No. of Hours: 6

Budding and its types – T - budding, patch, chip, flap, ring and flute budding. Graftage and its types – approach or inarching, whip, cleft, top, veneer, epicotyl and bud grafting.

Unit IV

No. of Hours: 6

Pruning - root, ringing, notching, smudging, bending, pinching and thinning. System of irrigation – surface, sub-surface and overhead irrigation.

Unit V

No. of Hours: 6

Types of manures, fertilizers and its applications, types of pots and containers, pot mixtures for horticultural plants.

Books for Study:

1. Kumar, N. 1986. *Introduction to Horticulture*, Rajalakshmi Publications, Nagercoil, Kanyakumari.
2. Kumeresan, V. 2009. *Horticulture*, Saras publication, Nagercoil, Kanyakumari.

Books for Reference:

1. Adams, C. R., K. M. Banford and M. P. Early. 1993. *Principles of Horticulture*. Butterworth Heineman Ltd., London.
2. Edmond, J. B., T. L. Senn, F.S. Adrews and R. J. Halfacre. 1977. *Fundamentals of Horticulture* (4th Ed.) Tata McGraw-Hill, New Delhi.
3. Rao, K .M 1991. *A Text Book of Horticulture*. McMillan India Ltd, New Delhi.

Web Resources:

www.agrimoon.com/horticulture-icar-ecourse-pdf-books/

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the principles and practices in Horticulture.	K3
CO2	Gain Knowledge of plant propagation techniques and its applications.	K2
CO3	Secure employment opportunities in rural areas.	K1
CO4	Create an aesthetic value by growing different groups of ornamentals.	K2
CO5	Apply the principles and practices of horticulture.	K1

Syllabus for B.Sc., Botany Main

4 Hrs/ Week

Semester – IV

Credit – 4

Total Hrs: 60

Microbiology (19UBOC4)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To understand the scope of Microbiology.
- To know the structure and classification of bacteria and viruses.
- To provide knowledge about the spoilage of food and preservation.
- To study the production of antibiotics, alcohol and organic acids.

Syllabus

Unit I

No. of Hours: 12

History and scope of Microbiology – Biogenesis, Abiogenesis, Germ theory of diseases, Koch postulates, Whittaker's Five Kingdom Concept. An outline classification of Bacteria (Bergey's System), Ultrastructure of Bacteria – capsule, flagella (structure and locomotion – spirochaetial and gliding), pili. Cell wall – chemical composition, Gram positive and negative bacteria. Bacterial growth and cultivation techniques – pour plate, spread plate, streak plate, sub culturing and broth culture.

Unit II

No. of Hours: 12

Nutritional types of bacteria – Autotrophs - photoautotrophs, chemoautotrophs; heterotrophs and its types. Bacterial Reproduction – Conjugation, Transformation, Transduction, Lysogeny. Economic importance of bacteria.

Unit III

No. of Hours: 12

An outline classification of viruses. Viruses - general characters, symptoms, structure and replication. General characters of Bacteriophage, Cyanophage, Mycophage; Structure and reproduction of Tobacco Mosaic Virus (TMV).

Unit IV

No. of Hours: 12

Food Microbiology: Spoilage of food, methods of food preservation – physical and chemical. Dairy Microbiology: Dairy Products – Cheese and yogurt; Water: sewage treatment – primary, secondary and tertiary.

Unit V

No. of Hours: 12

Single Cell Protein (SCP): Definition, advantages and mass culture of *Spirulina*. Microbes in industry: Antibiotics – Penicillin (fermentation, recovery), Production of

organic acids – Vinegar (substrate, method) and citric acid (medium, fermentation, manufacturing process, recovery and uses) production.

Books for Study:

1. Dubey, R.C. & Maheswari, D. K. 2000. *A Textbook of Microbiology*. S. Chand and Company Ltd., Ram Nagar, New Delhi.

Books for Reference:

1. Atlas, R.M. 1997. *Principles of Microbiology*, Second Edition, W.M.T. Brown Publishers.
2. Biswas, S.B. 1976. *An Introduction to Virus*. Vikas Publishing House Ltd.
3. Madigan, M.T., Martinko, J.M., Parker, J. 2009. *Brock Biology of Microorganisms*. Twelfth Edition, Pearson/ Benjamin Cummings.
4. Prescott. 2017. *Microbiology*. Mc Graw Hill Education/ Asia
5. Pelczar, M.J., Chan, E.C.S., Kreig, N.R. 1993. *Microbiology*. Fifth Edition. Mc Graw Hill Book Company.
6. Stainer, R.Y., Ingraham, J.L., Wheelis, M.L., Painter, P.R. 2005. *General Microbiology*, Fifth Edition, McMillan.
7. Tortora, G.J., Funke, B.R., Case, C.L. 2008. *Microbiology: An Introduction*. Ninth Edition. Pearson's Education.
8. Willey, J.M., Sherwood, L.M., Woolverton, C.J. 2008. *Prescott, Harley and Klein's Microbiology*, Seventh Edition, McGraw Hill Higher Education

Web Resources:

<https://www.cliffsnotes.com> > biology

<https://www.docsity.com>

Course Outcome (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the principles and scope of Microbiology.	K2
CO2	Bring out the importance of microorganisms in different fields.	K1
CO3	Enrich the knowledge of interactions of microbes with plants.	K3
CO4	Understand the fundamental causes associated with pathogens.	K2

CO5	Understand the production of antibiotics, alcohols and organic acids by the activity of microbes.	K2
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Mapping of COs with POs and PSOs

POs& PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	L	L	M	S	S	L	M	L	S
CO2	M	M	M	S	L	L	L	M	L	S
CO3	S	M	L	L	M	S	M	S	L	S
CO4	L	S	L	M	S	M	M	S	L	M
CO5	L	M	L	L	L	L	L	L	L	L

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – IV

Credit – 5

Total Hrs: 75

Elective I: Plant Biotechnology (19UBOEC1)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To understand the basic concept of biotechnology.
- To learn tissue culture techniques.
- To create awareness about the plant products obtained through transgenic plants.
- To understand the importance of producing virus free plants through tissue culture.

Unit I

No. of Hours: 6

Introduction – History of tissue culture; Establishment of tissue culture lab, Sterilization techniques – Wet, Dry, Flame, Filter and Surface Sterilization methods, Nutritional composition of medium. Types of media – Solid (MS and Nitsch) and Liquid (B5 and Gamborg's). Micropropagation - Tissue and Organ. Anther and embryo culture.

Unit II

No. of Hours: 6

Callus culture – initiation and maintenance of callus, suspension culture – types – batch, continuous and immobilize cultures, Subculturing, Hardening, Somatic Embryogenesis.

Unit III

No. of Hours: 6

Meristem culture – production of virus free plants, culture, browning of medium, thermotherapy, cryotherapy and chemotherapy. Virus – indexing, maintenance of virus – free stocks, applications and limitations.

Unit IV

No. of Hours: 6

Somatic hybridization – protoplast isolation, fusion, selection of hybrid cells, regeneration of hybrid plants, symmetric and asymmetric hybrids, fate of plasma genes, cybrids.

