ANNAMALAI UNIVERSITY

206 - B.Sc. BOTANY

Programme Structure and scheme of Examination (under CBCS)
(Applicable to the candidates admitted in Affiliated Colleges from the academic year 2022-2023 onwards)

Course code	Part	Study Components and Course Title	Hours / week	Credit	Maximum marks		
					CIA	ESE	Total
		SEMESTER - I					
22UTAML11	I	Language Course-I: Tamil/other languages	5	3	25	75	100
22UENGL12	II	English Course –I: Communicative English I	5	3	25	75	100
22UBOTC13	III	Core course I: Phycology and Bryology	4	4	25	75	100
22UBOTC14		Core course II: Mycology and Lichenology	4	4	25	75	100
22UBOTC15		Core Practical I:	3	-	-	-	-
		Allied I: Paper I	4	4	25	75	100
		Allied Practical I	3	-	-	-	-
22UENVS18	IV	Environmental studies	2	2	25	75	100
		Total	**30**	**20**			**600**
		SEMESTER - II					
22UTAML21	I	Language Course-II: Tamil/other languages	5	3	25	75	100
22UENGL22	II	English Course –II: Communicative English II	5	3	25	75	100
22UBOTC23	III	Core course III: Microbiology & Plant Pathology	4	4	25	75	100
22UBOTP24		Core Practical I:	3	4	40	60	100
		Allied –I : Paper II	4	4	25	75	100
		Allied Practical I	2	2	40	60	100
22UBOTE27		Internal Elective I	3	3	25	75	100
22UVALE27	IV	Value Education	2	1	25	75	100
22USOFS28		Soft skill	2	1	25	75	100
		Total	**30**	**25**			**900**

Internal Elective Courses

CODE	COMPONENT	PAPER TITLE
22UBOTE27-1	Internal Elective I	Horticulture
22UBOTE27-2		Seed Technology
22UBOTE27-3		Medicinal Botany

Allied Courses offed by the Department of Botany

22UBOTA01	THEORY	Allied Botany Paper I
22UBOTA02	THEORY	Allied Botany Paper II
22UBOTAP1	PRACTICAL	Allied Botany Practical

SEMESTER - I PART III	22UBOTC13: CORE COURSE - I : PHYCOLOGY AND BRYOLOGY	CREDITS: 4 HOURS: 60

COURSE OBJECTIVES:

1. To understand the major groups of cryptogamic plants and their characteristics.
2. To study their interrelationships and trace their evolutionary trends.
3. To know the classification, life cycle and economic importance of Algae.
4. To understand Bryophytes and their salient features.
5. To learn the classification and economic importance of Bryophytes.

UNIT – I : Algae (10 hours)

General characteristics of algae. Various habitats of algae – freshwater, marine and soil. Classification (F.E. Fritsch, 1945). Salient features of various classes as per Fritsch's system. Cell structure of prokaryotic algae (Cyanophyceaen cell) and eukaryotic algae (Chlorophycean cell).

UNIT – II : Algae (10 hours)

Thallus organization, mode of reproduction, algal life cycle patterns (haplontic, diplontic, haplo-diplontic and diplobiontic). Mass culture (*Spirulina*), economic importance of algae and BGA in Azolla as fodder and biofertilizer.

UNIT – III : Algae (15 hours)

Detailed study of the following genera: occurrence, distribution, common species, structure, reproduction and life cycle of *Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum* and *Polysiphonia* (developmental studies on sex organs not required).

UNIT – IV : Bryophytes (10 hours)

General characteristics of Bryophytes, Various natural habitats of Bryophytes, Classification (Rothmaler, 1951), vegetative reproduction and economic importance. Evolution of gametophytes and sporophytes among Bryophytes.

UNIT – V : Bryophytes (15 hours)

Detailed study of the following genera: occurrence, distribution, common species, structure, reproduction and life cycle of *Marchantia, Anthoceros and Funaria* (developmental studies on sex organs not required).

Text Books :

1. Pandey, BP. 2018. College Botany Volume I, 20/e, S. Chand and Company, New Delhi.
2. Pandey, BP. 2005. Simplified Course in Botany. S. Chand and Company, New Delhi.
3. Sharma, OP. 1992. Text Book of Algae. Tata McGraw Hill, New Delhi. 21
4. Pandey, S.N, P.S.Trivedi(2008).A text book of Botany Vol –I – 11thEdt, Vikas publishing House, Noida.
5. Pandey, S.N, P.S.Trivedi (2008). A text book of Botany Vol –II, Vikas publishing House, Noida.
6. Gangulee, HC. And Kar, AK. 1989. College Botany, Vol-II, Books & Allied Pvt. Ltd., Calcutta.

