KONGUNADU ARTS AND SCIENCE COLLEGE

(AUTONOMOUS)

COIMBATORE – 641 029

DEPARTMENT OF BOTANY (PG)

CURRICULUM AND SCHEME OF EXAMINATIONS
(CBCS)
(2021 - 2022 onwards)

KONGUNADU ARTS AND SCIENCE COLLEGE
(AUTONOMOUS)
COIMBATORE – 641 029

Vision:

- Developing the total personality of every student in a holistic way by adhering to the principles of **Swami Vivekananda** and **Mahatma Gandhi**.

Mission:

- Imparting holistic and man-making education with emphasis on character, culture and value - moral and ethical.
- Designing the curriculum and offering courses that transform its students into value added skilled human resources.
- Constantly updating academic and management practices towards total quality management and promotion of quality in all spheres.
- Extending the best student support services by making them comprehensive and by evolving a curriculum relevant to student community and society at large.
- Taking steps to make education affordable and accessible by extending scholarships to the meritorious and economically disadvantaged students.
- Moulding the teachers in such a way that they become the role models in promoting Higher Education.

DEPARTMENT OF BOTANY

Vision:

- Disseminate the knowledge on plants and their utility to the society.
- To develop feasible strategies in plant sciences for obtaining sustainable benefits from them.

Mission:

- Designing the curriculum by frequently updating the syllabi according to the need.
- Preparing the students with more aptitude, skill and leadership quality by educating them.
- Make the students as entrepreneurs in the plant based industries.
- Identification and encouragement to turn the students into eminent Scientists/ Laurels.

PROGRAMME OUTCOMES (PO)

PO 1

- This programme aids an excellent opportunities for students to develop demonstrative knowledge, understanding skills, qualities and other attributes in the range of plant diversity in terms of structure, function, evolution and their environmental relationships.

PO2

- Plant diversity conservation strategies such as tissue culture techniques, *in situ* and *ex situ* methods motivate students to create interest towards nature and its protection of plant heritage.

PO3

- Contribution and importance of medicinal plants instill a sense of care and concern over the improved production of our supply on medicine, food and other plant products for the betterment of man's holistic development and welfare.

PO4

- Explore the therapeutic aspects of medicinal plants by traditional indigenous approaches and perspectives on treating ailments.

PO5

- Contribution and importance of medicinal plants instill a sense of care and concern over the improved production of out supply on medicine, food and other plant products for the betterment of man's holistic development and welfare.

PO6

- Students can acquire acquainted knowledge on basic scientific phenomena, fundamental principles, and applications of various mathematical tools and physical principles in relevant biological situations.

PO7

- Students will be able to understand the potentials, and impact of biotechnological innovations by implementing modern appropriate techniques and practical exposures in the field of Plant Molecular Biology, Plant Biotechnology and Nanobiology.

PO8

- Demonstrate knowledge and understanding of concepts and principles in recent research approaches and to manage projects in multidisciplinary environments.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1

- Highest priority is given to morphology, taxonomy, anatomy and embryology to know each and every character of the plant both in external and internal characters for their identification and classification to involve plants further in biochemical and pharmaceutical aspects.

PSO2

- Students will be able to apply fundamental biostatistics, bioinformatics tools and biophysical principles for the analysis of relevant biological situations and for developing intellectual skills on biological data and databases.

PSO3

- Students will be able to explicate the ecological interconnections of life on earth by tracing energy and nutrient flows through the environment by the microbial and degradation of the waste. They will be able to relate the physical features of the environment to that of the structure of populations, communities and ecosystem.

PSO4

- Study on medicinal plants provide firsthand knowledge on local, rare, endangered, endemic and exotic medicinal plants in their original habitats, their therapeutic values acquired through their physiological pathways and their cultivation practices for effective conservation for future use.

PSO5

- Through microbiological core concepts the students were able to inter-relate integral and ubiquitous role of microbes with their environment. In plant pathology, students are expected to recognize plant diseases and their disease management in economically important crop plants.