Unit V

No. of Hours: 6

Transgenic plants as bioreactors – production of alkaloids, industrial enzymes, plantibodies, edible vaccines, biodegradable plastics and therapeutic proteins.

Books for Study:

1. Dubey, R.C. 2001. *A Text Book of Biotechnology*. S. Chand & Co. Ram Nagar, New Delhi

Books for Reference:

1. Reinst, J., and Bajaj, Y.P.S., 1990. *Plant, Cell, Tissue and Organ culture*. Narosa Publication, New Delhi.
2. Singh, B.D., 2003. *Biotechnology*, Kalyani Publishers, Ludhiana.
3. Ramawat, K.G., 2006. *Plant Biotechnology*. S. Chand and Co. Ram Nagar, New Delhi
4. Chawla, H.S., 2003. *Laboratory Manual for Plant Biotechnology*. Oxford and IBH Publication PVT Ltd., New Delhi.

Web Resources:

<https://www.university.youth4works.com>

<https://agrimoon.com>

Course Outcomes (CO):

CO Number	CO Statement	Knowledge Level
CO1	Develop the knowledge of fundamentals of biotechnology.	K1
CO2	Understand the significance of plant based product obtained through transgenic plants.	K2
CO3	Develop the impact of various types of culture methods in plants.	K4
CO4	Analyse the techniques to protect the plants from viral diseases.	K4
CO5	Understand the role of transgenic plants as bioreactors.	K2

Mapping of COs with POs and PSOs

POs & PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	L	S	L	L	L	M	L	S
CO2	L	S	L	S	L	L	M	S	L	S
CO3	S	S	S	S	M	S	S	S	M	S
CO4	S	S	S	S	M	S	S	M	S	S
CO5	M	M	S	S	M	M	M	L	S	S

L – Low; M – Medium; S – Strong

Syllabus for B.Sc., Botany Main

5 Hrs / Week

Semester – IV

Credits - 5

Elective I – Agricultural Microbiology (19UBOESC1)

(To come into effect from 2009-2010 onwards for the students admitted from 2008-2009)

Objectives

1. To understand the basic concepts of soil-microbe interaction.
2. To create awareness on restoration of soil fertility through microbes.

Syllabus

Unit I

No. of Hours: 6

Types of Microorganisms in soil - bacteria, fungi, actinomycetes, algae and protozoa.

Unit II

No. of Hours: 6

Brief account of microbial interaction : Symbiosis, neutralism, Commensalism, Competition, Ammensalism, Synergism, Parasitism.

Unit III

No. of Hours: 6

Role of rhizosphere, microorganism in improving soil fertility. Crop rotation. Role of microorganism in decomposition of organic matter.

Unit IV

No. of Hours: 6

Nitrogen cycle in nature – biological nitrogen fixation, biofertilizer, *Rhizobium* – root nodulation – mass multiplication methods, field application. *Azospirillum*, mass multiplication methods.

Unit V

No. of Hours: 6

Biological control of soil-borne microbial pathogens and nematodes - Microbial pesticides. Interaction of synthetic pesticides with soil microorganisms. Entomopathogenic fungi.

Reference Books:

1. Bagyaraj, D. J., Rangaswami, G. 2007. Agricultural Microbiology. 2nd edition, PHI Learning Pvt. Ltd. New Delhi

2. Subba Rao, N.S. 1999. Soil Microbiology. 4th edition, Oxford and IBH Publishing, New Delhi

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Study different groups of soil microorganisms.	K1
CO2	Understand various types of interactions exist among microorganisms and plants.	K4
CO3	Obtain knowledge about different component and its role in agricultural microbiology	K3

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	M	S	S	S
CO2	S	S	S	S	S	S	M	S	S	S
CO3	S	S	S	S	S	S	M	S	S	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Zoology Main

3 Hrs/ Week

Semester – IV

Credit – 3

Total Hrs: 45

Allied Botany – II (Cryptogams, Gymnosperms and Plant Physiology) (19UZOAC4)
(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To understand the diversity among the Cryptogams.
- To study the reproduction and life cycle of Cryptogams and Gymnosperms.
- To understand the metabolic activities of plants.

Syllabus

Unit I

No. of Hours: 9

Algae – Detailed study of structure and reproduction of the following genera

Oscillatoria and *Oedogonium*

Unit II

No. of Hours: 9

Fungi - Detailed study of structure and reproduction of the genus *Polyporus*

Bryophytes - Detailed study of structure and reproduction of the genus *Funaria*

Unit III

No. of Hours: 9

Pteridophytes - Detailed study of structure and reproduction of the genus *Lycopodium*

Gymnosperms - Detailed study of structure and reproduction of the genus *Cycas*

Unit IV

No. of Hours: 9

Absorption of water - (Active & Passive) and salts (Contact ion exchange theory, Carbonic acid theory). Transpiration and its types.

Unit V

No. of Hours: 9

Photosynthesis - Light and Dark reaction. Respiration - aerobic and anaerobic, Glycolysis and Krebs's cycle.

Books for Study:

1. Rao, K. N., Krishna Murthy, K.V., and Sudhakara, Rao G., 1993, *Ancillary Botany*, Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai.

Books for Reference:

1. Muneeswaran, A., 1983, *A Text Book of Botany*, 2nded, Brighton Book House, Chennai.
2. Gangulee, H.C and Kar, A.K. 2002. *College Botany*, Vol.II, Revised Edition, New Central Book Agency (P) Ltd., Kolkata.
3. Rasod, S. K., Sekar, T., 2004. *Allied Botany Paper II*, 1st ed., Popular Book Depot, Chennai.
4. Gangulee, H.C., Das, K.S. and C. Duta, 2007. *College Botany*, Vol.I, 6th ed. New Central Book Agency (P) Ltd., Kolkata.
5. Annie Ragland, Kumaresan, V. & Arumugam, N. 2014. *Algae, Fungi, Bryophytes and Plant Pathology*. Saras Publication, Nagercoil.

Web Resources:

www.freebookcentre.net/Biology/Botany-Books.html

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the diversity of Cryptogams at various levels.	K2
CO2	Promote the elementary knowledge from Cryptogams to Gymnosperms.	K4
CO3	Understand the physiological activities of plants.	K4

Syllabus for B.Sc., Botany Main

2 Hrs/ Week

Semester – IV

Credit – 2

Total Hrs - 30

Skill Based IV (Practical): Laboratory techniques in Applied Biology (19UBOSQC4)
(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To create awareness among students about basic techniques of applied biology.
- To cultivate lab-oriented skills among students.
- To acquire hands-on training in Microbiology and Biotechnology.
- To enhance the practical knowledge of students for their higher studies.

Syllabus

No. of Hours: 30

- Sterilization – Principles and methods – (i) Wet sterilization – Autoclave
 - (ii) Dry sterilization – Hot Air Oven
 - (iii) Flame sterilization
 - (iv) Filter sterilization
- Laminar air flow hood
- Staining of Bacteria – Simple staining; Differential staining - Gram staining
- Temporary wet mount of microorganism (TWM)
- Hanging drop technique
- Preparation of glass wares for Plant Tissue Culture (PTC)
- Sterilization of explants in PTC
- Media preparation – Nutrient agar and broth (Bacteria); Potato Dextrose Agar (Fungi); Murashige & Skoog's (MS medium) and inoculation of explants in PTC

Books for Study:

1. Aneja, K.R., 2003. *Experiments in Microbiology, Plant pathology and Biotechnology* (Fourth Revised edition, New Age International (P Ltd, Publishers, New Delhi).