7. Prem Puri. 1981. Bryophytes - Morphology growth and differentiation. Atma Ram & Sons. Lucknow.
8. Smith, GM. 1955. Cryptogamic Botany Vol-1&II, McGraw Hill, New York
9. Sharma, OP (2013). Bryophytes, McGraw Hill education (India) Pvt..Ltd, New Delhi
10. Vashishta, Sinha AK (2011). Bryophytes, S.Chand & Company ltd., New Delhi
11. Rashid, A (1998).An Introduction to Bryophyta, Vikas Pub.Ltd, Newdelhi

COURSE OUTCOMES

On successful completion of the course, the student will be able to

1. Acquire thorough knowledge on the salient features of Algae and Bryophytes.
2. Learn the major classes, types, structure and reproduction of various genera.
3. Conserve them in their natural environment.
4. Acquire the basic knowledge of the evolutionary relationship between algae and bryophytes.
5. Identify the economic importance of Algae and Bryophytes.

OUTCOME MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	1	2	3	2	2
CO2	2	2	2	1	3
CO3	2	3	3	2	3
CO4	1	2	3	3	2
CO5	3	2	3	2	3

SEMESTER - I PART – III	22UBOTC14: CORE COURSE-II : MYCOLOGY AND LICHENOLOGY	CREDITS: 4 HOURS: 60

COURSE OBJECTIVES:

1. To acquire thorough knowledge on the salient features of fungi and lichens.
2. To learn the major classes, types, structure and reproduction of various genera.
3. To study the classification, characteristic features, distribution, and reproduction cycle of fungi and lichens
4. To know the ecological and economic importance of fungi and lichens
5. To understand the concept of lichens as indicator for air pollution.

UNIT - I : Fungi (10 hours)

General characteristics - range of thallus organization, The architecture of thallus, fungal cells, cell wall composition, cell organelles and cytoskeleton; mode of nutrition. Outline on the Classification of fungi (C. J Alexopoulos and C. W. Mims, 1979).

UNIT - II : Fungi (10 hours)

Ecology of fungi, Reproduction (vegetative, asexual and sexual), Heterothallism; heterokaryosis; parasexuality; degeneration of sex. Spore dispersal mechanisms. Economic importance of fungi in industries and medicine.

UNIT - III : Fungi (20 hours)

Detailed study of morphology, reproduction and life cycle of the following: (a) Mastigimycotina-*Albugo*; (b) Zygomycotina- *Rhizopus*; (c) Ascomycotina-*Saccharomyces* and *Penicillium*; (d) Basidiomycotina- *Puccinia*; (e) Deuteromycotina-*Cercospora.*

UNIT – IV : Lichens (10 hours)

Introduction to Lichens, Distribution, Types, Nature of Mycobionts and Phycobionts, Thallus organization, Classification of Lichens (Hale, 1969). Special structures of Lichen thallus, Reproduction, Biomedical applications.

UNIT – V : Lichens (10 hours)

Structure, vegetative and sexual reproduction (with reference to fruticose lichen - *Usnea*). Economic importance and role in succession and pollution monitoring.

Text Books:

1. Sharma, OP (2011). Fungi and allied microbes The McGraw –Hill companies, New Delhi
2. Sharma, PD (2003).The Fungi. Rastogi Publications, Meerut
3. Sharma OP 1989. Text Book of fungi. Tata McGraw Hill, New York.
4. Bessey, E.A (1979). Morphology and Taxonomy of fungi, Vikas publishing House Pvt. Ltd, New Delhi.
5. Mehrotra, RS, Aneja KR (1990).An Introduction to Mycology , New Age International Pub, New Delhi
6. Webster,J (1970) Introduction to fungi , Cambridge university press,London.

7. Muthukumar, S. and Tarar, JL (2006), Lichen Flora of Central India, Eastern book Corporation , New Delhi.
8. Dharani Dhar Awasthi (2000). A Handbook of Lichens, Vedams eBooks (P) Ltd. New Delhi
9. Hale M.E, (1983), The Biology of Lichens, New Age International publishers, New Delhi.

COURSE OUTCOMES :

On successful completion of the course, the student will be able to

1. Acquire thorough knowledge on the salient features of Fungi and Lichens.
2. Learn about the morphology, structure, reproduction and life cycle of Fungi and Lichens.
3. Study the various classes and major types of Fungi and variations in life cycles.
4. Understand the fundamentals of economic importance and biomedical applications of Fungi and Lichens.
5. To learn about the role of lichens as pollution indicators.