PBO1

KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)
COIMBATORE – 641 029

Course Name: M.Sc., Botany

Curriculum and scheme of Examination under CBCS
(Applicable to the students admitted during the Academic Year 2021-2022)

Semester	Subject Code	Title of the Paper	Instruction hours /cycle	Exam Marks			Duration of Exam (hours)	Credits
				CIA	ESE	Total		
I	21PBO101	C.P.1 - Plant Diversity I	7	50	50	100	3	5
	21PBO102	C.P.2 - Plant Diversity II	7	50	50	100	3	5
	21PBO103	C.P.3 - Anatomy, Embryology of Angiosperms and Microtechniques	6	50	50	100	3	4
	21PBO1E1	Major Elective I	6	50	50	100	3	5
	21PBO1CL	C.Pr.1 - Plant Diversity I & II , Anatomy, Embryology of Angiosperms and Microtechniques	4	50	50	100	4	2
		Total	**30**	-	-	**500**	-	**21**
II	21PBO204	C.P.4 – Bioinformatics	6	50	50	100	3	4
	21PBO205	C.P.5 - Cell Biology, Genetics, Plant Breeding and Biostatistics	6	50	50	100	3	5
	21PBO206	C.P.6 - Ecology, Bioenergetics and Natural Resource Management	6	50	50	100	3	5
	21PBO2E2	Major Elective II	6	50	50	100	3	5
	21PBO2CM	C.Pr.2 – Bioinformatics	2	50	50	100	4	2
	21PBO2CN	C.Pr. 3 - Cell Biology, Genetics, Plant Breeding and Biostatistics, Ecology, Bioenergetics and Natural Resource Management	4	50	50	100	4	2
		Total	**30**	-	-	**600**	-	**23**
III	21PBO307	C.P.7 - Taxonomy and Biosystematics	6	50	50	100	3	5
	21PBO308	C.P.8 - Microbiology and Plant Pathology	6	50	50	100	3	5
	21PBO309	C.P.9 - Biotechnology and Nanobiology	6	50	50	100	3	5
	21PBO3N1	Non-Major Elective I	6	50	50	100	3	4
	21PBO3CO	C.Pr.4 - Taxonomy and Biosystematics, Microbiology and Plant Pathology & Biotechnology and Nanobiology	4	50	50	100	4	2
	-	Extra Departmental Course (EDC)	2	50	50	100	3	2
		Total	**30**	-	-	**600**	-	**23**
IV	21PBO410	C.P.10 – Biophysics, Biochemistry and Bioinstrumentation	7	50	50	100	3	5
	21PBO411	C.P.11 - Plant Physiology	7	50	50	100	3	5
	21PBO4N2	Non-Major Elective II	7	50	50	100	3	4
	21PBO4CP	C.Pr.5– Biophysics, Biochemistry and Bioinstrumentation & Plant Physiology	4	50	50	100	4	2
	21PBO4Z1	Project Work & Viva – Voce	5	50	50	100	-	5
-	-	SWAYAM – MOOC	-	-	-	-	-	2
		Total	**30**	-	-	**500**	-	**23**
		Grand Total		-	-	**2200**	-	**90**

Note:

CBCS – Choice Based Credit system
CIA – Continuous Internal Assessment
ESE – End of Semester Examinations

Major Elective Papers

(2 papers are to be chosen from the following 4 papers)

1. **Forest Resources and Utilization**
2. **Seed Technology**
3. **Food Science and Nutrition**
4. **Horticulture**

Non-Major Elective Papers

(2 papers are to be chosen from the following 4 papers)

1. **Pharmacognosy**
2. **Limnology**
3. **Plant Biotechnology**
4. **Medicinal Plants**

Sub code and title of the Extra Department Course (EDC)

21PBO3X1- APPLIED HORTICULTURE

Tally Table:

Part	Subject	No. of Subjects	Total Marks	Credits
I	Core - Theory / Practical / Project	17	1700	68
	Major Elective Paper	2	200	10
	EDC Paper	1	100	2
	Non - Major Elective Paper	2	200	8
	SWAYAM – MOOC	-	-	2
	Grand Total	**22**	**2200**	**90**

- 50 % CIA is applicable to all subjects except JOC, COP and SWAYAM courses which are considered as extra credit courses.
- The students should complete **SWAYAM-MOOC** courses before the completion of 3rd semester and the course completion certificate should be submitted through the HOD to the Controller of Examinations. Two credits will be given to the candidates who have successfully completed. In case the students have completed more than one online course, the appropriate 2 extra credits shall be awarded to such candidates upon the submission of certificate through the HOD to the Controller of Examinations.
- A **Field Trip** preferably relevant to the course should be undertaken every year.