Books for Reference:

1. Kalaichelvan, P.T., 2008. *Microbiology and Biotechnology – A Laboratory manual*, MJP Publishers, Chennai.

2. Gayatri, M.C., Kavyashree, R., 2015. *Plant tissue culture – Protocols in Plant Biotechnology*, Narosa Publishing House Pvt. Ltd., New Delhi.

Web Resources:

<https://microbiologyonline.org/file/7926d7789d8a2f7b2075109f68c3175e.pdf>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Develop knowledge about the basic techniques of Applied Biology.	K2
CO2	Understand the sterilization techniques in Microbiology and Biotechnology.	K3
CO3	Apply the knowledge of plant tissue culture techniques to develop as an entrepreneur.	K3
CO4	Educate the skill of handling microbes.	K4

Mapping of COs with POs and PSOs

POs&PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	M	L	L	S	L	S
CO2	L	S	M	S	L	L	L	S	L	S
CO3	L	S	S	S	L	L	L	S	L	S
CO4	S	S	S	S	S	L	L	S	L	S

L – Low; M – Medium; S - Strong

Syllabus for II B.A./ B.Sc./ B.Com. (For Non-Major Students)

2 Hrs/ Week

Semester – III

Credit – 2

Total Hrs: 30

Non Major Elective II: Home Gardening (19UBONEC2)

(To come into effect from 2020-2021 onwards for the students admitted from 2019-2020)

Course Objectives : The course aims

- To help the students to gain knowledge on planning and maintaining of garden
- To widen their knowledge to create garden of their own interest.
- To upsurge the student community about gardening as a leisure activity.

Unit I

No. of Hours: 6

Introduction and importance of home gardening: Kitchen garden – selection of site, size and shape, layout, soil, climate, cropping season, raising of nursery, transplanting, irrigation, manuring, stacking, training, pruning, weeding and harvesting.

Unit II

No. of Hours: 6

General aspect of terrace garden; cultivation aspects of vegetables and fruits (mention any three examples in each group).

Unit III

No. of Hours: 6

Bonsai – introduction, principle and importance. Tools and accessories. Ideal environment – containers and potting compost, methodology – repotting, fixing in shallow pots, dwarfing, watering, weeding and feeding. Different styles. Training of Bonsai – disbudding, pruning, wiring and other methods.

Unit IV

No. of Hours: 6

Water gardens – types - formal and informal pools; planting, management and plants for the water garden. Rock garden – establishment, construction, management and suitable plants for rockery.

Unit V

No. of Hours: 6

Lawn – Definition; Methods of lawn making – From seed, by turfing, turf plastering and dibbling roots, Maintenance of lawn; Plants suitable for planting in lawn, commonly growing grass species.

Books for Study:

1. Kumar, N. 1986. *Introduction to Horticulture*, Rajalakshmi Publications, Nagercoil, Kanyakumari.

Books for Reference:

1. Dey, S.C. 2006. *Bonsai – An Art of miniature plant culture*. Agrobios,
2. Amarnath, V. 2007. *Nursery and Landscaping*. Agrobios, Jodhpur, India.
3. Sheela, V.L. 2011. *Horticulture*, MJP Publishers, Triplicane, Chennai.

Web Resources:

www.agrimoon.com/horticulture-icar-ecourse-pdf-books/

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the importance and maintenance of Home Gardening.	K2
CO2	Develop terrace garden tailored to suit individual's taste.	K3
CO3	Apply the knowledge of growing Bonsai as realistic representations.	K4
CO4	Understand the significance of water gardens and propagate variety of aquatic plants.	K4
CO5	Develop the potential of the methods of creating lawns and their maintenance.	K4

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – V

Credit – 5

Total Hrs: 75

Cytology and Evolution (18UBOC5)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To understand the basic structure and function of plant cell.
- To gain knowledge about the internal organelles of the plant cell.
- To study the cell division in plants.
- To know the evolutionary concept and theories.

Syllabus

Unit I

No. of Hours: 15

Microscopy - Definition, Types - Light Microscope - Compound Microscope - Electron Microscope, X-Ray Microscope - Principle and structure.

Components of a cell - plasma membrane - Lamellar model - The unit membrane (De Robertson Model). Fluid mosaic model - chemical composition of cell wall - Ultra microscopic structure of the cell wall.

Unit II

No. of Hours: 15

Occurrence, Morphology, Ultrastructure and functions of Endoplasmic Reticulum, Dictyosomes, Lysosome, Mitochondria and Plastids.

Unit III

No. of Hours: 15

Occurrence, Morphology, Ultrastructure and function of Ribosomes, Nucleus, Chromosomes and its types – Giant chromosome – Polytene and Lamp brush.

Unit IV

No. of Hours: 15

Occurrence, Structure of Nucleic acids - DNA - forms of DNA - A, B, C, D and Z - DNA, RNA - Types - rRNA, mRNA and tRNA.

Cell Division : Cell cycle – G₁, S, G₂ and M phase, Mitosis, Meiosis, Cytokinesis, significance of Mitosis and Meiosis.

Unit V

No. of Hours: 15

Evolutionary concept – Origin of life, Kinds of variation - Evolutionary theories of Lamarck, Charles Darwin and the synthetic theory. Origin and evolution of cultivated plants.

Books for Study:

1. Verma, P.S. and V.K. Agarwal. 2004. *Cell biology, Genetics, Molecular Biology and Evolution*. S.Chand & Co. New Delhi.
2. Kochhar, P.L. 1989. *Genetics and Evolution*. Ratan Prakashan Mandir, Agra.

Books for Reference:

1. Avers, C.J. 1976. *Cell Biology*. D. Van Nostrand Company.
2. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. *The World of the Cell*. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
3. Cooper, G.M. and Hausman, R.E. 2009. *The Cell: A Molecular Approach*. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. *Cell and Molecular Biology*. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
5. Gopalakrishnan Itta Sambasiviah, T.S. 1984. *Principles of Organic Evolution*.
6. Karp, G. 1996. *Cell and Molecular Biology*. John Wiley & Sons Inc. New York.
7. Powar, C.B. 2010. *Cell Biology*. Himalaya Publishing House.

Web Resources:

<https://acseenotes.wordpress.com>

<https://www.biologycorners.com>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge about the plant cell.	K2
CO2	Acquaint the modern views of cell biology.	K3
CO3	Understand the fundamental knowledge about the concepts of evolution.	K4
CO4	Cope up with current understanding of evolutionary changes.	K4

Mapping of COs with POs and PSOs

POs&PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
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CO1	M	M	L	L	S	M	L	M	L	S
CO2	M	S	M	L	S	M	L	L	L	S
CO3	M	M	S	L	M	M	L	M	L	M
CO4	L	M	L	L	S	M	L	L	L	S
CO5	M	L	M	L	S	M	L	M	L	M

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

6 Hrs/ Week

Semester – V

Credit – 6

Total Hrs :90 **Morphology and Taxonomy of Angiosperms (18UBOC6)**

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To know the basic morphological features of plant parts.
- To study the classification plants based on the morphological characters.
- To study the morphological, taxonomical details and economic importance of plants belonging to some selected families.