OUTCOME MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	1	2	2	2	2
CO2	2	2	2	3	3
CO3	3	3	3	2	3
CO4	2	2	3	3	2
CO5	1	2	3	1	3

SEMESTER – I & II PART – III	22UBOTP15/22UBOTP24: CORE PRACTICAL – I: COVERING CORE COURSES I, II AND III	CREDITS: 4 HOURS: 90

1. To make suitable micro preparations and detailed microscopic analysis of vegetative and reproductive parts of the following Algae – *Oscillatoria, Oedogonium, Caulerpa, Cyclotella, Sargassum and Polysiphonia*
2. To identify types from algal mixtures.
3. To make suitable micro preparations and detailed microscopic analysis of vegetative and reproductive parts of the following Bryophytes - *Marchantia, Anthoceros and Funaria.*
4. To make suitable micro preparations and detailed microscopic analysis of vegetative and reproductive parts of the following Fungi - *Rhizopus*, *Saccharomyces, Penicillium*, *Puccinia* and *Cercospora.*To Study the vegetative, special structures and reproductive structures of Lichens (*Usnea*).
5. To observe and identify microscopic specimens and write illustrated and explanatory notes on them.
6. Identification of Bacteria using Gram staining in Curd.
7. Study of plant diseases – casual organism, symptoms and controlmeasures.
8. To maintain observation and record note book.

COURSE OUTCOMES

On successful completion of this course the student will be able to

1) Make micropreaprations of the forms studied in the syllabus
2) Identify the different lower groups of plants
3) Understand and identify microorganisms
4) Aanlyse and identify plant diseases
5) Maintain scientific records of observations

OUTCOME MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	1	3	2
CO2	2	3	2	2	3
CO3	2	1	3	2	3
CO4	1	3	3	2	2
CO5	2	2	3	1	3

SEMESTER - II PART – III	22UBOTC23: CORE COURSE-III: MICROBIOLOGY AND PLANT PATHOLOGY	CREDITS: 4 HOURS: 60

COURSE OBJECTIVES:

1. To study the History and scope of microbiology.
2. To understand the classification, structure, bacteria and viruses.
3. To create the awareness on economic importance of microorganisms.
4. To study the classification and symptoms of plant diseases.
5. To study the infection, casual organism and control of some diseases.

UNIT – I (10 hours)

History and scope of microbiology, contributions of L.Pasteur and R.Koch. Classification of microbes – R.H. Whittaker's five kingdom concept, Carl Woese's – Domain system. Basic principles of staining of Bacteria. Microbial interactions – beneficial association (symbiosis, VAM) and destructive association (Plant diseases).

UNIT – II (15 hours)

Bacteria: General characters, morphology and classification of bacteria - ultra structure of bacterial cell. Nutrition, respiration and reproduction of bacteria. Viruses: General characters, classification and general structure with special reference to viroids and prions. Structure of TMV and T4 bacteriophage – Multiplication of bacteriophage (Lytic and Lysogenic cycle) Mycoplasma: Properties and salient features.

UNIT - III (10 hours)

Role of microorganisms in industries - alcoholic beverages, dairy products. Enzymes – amylase and protease. Antibiotics – Penicillin and Streptomycin. Vaccines. Agriculture- Biofertilizers and biopesticides. Environment – Sewage treatment and Biogas.

UNIT – IV (15 hours)

Plant Pathology - History and principles, classification of diseases, kinds of symptoms (hypertrophy, hypotrophy and necrotic symptoms). study of infection - entry of fungal, bacterial and viral pathogens and dissemination of pathogens - spore dispersal, role of vectors, influence of wind, temperature and humidity in transmission.

UNIT – V (10 hours)

Control methods of plant diseases - cultural, chemical and biological methods. Study of the following plant diseases:

1. Citrus canker
2. Tikka disease of groundnut
3. Red rot of sugarcane
4. Bunchy top of banana.

Text Books

1. Verma, J.P .1992. The Bacteria.
2. Pelczar .1993. Introductory Microbiology.
3. Clifton, A. 1958. Introduction to Bacteria.
4. Gupta, G.P. Plant Pathology
5. Singh, R.S . Plant Pathology
6. Mehortra , R.S . Plant Pathology
7. Bilgrami K.S. and Dube . Text book of Modern Plant Pathology

COURSE OUTCOMES

On successful completion of this course, the student will be able to

1. Give a detailed introduction of microorganisms and their classification.
2. Understand the factors lying behind the plant diseases and how to overcome
3. Demonstrate control of microbes and utility .
4. Analyse plant diseases – casual organism, symptoms and control measures
5. Predict disease incidence based on environmental conditions