Extra Credit Courses

Semester	Subject Code	Title of the Paper	Instruction hours /cycle	Exam Marks			Duration of Exam (hours)	Credits
				CIA	ESE	Total		
II	21PBO2J1	JOC - Floriculture and Landscaping	4	-	100	**100**	3	**2**
	21PBO2J2	JOC - Food Processing and Preservation	4	-	100	**100**	3	**2**

Diploma Courses

PG Diploma in Biodiversity

Semester	Subject Code	Title of the Paper	Instruction hours /cycle	Exam Marks			Duration of Exam (hours)	Credits
				CIA	ESE	Total		
I	21PDB101	C.P.1. Introduction to Biodiversity	2	50	50	**100**	3	**2**
	21PDB102	C.P.2. Values, Uses and Loss of Biodiversity	2	50	50	**100**	3	**2**
	21PDB103	C.P.3. Conservation and Management of Biodiversity	2	50	50	**100**	3	**2**
	21PDB1CL	C.Pr.1. Biodiversity	2	50	50	**100**	3	**2**
		Total	**8**			**400**		**8**
II	21PDB204	C.P.4. Biodiversity Prospecting and Indigenous Knowledge System (IKS) and Biotechnology for Biodiversity	2	50	50	**100**	3	**2**
	21PDB205	C.P.5. Wildlife Biology and Conservation Policies and Law	2	50	50	**100**	3	**2**
	21PDB2Z1	Project	4	50	50	**200**	-	**4**
		Total	**8**			**400**		**8**
		Grand total	**16**			**800**		**16**

Note:

CBCS - Choice Based Credit System
CIA - Continuous Internal Assessment
ESE - End of Semester Examinations

PBO4

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	75	(75+75) converted to 30	50
CIA II	75		
Problem based Assignment**		10	
Attendance		5	
Others*		5	
Practical			
CIA Practical		(50) converted to 30	50
Observation Notebook		15	
Attendance		5	
Project			
Review		45	50
Regularity		5	

***Class Participation, Case Studies Presentation, Field Work, Field Survey, Group Discussion, Term Paper, Workshop/Conference Participation. Presentation of Papers in Conferences, Quiz, Report/Content writing. Etc.**

****** Two Assignments to be given. (Each 5 marks)**

PBO5

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

(K1 - Remember; **K2 -** Understanding; **K3 -** Apply; **K4 -** Analyze; **K5 –** Evaluate)

1. Theory Examination: CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 20	A (Answer all)	20 x 1 = 20	MCQ -10/Fill ups-5/One word-5	75**
K2 – K5 Q21 to 28	B (5 out of 8)	5 x 5 = 25	Short Answers	
K2 - K5 Q29 to 33	C (3 out of 5)	3 x 10 = 30	Descriptive / Detailed	

****For ESE 75 marks converted to 50 marks**

2. Practical Examination:

Knowledge Level	Section	Marks	Total
K3	Experiments	45	50
K4	Record Work	05	
K5			

3. Project Viva Voce:

Knowledge Level	Section	Marks	Total
K3	Project Report	35	50
K4	Viva - voce	15	
K5			

21PBO101

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Paper: 1 -PLANT DIVERSITY - I				
Batch **2021-2022**	**Semester** **I**	**Hours / Week** **7**	**Total Hours** **105**	**Credits** **5**

COURSE OBJECTIVES

- To obtain knowledge on diverse groups of Thallophytes.
- To impart insight knowledge on the diversity, structural organization and reproduction of algae, fungi and lichens.
- To acquire knowledge on the life cycle patterns of Thallophytes and their significance.

COURSE OUTCOMES

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

K1	CO1	Grasp the basic concepts of lower life forms.
↑	CO2	Understand the diversity in habits, habitats and organization of various groups of lower plants.
	CO3	Explore knowledge on the modes of nutrition and fructifications in fungi
	CO4	Apply the inherit knowledge on the exploitation of useful products from lower forms for the betterment of human welfare.
↓ K5	CO5	Evaluate the structural organization and life cycle patterns of various lichens.

SYLLABUS

UNIT I **(21 HOURS)**

Algae: History, Details of habit, habitats and distribution of algae. Systems of classification in algae, Classification of algae by Fritsch (1945). General characters - thallus organization, algal pigments, reproduction and life cycle patterns in algae. Thallus organization, reproduction and life cycles of Cyanophyceae, Chlorophyceae and Xanthophyceae.

UNIT II **(21 HOURS)**

Thallus organization, reproduction and life cycle patterns of Bacillariophyceae, Phaeophyceae and Rhodophyceae. Recent insights of algal phylogeny and evolution. Ecological and economical aspects of algae. Algae as pollution indicators*. Algal blooms. Centers of algal research in India. Contribution of Indian Phycologists.