Syllabus

Unit I

No. of Hours: 20

Morphology - Introduction - Root system and its modifications - Shoot system - Types and Modifications. Leaf types and Modification, Phyllotaxy and its types.

Unit II

No. of Hours: 20

Inflorescence - Racemose - Cymose and mixed types. Descriptive terminologies of flower; Fruits - Types, Dispersal of fruits and seeds, seed germination - epigeal, hypogeal and viviparous.

Unit III

No. of Hours: 20

Principles of Taxonomy - Taxonomy and its importance, Floras and Herbarium techniques. System of classifications – Bentham and Hooker (Natural), Cronquist (Modern) - Merits and Demerits; Taxonomic hierarchy. Plant nomenclature - Typification; Identification methods - Keys (Indented and Bracketed). A brief account of Chemotaxonomy and Numerical Taxonomy.

Unit IV

No. of Hours: 15

A detailed study and economic importance of the following families: Annonaceae, Nymphaeaceae, Capparidaceae, Sapotaceae, Rutaceae, Fabaceae, Caesalpiaceae, Mimosaceae, Myrtaceae, Cucurbitaceae and Apiaceae.

Unit V

No. of Hours: 15

Asteraceae, Solanaceae, Asclepiadaceae, Apocynaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Moraceae, Cannaceae, Araceae, Liliaceae, Orchidaceae and Poaceae.

Books for Study:

1. Annie Ragland and Kumaresan V. 2004, *Taxonomy of Angiosperms*. Saras Publication. Nagarcoil.
2. Rao, K.N. and Krishnamurthy, K.V. 1990. *Angiosperms*, Viswanathan Publishers.

Books for Reference:

1. Lawrance, G. H.M. 1951. *Taxonomy of Vascular Plants*. Mac Millan Co., Newyork.
2. Rendle, A.B. 1956. *The Classification of Flowering Plants Vol. I and II*. Cambridge University Press. London.
3. Jeffrey, C. 1968. *Introduction to Plant Taxonomy*. Allied Publishers. J.A.Churchill. London.
4. Naik, V.N. 1984. *Taxonomy of Angiosperms*. Tata McGraw-Hill Education.
5. Sivarajan, V.V. 1986. *Introduction to Plant Taxonomy*. Oxford and IBH Publishers & Co. Pvt., Ltd., New Delhi.
6. Datta, S.C. 1988. *Systematic Botany* (4th Ed.). Wiley Eastern Ltd.
7. Mukerjee, S.K. 1990. *College Botany Vol. III*. Longmans, Green and Co. New Central Agency. Calcutta.
8. Gurucharan Singh. 2004. *Plant systematic - Theory and Practice*. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi. 2nd Edition.
9. Gangulee, H.C., Das, K.S. and Datta, C. 2011. *College Botany Vol. I*. New Central Book Agency. Calcutta.

Web Resources:

<https://delta-intkey.com>

<https://sakshieducation.edu>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Identify and classify plants based on morphological features.	K1
CO2	Provide an insight on the association among plants belonging to various families.	K2
CO3	Understand traditional aspects of Plant Taxonomy.	K3

CO4	Acquire knowledge and skills to collect, preserve and identify Herbarium specimen.	K4
CO5	Expand the scientific knowledge to meet the needs of current requirements.	K4

Mapping of COs with POs and PSOs

POs&PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	L	S	M	L	S	S	L	S
CO2	L	S	M	S	L	L	S	S	L	S
CO3	L	S	S	S	L	L	S	S	L	S
CO4	S	S	S	S	S	L	S	S	L	S
CO5	S	M	M	S	S	S	S	M	L	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – V

Credit – 5

Total Hrs: 75

Biochemistry and Biophysics (18UBOC7)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To understand the role of chemistry in Biology.
- To give analyse Chemical reactions occurs in living organisms.
- To understand the interrelationships of structure, properties and functions of plants.
- To impart the knowledge about the structure of proteins, carbohydrates, lipids, aminoacids, enzymes and co-enzymes.
- To make an emphatic study on Enzyme kinetics and physical, chemical organizations of protoplasm.

Syllabus

Unit I

No. of Hours: 15

Definition and scope. Atoms and molecules, Chemistry of solutions, colloid and its properties, Chemical bonds - ionic bond, covalent bond and hydrogen bond. Principles and working mechanism of pH meter, Paper Chromatography, Centrifugation - Rotary, Zonal and Ultra Centrifuge and Colorimetry.

Unit II

No. of Hours: 15

Carbohydrates - Classification, Structure, Chemical Properties and Functions of monosaccharides, disaccharides and polysaccharides.

Amino Acids and Proteins - Classification (based on structure and chemical nature of aminoacids), structure & properties.

Unit III

No. of Hours: 15

Lipids - Classification, structure, properties and functions. Enzymes - IUBAB - classification, properties, mechanism of enzyme action and factors affecting enzyme activity.

Unit IV

No. of Hours: 15

Light - Nature, properties, Absorption and Action spectrum - fluorescence and phosphorescence. First Law of thermodynamics and its applications - Entropy - its physical significance.

Unit V**No. of Hours: 15**

Bioenergetics - oxidation and reduction - oxidising and reducing agents - Redox reaction and Redox potential. Exergonic and Endergonic reaction - Free energy. ATP and other Energy rich compounds - causes of Energy richness.

Books for Study:

1. Annie Ragland, K.Rajkumar, K.Rajarathnam & M.Jayakumar. 2009. *Plant Physiology*. Saras Publications, Nagercoil.
2. Arumugam, N. and V. Kumaresan. 2012. *Biophysics and Bioinstrumentation*. Saras Publication. Nagercoil.

Books for Reference:

1. Jain, J.L. 1999. *Fundamentals of Biochemistry*. S .Chand & Co. Ltd., New Delhi.
2. Boyer, R. 2002. *Concepts in Biochemistry* 2nd edition Brookcole.
3. Deb, A.C. 2004. *Fundamentals of Biochemistry*. New Central Book Agency.
4. Eric. E.C. and P.K.Stumpf-John.2004. *Outlines of Biochemistry*. Wiley and Sons, Inc. New York.
5. David.H. & N. Hooper. 2005. *Biochemistry*. BabaBarchaNath Printers, Hariyana.
6. Satyanarayana, U. and U.Chakrabani. 2007. *Essentials of Biochemistry*. Book and Allied Pvt. Ltd. Kolkatta.
7. Lehninger, N. 2012. *Principles of Biochemistry*. CBS Publishers. New Delhi.