OUTCOME MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	3	1	3	2
CO2	1	3	2	2	3
CO3	2	1	3	2	1
CO4	3	3	3	2	3
CO5	2	1	3	3	3

SEMESTER - II PART – III	22UBOTE27: INTERNAL ELECTIVE - I A. HORTICULTURE	CREDITS: 3 HOURS: 45

COURSE OBJECTIVES

1. To understand the salient features of Horticulture
2. To know the importance of cultivating horticultural crops.
3. To learn plant propagation for horticulture
4. To promote educational and training opportunities and encourage the development of all disciplines within Horticulture
5. To Familiarize with the improving of the environment

UNIT – I (9 hours)

Horticulture: Importance of Horticulture, Classification of Horticultural crops – fruits, vegetables, crops, climate, soil, water and nutrition needs of Horticultural crops, Pruning methods, Hydroponics.

UNIT – II (9 hours)

Garden designs, types of gardens – formal, informal and kitchen garden – floriculture, cultivation of commercial flowers – Rose. Cultivation of important fruit trees – Mango.

UNIT – III (9 hours)

Propagation methods, Cutting, Layering – Air layering, Budding –Grafting – Types of grafting- approach and crown grafting. Garden tools and implements, Manures and fertilizers, Farmyard manure, compost, Vermi compost and biofertilizers. Foliar sprays.

UNIT – IV (9 hours)

Components of Garden, Lawns and landscaping Trees, shrubs and shrubberies, climbers and creepers, Flower beds and borders, topiary, rockery. Conservatory or green houses, Indoor garden, Roof garden, Bonsai.

UNIT – V (9 hours)

Growth regulators in Horticulture, Rooting hormones, Flower induction, Parthenocarpy, Plant protection – Biocontrol methods, Common diseases of fruits and vegetable crops (Mango, Citrus, & Tomato).

Text Books

1. Kumar, N. (1997) Introduction to Horticulture, Rajalakshmi publications, Nagercoil, India – (28 chapters & approx. 300 pages).
2. Bose, T.K. & Mukherjee, D. (1972) Gardening in India, Oxford & IBH publishing Co., Kolkatta, Mumbai, New Delhi – 385pp.
3. Sandhu, M.K. (1989) Plant propagation, Wiley Eastern Ltd., New Delhi, Bangalore, Bombay, Calcutta, Chennai, Hyderabad, Pune – 287pp.
4. Lex Lauries & Victor H. Rice (1950) Floriculture – Fundamental and Practices. McGraw Hill Publishers, N.Y.
5. Naik, South Indian fruits and their culture, Vardhachary & co., Chennai.
6. Edmond Musser & Andres, Fundamentals of horticulture, McGraw Hill Book Co.,
7. Sundararajan, J.S. Muthuswamy, J. Shanmugavelu, K.G. balakrishnan, A guide to horticulture, Thiruvenkadam Printers, Coimbatore.

E- Materials:

http://ecoursesonline.iasri.res.in/course/index.php?categoryid=89

COURSE OUTCOMES

On the successful completion of the course, the student will be able to

1. Understand characteristics of ornamental plants
2. Provide employment opportunities, often in rural areas
3. Improve and manage the environment sustainably
4. Practice vegetative plant propagation
5. Gain knowledge of growth regulators, promoters and common diseases of Horticultural crops.

OUTCOME MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	3	1	3	2
CO2	2	3	2	2	3
CO3	2	1	3	2	1
CO4	1	3	3	2	3
CO5	2	2	3	1	3

SEMESTER – II PART - III	22UBOTE27: INTERNAL ELECTIVE - I : B. SEED TECHNOLOGY	CREDITS: 3 HOURS: 45

COURSE OBJECTIVES:

1. To acquire knowledge about seed technology
2. To realize the importance of seed technology in over all upgrading of the seed quality.
3. To know the varies components and techniques of seed Technology
4. To gain knowledge about laws and rules of seed and seed technology.
5. To understand the concept of certified seeds

UNIT - I (9 hours)

Introduction – Goals of Seed Technology. Seed industry in India – before and after independence. Development of seed programmes – Bases and types of seed programmes, steps involved in development of a seed programme.

UNIT - II (9 hours)

General principles of seed production. Maintenance of Nucleus and Breeder's seed. Foundation and certified seed production – cereals, pulses, oil seeds, fibres, and Sugar.

UNIT - III (9 hours)

Seed Processing, storage and marketing – Seed processing, seed drying, seed cleaning and Upgrading, Seed Treatment, Seed Packaging and Handling, Seed Storage, Seed marketing.