Web Resources:

<https://www.studocu.com>

<https://coursehero.com>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Facilitate fundamental concepts and principals of chemistry of life.	K1
CO2	Understand the chemical nature and behaviour of living matter and their transformation in biological systems.	K2

CO3	Know biomolecules and its chemical organization within plant cells.	K3
CO4	Apply physical concepts and techniques to address problems in biology.	K4
CO5	Explore the importance of bioenergetics in biological systems.	K4

Mapping of COs with POs and PSOs

POs&PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	M	S	S	S	M	M	S
CO2	L	M	S	M	S	S	S	S	M	S
CO3	S	S	S	M	S	S	S	S	M	S
CO4	S	S	S	M	S	S	S	S	M	S
CO5	S	S	M	M	S	S	S	M	M	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – V

Credit – 5

Total Hrs: 75

Elective II - Biostatistics and Bioinformatics (18UBOEC2)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To facilitate the students, an investigative approach to understand science observed through mathematical data.
- To bridge the gap between the exposition of subject matter to exercise practical problems.
- To link biology to the world of technology.

Syllabus

Unit I

No. of Hours: 15

Biostatistics - Definition. Data - Objectives, types, classification and collection methods - Primary and secondary. Methods of classification- individual, discrete and continuous series. Tabulation - parts - simple and Complex tables.

Unit II

No. of Hours: 15

Graphic presentation of data - Kinds of Diagram - line, bar, pie, pictograms, cartograms, histogram, polygon and Frequency curve-limitations, rules and significance.

Unit III

No. of Hours: 15

Measures of Central Tendency – Mean – arithmetic, geometric and harmonic, Median, Mode - merits and demerits. Measures of dispersion - range, quartile, mean and standard deviation; standard error - variance, coefficient of variance. Chi-square test and Test for Goodness of fit.

Unit IV

No. of Hours: 15

Bioinformatics – Definitions; Fundamentals of Computer - Hardware components, CPU and peripherals, Software types – system and application. CPU Operating System, Network types - LAN, WAN and INTERNET.

Unit V

No. of Hours: 15

Application of Bioinformatics in various fields. Classification of Biological Databases - Primary and secondary Databases – Protein - PDB, PIR, SWISS-PROT and Nucleic acid Database - NCBI, DDBJ, EMBL and specialized database - MMDB.

Books for Study:

1. Sundarajan, S. and Balaji, R. 2002. *Introduction to Bioinformatics*. Himalaya Publishing House, Mumbai.
2. Arumugam, N. 2011. *Basic concepts of Biostatistics*. Saras Publication. Nagarcoil.

Books for Reference:

1. Ignachimuthu. S.J. 2006, *Basic Bioinformatics*. Narosa Publishing House. New Delhi.
2. Ramkrishnan, P. 2010. *Biostatistics*. Saras Publication. Nagarcoil.

Web Resources:

- <https://www.university.youth4work.com>
<https://www.faculty.franklin.uga.edu>> lec1

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Facilitate investigative approach to understand science mediated through mathematical data.	K1
CO2	Connect the gap between the expositions of subject matter to exercise practical problems.	K2
CO3	Apply statistical analysis for collection and interpretation of biological data.	K3
CO4	Elucidate the science of developing and utilizing computer databases and algorithms to accelerate and enhance the biological research.	K4
CO5	Analyse the sequence data of nucleic acids and proteins to study the molecular structure, function and evolution.	K4

Mapping of COs with POs and PSOs

POs&PSOs COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	M	M	M	M	L	M	L	S
CO2	M	L	M	M	M	L	L	M	L	S
CO3	M	L	M	M	M	L	M	M	L	S
CO4	M	L	M	M	M	S	M	M	L	S
CO5	M	L	M	M	M	S	M	M	L	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs / Week

Semester – V

Credits - 5

Elective II – Bioinstrumentation (18UBOESC2)

(To come into effect from 2010-2011 onwards for the students admitted from 2008-2009)

Objectives

1. To gain knowledge on measurements in cellular and molecular biology.
2. To understand basic principles and application of tools and technique in biology for higher studies and research based career.

Syllabus

Unit I

No. of Hours: 15

General Biophysical methods – Measurement of pH, Radioactive labeling and counting, Autoradiography.

Unit II

No. of Hours: 15

Separation & Identification of Materials - concept of Chromatography (Partition Chromatography, Paper Chromatography, Adsorption Chromatography, TLC, GLC, Ion Exchange Chromatography, Gel Chromatography, HPLC, Affinity Chromatography); Electrophoresis (Gel Electrophoresis, Paper Electrophoresis).

Unit III

No. of Hours: 15

Centrifugation – Basic Principle of Centrifugation, Instrumentation of Ultracentrifuge (Preparative, Analytical), Factors affecting Sedimentation velocity, Standard Sedimentation Coefficient, Centrifugation of associating systems, Rate-Zonal centrifugation, sedimentation equilibrium Centrifugation.

Unit IV

No. of Hours: 15

X-Ray Crystallography – X-ray diffraction, Bragg equation, Reciprocal lattice, Miller indices & Unit cell, Concept of different crystal structure, determination of crystal structure concept of rotating crystal method, powder method.

Unit V**No. of Hours: 15**

Spectroscopy: Absorption Spectroscopy – Simple theory of the absorption of light by molecules, Beer-Lambert law, Instrumentation for measuring the absorbance of visible light, Factors affecting the absorption properties of a Chromophore. Instrumentation of UV-Vis Spectrophotometer.

Reference Books:

1. John G. Webster., 2003. Bioinstrumentation. Wiley Publisher.
2. Veerakumari, L. 2006. Bioinstrumentation. MJP Publishers.

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Acquire fundamental knowledge in instruments of biology.	K1
CO2	Understand the principle, concepts and mechanism of various separation techniques.	K4
CO3	Gain knowledge about techniques employed in X – ray crystallography and spectroscopy useful for higher studies.	K3

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	L	S	S	S
CO2	S	S	S	S	S	S	L	S	S	S
CO3	S	S	S	S	S	S	L	S	S	S

L – Low; M – Medium; S - Strong

Syllabus for III B.A/B.Sc./B.Com. (For Non-Major Students)

2 Hrs/ Week

Semester – V

Credit – 2

Total Hrs:30

Non Major Skill Based – I: Mushroom Cultivation (18UBONSC1)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To know about the food value and nutrients of mushrooms.
- To study the cultivation of different kinds of mushrooms.
- To know about the medicinal value of mushrooms.
- To make aware of diseases and storage of mushrooms.

Syllabus

Unit I

No. of Hours: 6

Mushrooms – morphology, types and advantages of mushroom cultivation. Medicinal and nutritional value of mushroom. Edible and poisonous mushroom.

Unit II

No. of Hours: 6

Mushroom Cultivation: Spawn and spawning - different types of spawn - virgin, flake, brick and grain spawn. Methods of spawning - double layer, top, through, shake-up, active mycelium, spot and super spawning, storage of spawn. Casing - sterilization, Time of casing.

Unit III

No. of Hours: 6

Techniques in mushroom cultivation – mushroom farm location, layout. Cultivation of Paddy straw mushroom - Standard bed, Hollow bed, Cage method - Substrates, spawn making methods and field cultivation.

Unit IV

No. of Hours: 6

Oyster and White button Mushroom cultivation - substrates, spawn making methods and field cultivation. Factors affecting Mushroom cultivation.

Unit V

No. of Hours: 6

Storage of mushrooms - blanching, steeping, sun-drying, canning, pickling and freeze drying. Do's and Dont's of mushroom growing. Diseases of mushrooms – Bacterial, Fungal, Viral diseases and other diseases caused by insects, mites and nematodes. Recipes of mushroom (omlette, tikka, chilly, soup and pickle).

Books for Study:

1. Pandey, R.K. and S.K. Ghosh. 1999. A Hand Book on Mushroom Cultivation. Emkay Publications, Delhi

Books for Reference:

1. Bahl, N. 1988. Hand book on Mushrooms. Oxford and IBH publishing Co.Pvt. Ltd., Delhi. (2nd Edition).
2. Suman, B.C. and V.P. Sharma. 2011. Mushroom Cultivation and Uses. Agrobios Publication, Jodhpur.
3. V.P. Sharma and B.C. Suman, 2011. Diseases and pests of Mushroom. Agrobios publication, Jodhpur.

Web Resources: <https://www.agricultureguruji.com>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Know the significance of food and energy value of mushroom.	K1
CO2	Understand the cultivation methods of various kinds of mushrooms.	K2
CO3	Impart the medicinal values of mushrooms in terms of human welfare.	K3
CO4	Aware of different kinds of diseases affecting mushrooms and various preservation techniques.	K4
CO5	Provide an idea about food recipes using mushroom.	K4

Syllabus for B.Sc., Botany Main

6 Hrs/ Week

Semester – VI

Credit – 6

Total Hrs:90

Plant Physiology (18UBOC8)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To lay an emphasis on the physiological functions going in plants.
- To understand the growth of the plants.
- To reveal the knowledge about the scope and role of plant physiology in applied sciences.

Syllabus

Unit I

No. of Hours: 20

Water – Molecular structure, properties and its importance; Physical processes – diffusion, osmosis, plasmolysis and imbibition. Plant cell as an osmotic system - Relationships of water, solute, pressure potential and DPD. Absorption of water - active and passive absorption theories - Ascent of sap - Transpiration pull and cohesion theory. Transpiration – types and significance, Steward's hypothesis, ATP driven (H^+) - K^+ exchange pump theory. Mineral nutrition - physiological role of micro and macronutrients. Translocation of ions - cytochrome pump and protein lecithin theory. Translocation of organic solutes - Munch Mass flow hypothesis.

Unit II

No. of Hours: 20

Photosynthesis – pigment types, Light reaction - Red drop and Emerson's enhancement effect, photosystems I & II, cyclic and non-cyclic Electron transport and Photophosphorylation, significance of light reaction. Dark reaction - C_3 & C_4 cycle and its differences. CAM pathway, Photorespiration and its significance. Factors affecting photosynthesis.

Unit III

No. of Hours: 20

Respiration - Types – Glycolysis; Mechanism of anaerobic respiration, Different types of fermentation (Alcoholic, Lactic, Butyric and Acetic Acid); Aerobic Respiration - Krebs's cycle and its significance. Respiratory Quotient, ETS chain and Chemiosmotic hypothesis - ATP energy Budget - Factors affecting respiration.

Unit IV**No. of Hours: 15**

Nitrogen metabolism - Nitrogen cycle - Nodule formation - Biochemistry of Nitrogen fixation. Biosynthesis of Aminoacids - Reductive amination and Transamination - Protein synthesis. Fat metabolism - α , β -oxidation and Glyoxylate cycle.

Unit V**No. of Hours: 15**

Growth Hormones - Physiological role of Auxin, Gibberellin, Cytokinin and Ethylene. Physiology of Flowering - Photoperiodism and Vernalization - Role of phytohormone in flowering. Physiology of Fruit ripening and Seed germination – Plant movements.

Books for Study:

1. Jain, V.K. 2014. *Fundamentals of Physiology*. S.Chand & Co. New Delhi.

Books for Reference:

1. Devlin, R. M. and Witham, F. H. 1983. *Plant Physiology*. PWS Publishers.
2. Salisbury, F. B. and Ross. C. 1991. *Plant Physiology*. 4th revised edition, Brooks/ Cole Publishers.
3. Gill, P.S. 2000. *Plant Physiology*. S.Chand & Co. New Delhi.
4. Pandey, S.N. & B.K. Sinha. 2000. *Plant Physiology*. Vikas Publications. New Delhi.
5. Sinha, R.K.2004. *Modern Plant Physiology*. Narosa Publications House. New Delhi.
6. Srivastava, H.N.2005. *Plant Physiology*. Pradeep Publications. New Delhi.
7. Annie Ragland, K. Rajkumar, M. Jayakumar & K. Rajarathinam. 2011., *Plant Physiology*. Saras Publications. Nagercoil.

Web Resources:

<https://study.com>

<https://employees.csbsju.edu>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge on metabolism, physiology and structure of plants together.	K1

CO2	Understand the regulation of growth and development of plants and its impact on environment.	K2
CO3	Elucidate the physiological process that regulates energy metabolism in green plants.	K3
CO4	Explore the plants making decision to respond to changing environmental stimuli.	K4

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	L	S	S	L	S	S	M
CO2	S	S	S	L	S	L	L	L	L	L
CO3	S	S	S	M	S	L	L	L	L	L
CO4	S	S	S	L	S	S	S	S	S	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – VI

Credit – 5

Total Hrs: 75

Genetics and Plant Breeding (18UBOC9)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims to know

- The role of gene in character determination of an organism.
- The change in the gene order, how it brings the change in the external morphology and the characters in an organism.
- To understand the production of hybrids.
- The techniques in hybridization which brings the new varieties.

Syllabus

Unit I

No. of Hours: 15

Introduction - Designating symbols for genes. Mendel's Laws of inheritance - Monohybrid and Dihybrid cross. Deviations from Mendelian ratio - Allelic and non - allelic gene interactions with plant examples - Multiple alleles - pseudoalleles - isoalleles - polygenic inheritance.

Unit II

No. of Hours: 15

Linkage – complete & incomplete, coupling and repulsion theory. Crossing over - mechanism and theories. Cytological proof for crossing over. Mapping of genes on chromosome - two point and three point test cross. Sex determination - chromosome, genic balance and single gene. Sex linkage - sex linked inheritance. Mutation - types - gene mutation - chemical basis (tautomerism, base analogues). Chromosomal aberrations, Polyploids and heteroploids.

Unit III

No. of Hours: 15

Organisation of genetic material - Unique and repetitive DNA - Uninterrupted genes, Split genes, Overlapping genes and pseudogenes. Fine structure of the gene-cistron, Muton and Recon. Replication of DNA - Semi conservative method.

Unit IV

No. of Hours: 15

Genetic code, Gene regulation - Operon concept - Lac Operon; Biochemical genetics - One gene one enzyme hypothesis.

Extranuclear inheritance - Plastid inheritance, Kappa particles, Male sterility in Maize and its applications.