UNIT - IV (9 hours)

Seed Testing – Introduction, seed Sampling, Seed purity, Genuineness of Seed varieties, Seed Germination, Seed viability, Seed vigour, Seed Health, Seed Moisture.

UNIT - V (9 hours)

Seed certification and Seed Legislation Seed certification, Seed certification standard field and Seed inspection, Seed legispation and seed Law Enforcement.

Text Books

1. Agrawal, R. L. 1982. Seed Technology.ISBN: 81-204-0068-2.
2. Miler B. Mc Donald and Lawrence. 1998. Seed production – Principles and Practices. Copeland CBS publication – ISBN 81-239-0600-5 Chapman ISBN: 0-412-07551-2.
3. Dr. Veena Gupata . 2009. Seeds – Their Conservation Principles and Practices.
4. Vanangamudi, K and V. Manonmani 2011. Organic Seed – Traditional Varieties and Technologies.ISBN: 978-81-7233-700-1.
5. Brijesh Tiwari. 2014. Seed Science and Technology. ISBN: 978-93-5030-194-4.
6. Yashwanth Kumar, D. 2014.Seed Science and Technology. ISBN; 978-93-5111-321-8.
7. Agrawal, PK and M. Dadlani. Techniques in Seed Science and Technology. ISBN: 81-7003-138-9.

COURSE OUTCOMES:

On the successful completion of the course, the student will be able to

1. Acquire knowledge about seed technology
2. Realize the importance of seed technology in over all upgrading of the seed quality.
3. Understand the various components and techniques of seed Technology
4. Analyse the laws and rules of seed and seed technology.
5. Apply the concept of certified seeds

OUTCOME MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	3	1	3	2
CO2	1	3	2	2	3
CO3	2	1	3	2	1
CO4	1	3	3	2	3
CO5	2	2	3	3	3

SEMESTER - II PART - III	22UBOTE27: INTERNAL ELECTIVE - I : C. MEDICINAL BOTANY	CREDITS: 3 HOURS: 45

COURSE OBJECTIVES:

1. To educate, study, develop, cultivate, benefits of medicinal plants
2. To understand salient features of Medicinal plants
3. To acquire the knowledge about Siddha, Aurvedha and Unani system of medicines
4. To stimulate Agro ecological practices.
5. To support research and the implementation of medicinal plant programmes and projects in the municipalities

UNIT – I (9 hours)

Pharmacognosy - Definition and History. Introduction, brief history of medicinal plants. Indian system of medicines – Siddha, Aurvedha and Unani systems. Classification of crude drugs, and their chemistry.

UNIT - II (9 hours)

Vernacular and botanical names of locally available medicinal plants. Preparation of herbal drugs – Medicinally useful parts of plants.

UNIT – III (9 hours)

Morphological studies - Chemical constituents. Therapeutic and other Pharmaceutical uses of Root – *Catheranthus,* Bark - *Cinchona*, Leaves - *Adathoda* and *Eucalyptus*, Flower - *Clove*.

UNIT – IV (9 hours)

Establishment of Herbal Garden – Pot culture and uses of medicinal plants - Jaundice, Cardiac, Diabetics, Blood pressure and Skin diseases. (Two Plant examples for each mentioned above)

UNIT – V (9 hours)

Fruits and seed - Wood apple, Gooseberry and Poppy seed, Underground stem - Ginger, Unorganized drugs. Gum - Acacia, Resin - Turpentine, Fixed oil - Castor oil.

Text Books

1. Sathyarathi *et al* – 1982 – Indian Medicinal Plants, Vols., I, II & III. ICMR, New Delhi.
2. J.S. Gamble – 1935 – Flora of the Presidency of Median vols. I, II & III. Govt. Press Calcutta, India.
3. K.M. Mathew – 1989 – Flora and Tamil Nadu carnatic reprint herbarium, St.Joseph's College, Tiruchirappalli.
4. Prajapathi, Purohit, Sharma and Kumar. (2003). A Hand book of Medicinal plants. Agrobios Publications, Jodhpur.
5. John Jothi Prakash, E. (2003). Medicinal Botany and Pharmacognosy. JPR Publication, Vallioor, Tirunelveli.

E- Materials:

https://science.umd.edu/classroom/bsci124/lec29.html

COURSE OUTCOMES:

On the successful completion of the course, the student will be able to

1. Promote cultivation and conservation of medicinal plants.
2. Identify the medicinal plants to be conserved
3. Analyse the various systems of medicines
4. Describe the process drug production
5. Manage and maintain herbal gardens

OUTCOME MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	2	3	1	1	2
CO2	3	3	2	2	3
CO3	2	1	3	2	1
CO4	1	3	3	2	3
CO5	2	2	3	2	3