Unit V

No. of Hours: 15

Plant breeding - Principles involved in plant breeding - Green revolution. Hybridization techniques. Methods of crop improvement - Introduction and Acclimatization, Selection(its type – mass, pure line and clonal). Breeding for disease resistance. Seed production, Multiplication, Maintenance and testing of improved seeds. Heterosis - its effects and causes.

Books for Study:

1. Verma, P.S. and V.K.Agarwal. 2009. *Genetics*. S.Chand & Co. New Delhi. (Unit I – IV)
2. Singh, B.D. 2001. *Plant Breeding. Principles and Method*. Kalyani Publications. New Delhi. (Unit V)

Books for Reference:

1. Stansfield, W.D. 1986. *Theory and Problems of Genetics*. McGraw Hill. New York
2. Kochhar, P.L. 1995. *Genetics and Evolution*. Ratan Prakashan Mandir, Agra.
3. Chaudhary, R.C. 2008. *Introduction to Plant Breeding*. Oxford & Ibh Co Pvt Ltd, India.
4. Singh, B.D.2009. *Fundamentals of Genetics*. Kalyani Publications. New Delhi.
5. Gupta, P.K. 2014. *Genetics*. Rastogi Publications. Meerut. India.

Web Resources:

<https://www.thinkswap.com>

<https://www.nature.com>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental principles of genetics and to analyse traits in plants.	K1
CO2	Analyse the mechanism governing Mendelian inheritance and gene interactions.	K3
CO3	Acquire knowledge on mechanism that generates variation in	K3

	trait.	
CO4	Acquaint principles of genetics to real world problems in biology.	K4
CO5	Understand the basic principles of plant breeding for successful implementation of traditional as well as molecular plant breeding programs.	K4

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	S	L	M	M	M
CO2	S	S	S	L	S	M	L	M	M	M
CO3	S	S	S	L	S	S	L	M	L	S
CO4	S	S	S	L	S	S	L	S	M	S
CO5	S	S	S	L	S	S	L	S	S	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – VI

Credit – 5

Total Hrs: 75

Ecology and Plant Geography (18UBOC10)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To understand the interactions of abiotic and biotic factors to maintain the ecosystem.
- To acquire knowledge about the structure of community along with the ecological succession.
- To study the effects of different types of pollution and its control measures.
- To understand the different domains of distribution of plants in the world.

Syllabus

Unit I

No. of Hours: 15

Ecology - its importance. Autecology and Synecology, Abiotic factors - light - temperature - Precipitation - Humidity of Air - atmospheric gases, wind and fire. Edaphic factors - formation of soil - Soil Profile - Physiochemical properties - Soil erosion and soil conservation.

Unit II

No. of Hours: 15

Biotic factors - relationships among organisms – positive, negative and neutral interactions; microclimate; morphological, anatomical and physiological adaptations of plants - hydrophytes, mesophytes, xerophytes, epiphytes and halophytes.

Unit III

No. of Hours: 15

Community ecology - Definition, characteristics, composition and structure of a community. Methods of study of communities (quadrats and transects). Units of vegetation - Ecological succession - concept of climax, hydrosere and xerosere.

Unit IV

No. of Hours: 15

Pollution - Air and water pollution - effects of air and water pollutants on plants - Carbon-di-oxide, Sulphur-di-oxide, Nitrogen oxides, Smog, Hydrocarbons, Aerosols, Chlorofluorocarbons; Water pollutants - sewage, agro chemicals, industrial effluents, oil; radioactive wastes - control measures.

Unit V

No. of Hours: 15

Principles of Plant Geography - Vegetation types - Tamil Nadu, India, World. Distribution of plants - Age and Area hypothesis. Conservation of Forests - Afforestation,

Social forestry and Agroforestry. Endangered plants, Red Data Book, Biosphere Reserve, Important National Parks and Sanctuaries. Roles of FAO, IBPGR, NBPGR and IUCN.

Books for Study:

1. Sharma, P.D. 2013. *Elements of Ecology*. Rastogi Publications, New Delhi. Unit I – IV)

Books for Reference:

1. Pun, G.S. 1983. *Forest Ecology*. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
2. Ambasht, R.S. 1990. *Text Book of Plant Ecology*. 4th Edition. Students friends & Co. Varanasi, India.
3. Chapman, R.S.M. 1995. *Ecology, Principles and Applications*. Cambridge. London.
4. Odum, E.P. 2004. *Fundamentals of Ecology*. Saunders, Philadelphia.
5. Bhatia, K.N. 2005. *A Treatise on Plant Ecology*. Pradeep Publications. Jalandhar.
6. Shukla, R.S. and Chandel, P.S. 2005. *Plant Ecology and Soil Science*. Chand & Co., New Delhi
7. Kumaresan, V. 2010. *Plant Ecology and Phytogeography*. Saras Publications, Nagercoil.

Web Resources:

<https://www.yourarticlelibrary.com>> notes >

<https://biologydiscussion.com>

<https://coursehero.com>

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the ecological relationship between organism and environment.	K1
CO2	Promote the knowledge of conservation and management of natural resources.	K2
CO3	Comprehend biotic and abiotic factors that influence population dynamics.	K2
CO4	Provide knowledge on forest types, climatic factors, edaphic factors, local and geographical distribution of plants.	K3

CO5	Acquire knowledge about structural and functional adaptations of plants to their physical environment.	K4
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Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	S	S	M	S	S	L	S
CO2	M	S	M	L	S	S	S	L	L	S
CO3	M	S	M	L	S	S	S	M	L	S
CO4	S	S	M	L	S	S	S	S	L	S
CO5	S	S	M	L	S	M	S	S	L	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs/ Week

Semester – VI

Credit – 5

Total Hrs: 75 Elective III – Genetic Engineering (18BOUEC3)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To introduce the basics of recombinant technology and to understand cloning vectors.
- To understand the application of Genetic Engineering in their production of useful by products for the public benefit.
- To develop scientific research in cloning vector and Genetic Engineering.
- To acquire knowledge about the Transgenic plants, genetically modified micro organisms and Genetically Engineered animals.
- To know about the transformation techniques involved in Genetic Engineering.

Syllabus

Unit I

No. of Hours: 15

Definition, Importance of Genetic Engineering. Restriction Enzymes - Types - Restriction Endonucleases, Exonucleases - Nomenclature and Recognition sequences. Vectors - Definition - Properties of a good vector - Plasmids - Types - F plasmids, R plasmids and Col plasmids, pBR322 and Bacteriophage vectors - M13.

Unit II

No. of Hours: 15

Cloning - Definition - Steps involved in Cloning - Isolation and preparation of desired DNA; DNA vector - cDNA library, genomic library; Insertion of desired DNA into plasmid; Selection of recombinants - Nucleic acid probes - characteristics, Preparation of probes and its Applications, Screening by nucleic acid Hybridization.

Unit III

No. of Hours: 15

Transformation Techniques - Direct gene transfer - Micro injection, Electroporation, Liposome mediated gene transfer and shot gun method. Indirect gene transfer - Agrobacterium mediated gene transfer - Methodology - Infection of wounded plants, co-cultivation, leaf disc method, advantages and disadvantages.

Unit IV

No. of Hours: 15

Genetically modified organisms (GMOs) - Transgenic plants - Herbicide resistance,

Insect resistance, virus resistance, Stress tolerance and engineering for delayed ripening of fruits.

Unit V

No. of Hours: 15

Genetically engineered microorganisms and animals - Transgenic Mice, Cattle, Sheep. Monoclonal antibodies - Principles and uses. Applications and Hazards in Genetic Engineering.

Books for Study:

1. Dubey, R.C.2009. *A Text book of Biotechnology*. S. Chand & Co. New Delhi.

Books for Reference:

1. Chawala, H.S.2003. *Introduction to Plant Biotechnology*. 2nd Ed., Oxford & IBH Publishing Company, New Delhi.
2. Joshi, P. 2003. *Genetic Engineering and its Applications*. Students Edition. Jodhpur.
3. Singh, B.D.2003. *Biotechnology*. Kalyani publishers. Ludhiana.
4. Kumaresan, V. 2005. *Biotechnology*. Saras Publication, Nagercoil.
5. Primrose, S. B. and Twyman, R. 2006. *Principles of Gene manipulation and Genomics*. 7th edition, Wiley-Blackwell.
6. Meyyan, R.P.2010. *Genetics and Genetic Engineering*. Saras Publication, Nagercoil.

Web Resources:

<https://www.nature.com>

<https://www.cliffnotes.com>

Course Outcomes (CO): On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Know about genetically engineered plants and their economic and environmental benefits.	K1
CO2	Acquire knowledge to introduce a new trait of the plant.	K2
CO3	Enable accurate and subtle <i>in vitro</i> manipulation techniques.	K2
CO4	Understand the significance of genetic engineering as an important tool.	K3

CO5	Provide through knowledge about genetically modified organisms.	K4
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Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	S	L	S	S	M	S	S	S
CO2	S	S	S	L	S	S	S	S	S	S
CO3	S	S	S	L	S	S	M	M	S	S
CO4	S	S	M	L	S	S	S	S	M	S
CO5	S	S	M	L	S	S	S	M	S	S

L – Low; M – Medium; S - Strong

Syllabus for B.Sc., Botany Main

5 Hrs / Week

Semester – VI

Credits - 5

Elective III – Plant Protection (18UBOESC3)

(To come into effect from 2010-2011 onwards for the students admitted from 2008-2009)

Objectives

1. To gain knowledge to prevent losses to crops caused by diseases.
2. To attain professional application to protect plants from diseases.

Syllabus

Unit I

No. of Hours: 15

Damage to crops of India by insects, nematodes, rodent, fungi, bacteria and viruses – a general outline.

Unit II

No. of Hours: 15

Types of plant diseases and casual agents. Insect transmission of bacteria and viruses. A general account of preventive measures of plant diseases including plant protection and quarantine measures. Legislations in plant protection, seed certification, weed control.

Unit III

No. of Hours: 15

Study of symptoms, etiology and control measures of the following diseases: damping off of seedling, bud rot of coconut, black rust of wheat, blast of paddy, smut of maize, red rot of sugarcane, Tikka disease of groundnut, wilt of cotton.

Unit IV

No. of Hours: 15

Soft rot of vegetables, Bacterial blight of rice, canker disease of citrus, ring rot of potato.

Unit V

No. of Hours: 15

Plant disease control methods: physical, chemical and biological control. Method of application of fungicides and pesticides.

Reference Books

1. Bap Reddy, D. 1992. Plant Protection in India. Allied Publishers (PP Limited).

2. Saha L.R. 2006. Handbook of Plant Protection. Kalyani Publishers.

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Understand the need for plant protection.	K4
CO2	Gain knowledge to prevent loss of crops caused by plant disease.	K1
CO3	Attain skill to protect plants from disease.	K3

Mapping of COs with POs and PSOs

POs&PSOs Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	S	L	M	L	M	S	S
CO2	M	S	S	S	S	M	L	S	S	S
CO3	S	S	S	S	S	M	L	S	S	S

L – Low; M – Medium; S - Strong

Syllabus for III B.A/B.Sc.B.Com. (For Non-Major Students)

2 Hrs/ Week

Semester – VI

Credit – 2

Total Hrs:30

Non Major Skill Based – II: Herbal Therapy (18UBONSC2)

(To come into effect from 2020-2021 onwards for the students admitted from 2018-2019)

Course Objectives : The course aims

- To understand about Indian system of medicine like Ayurveda and Siddha.
- To acquire knowledge about some herbal remedies for some common ailments.
- To know about herbal remedy for skin and hair problems.
- To gain knowledge about Aroma therapy and its uses.

Syllabus

Unit I

No. of Hours: 6

Introduction and basic principles of Ayurveda, Naturopathy and Siddha medicine - Panchabhutas - Tridhosha concept - Vadha, Pittha and Kappa dhosha.

Unit II

No. of Hours: 6

Preparation of Ayurvedic and Siddha medicine. Herbal remedies for some common infectious diseases: Asthma, Chickenpox, Cold, Diarrhoea, Dental care, fever, worms.

Unit III

No. of Hours: 6

Herbal remedies for some common disorders - Menstrual disorder, Hypertension, Jaundice, Diabetics and Ulcer (symptoms, causes and home remedies).

Unit IV

No. of Hours: 6

Symptoms, causes and herbal remedies for Acne, Black heads, Corns, Warts, Boils, Stings and Bites (symptoms, causes and home remedies).

Unit V

No. of Hours: 6

Dandruff, Premature greying and loss of Hair (symptoms, causes and home remedies).
Aroma Therapy - Essential oils and its uses. Nutraceuticals.

Books for Study:

1. Jaibala,S. and G. Balakrishnan. 1975. *A Hand Book of Common Remedies Based on Siddha Medicine*. Ed. St. Louis Institute Press, Madras.

Books for Reference:

1. Vaidya Bhagwar Dash, 1978. *Fundamentals of Ayurvedic Medicine*, Konark, Publishers Pvt. Ltd. Delhi.
2. Saha, N.N.1981. *Herbal Remedies*. Universal Publication - New Delhi.
3. Bakhru, H.K. 1992. *Herbs that Heals*. Vision Books Ltd., New Delhi.
4. Prajapati, N.D., S.S. Purohit & U. Kumar.2003. *A Hand Book of Medicinal Plant*. Agrobios Publication, India.
5. Frank, H. & M. Martin. 2006. *Herbal Medicine and Botanical Medicinal fads*. Viva Books Pvt., Ltd., New Delhi.
6. Despandey, D.J.2008. *A Handbook of Herbal Remedies*. Agrobios, Jodhpur, India.

Web Resources:

<https://www.ayusante.com> > articles

Course Outcomes (CO)

CO Number	CO Statement	Knowledge Level
CO1	Imply the practice of using herbs and their remedies to maintain health and cure diseases.	K1
CO2	Create platform to understand about Indian system of medicine such as Ayurveda, Siddha, Unani and Naturopathy.	K2
CO3	Strengthen the knowledge about certain herbal remedies for skin and hair care.	K3
CO4	Promote an idea about aromatherapy and its applications.	K3