UNIT III **(21 HOURS)**

Fungi: History, General features, occurrence and distribution, fungal taxonomy, mode of nutrition, classification of fungi by Alexopoulos and Mims (1979). Range of thallus structures, reproduction and types of fructifications in fungi and types of spores . Thallus organization, reproduction and life cycle patterns of Myxomycetes and Oomycetes.

21PBO101

UNIT IV **(21 HOURS)**

Thallus organization, reproduction and life cycle patterns of Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. Homothallism and heterothallism. Fungi as symbionts- recent insights of fungal phylogeny and evolution. Ecological and economic importance of fungi.

UNITV **(21 HOURS)**

Lichens: Brief history of lichens. General features, distribution, classification and structural organization of thallus. Nature of dual organisms, Interrelationships of phycobionts and mycobionts in lichen thallus organization. Structure, reproduction and life cycle patterns of Ascolichen, Basidiolichen and Deuterolichens. Ecological and economic aspects of lichens. Lichens as pollution indicators.

*** Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Fritsch F.E. (1965). (Rep) Structure and reproduction of the Algae. Vol I & II Cambridge University Press.
2. Alexopoulos C.J. and C.W. Mims. (1952). Introductory Mycology. East Wiley Ltd. New Delhi.
3. Sharma, O.P. (1986). Text book of Fungi. Tata McGraw - Hill publishing Co. New Delhi.
4. Gangulee, Das & Kar - (2001). College Botany Vol. I & II. New central Book agency Pvt. Ltd. Calcutta.
5. V. Singh, P.C. Pandey and D.K. Jain. (2012). A Text book of Botany. Rastogi Publication. Meerut, India.

REFERENCES

1. Bessey, E.A. (1971). Morphology and Taxonomy of Fungi. Hafner Publication Company, New York.
2. Bilgrams, K.S. and R.N. Verma, (1978). Physiology of Fungi. Vikas Publishing House.
3. Deacon, J.W. (1984). Introduction to Mycology. Blackwell Science publication, Oxford.
4. Duke, H.C. (1983). Introduction to fungi. Vikas publishing house. New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	M
CO2	S	M	H	M	H
CO3	H	S	H	S	S
CO4	H	H	M	S	M
CO5	S	S	H	M	H

S - Strong **H** - High **M** - Medium **L** - Low

21PBO102

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Paper: 2 -PLANT DIVERSITY – II				
Batch 2021-2022	**Semester I**	**Hours / Week 7**	**Total Hours 105**	**Credits 5**

COURSE OBJECTIVES

- To impart insight knowledge on the structural organizations and life cycle patterns of Bryophytes, Pteridophytes and Gymnosperms.
- To understand the basic concepts of evolutionary trends in Cryptogams and Phanerogams.
- To learn the preserved vestiges of various plant life forms of geological past.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Gain knowledge on ecological and phylogenetical aspects of Bryophytes.
	CO2	Understand the general distribution and characters of Pteridophytes.
	CO3	Apply knowledge on vascular organization and evolution of Pteridophytes .
	CO4	Distinguish various diagnostic features and distribution of Gymnosperms.
	CO5	Analyze the acquired knowledge on diversity of plant species and apply to the field level.

SYLLABUS

UNIT 1 **(21 HOURS)**

Bryophytes: General features and distribution. Classification of Bryophytes (Smith, 1955). General characters of Hepaticopsida, Anthoceropsida and Bryopsida. Structure and evolution of gametophyte and sporophyte. Ecological and economic importance of Byrophytes*. Fossil Bryophytes.

UNIT II **(21 HOURS)**

Pteridophytes: General features and distribution of Pteridophytes. Classification of Pteridophytes by Sporne (1966). General characters of Psilotopsida, Lycopsida, Sphenopsida and Pteropsida.

UNIT III **(21 HOURS)**

Reproduction methods in Pteridophytes. Origin and evolution. Vascular organization and Stelar evolution in Pteridophytes. Heterospory and origin of seed habits. Evolution of sorus. Ecological and economic importance of Pteridophytes.

UNIT IV **(21 HOURS)**

Gymnosperms: General characters, distribution and origin of Gymnosperms. Classification of Gymnosperms by Coulter and Chamberlain (1956). General structure and inter-relationships of Pteridospermales, Bennettitales, Pentoxylales and Ginkgoales.

21PBO102

UNIT V **(21 HOURS)**

General structure and inter-relationships of Cycadales, Coniferales and Gnetales. Angiospermic characters of Gnetales. Phylogenetic trends and affinities of various classes. Ecological and economic importance of Gymnosperms. Distribution of living Gymnosperms in India.

*** Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Gangulee, Das & Kar. (2001. College Botany Vol I & II. New central Book agency Pvt. Ltd. Calcutta.
2. Pandey, B.P. (1990). (6^{th} Ed.). A Textbook of Botany Vol. II. S. Chand & Co. Ltd., New Delhi.
3. Vasistha, P.C. (1971). Botany for Degree students. S. Chand & Co. Ltd., New Delhi.

REFERENCES

1. Sporne, K. R. (1966). The morphology of Pteridophytes. Bal Bergen Boeken, London.
2. Sporne, K.R. (1967). The morphology of Gymnosperms. Bal Bergen Boeken, London.
3. Arnold, C.D. (1947). An introduction to Paleobotany. McGraw Hill Publications, New York.
4. Seward A.C. (1991). Fossil plants. Today and Tomorrow Publishers, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	H
CO2	H	S	H	H	M
CO3	S	H	M	S	S
CO4	H	M	H	H	M
CO5	S	S	H	H	M

S - Strong **H** - High **M** - Medium **L** - Low

21PBO103

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Paper: 3 –ANATOMY, EMBRYOLOGY OF ANGIOSPERMS AND MICROTECHNIQUES				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**I**	**6**	**90**	**4**

COURSE OBJECTIVES

- To understand the histochemical techniques involved in permanent micro slides.
- To acquire knowledge about complex vascular tissues.
- To obtain inherit knowledge on mega and macro sporangial development and their functions.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Recognize various histochemical techniques involved in anatomy and embryology.
	CO2	Understand phylogenetic relationship of vascular tissues.
	CO3	Explore the embryological features of plants
	CO4	Analyze the techniques of parthenocarpy and polyembryony for the improvement of economically important crop species..
	CO5	Determine knowledge on the principles and concepts of histochemical staining techniques

SYLLABUS

UNIT I **(18 HOURS)**

Introduction to complex tissue: xylem - tracheids and vessels. Properties of Wood Dendrochronology - sap wood and heart wood - arrangement of vessels in secondary xylem. Phloem structure and transfer cells. Differentiate between primary and secondary xylem and phloem. Compression wood and tension wood. Phylogenetic trends of xylem and phloem.

UNIT II **(18 HOURS)**

Normal secondary growth in dicot stem*. Vascular cambium - origin, types - storied and non storied cambium, cork cambium, wound healing activity. Anomalous secondary growth in dicot and monocot stem in *Aristolochia, Boerhaavia, Piper* and *Draceana*. Nodes - types and evolution. Kranz anatomy - anatomical features of CAM plants and leaf abscission.

UNIT III **(18 HOURS)**

Development of anther, types of tapetum, role of tapetum in pollen wall development, pollen wall morphogenesis, Pollen sterility, pollen-stigma compatibility, megasporogenesis, female gametophyte and nutrition of embryo sac.

UNIT IV **(18 HOURS)**

Fertilization, control of fertilization, development of dicot and monocot embryo. Endosperm development, types of endosperm, haustoria of endosperm. Apomixis. Polyembryony - types and causes. Seed formation, dormancy and germination. Experimental embryology (Embryo rescue and Anther culture) and Parthenocarpy.

21PBO103

UNIT V **(18 HOURS)**

Microtome – Types of microtome and knives - Fixing and killing of plant tissues – Chemical and physical fixative reagents - Methods of tissue processing – Dehydration, clearing and infiltration, embedding, sectioning - Histochemical staining techniques - single and double staining, mounting, labeling and storage of slides.

*** Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Bhojwani S. S. and Bhatnager S.P. (1997). The embryology of Angiosperms. Vikas Publishers House, Chennai.
2. Fahn, A. Plant Anotamy. (1985) Pergman press, London.

REFERENCES

1. Esau, K. (1991). Anatomy of seed plants. (7^{th} Ed.). Wely Eastern Ha, Chennai.
2. Eames A. J. and Mac Daniels. (1976). An introduction to plant Anatomy. Tata Mac Graw Hill, New Delhi.
3. Johri, B.M., K.B. Ambegaokar and P.S. Srivastava. (1992). Vol. I. Embryology of Angiosperms. Springer - Verlac, New York.
4. Maheswari, P. (2006). Introduction to embryology and Angiosperms. Tata Mac Graw Hill, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	M	H
CO2	H	H	S	S	H
CO3	M	H	H	M	S
CO4	H	S	H	S	M
CO5	S	H	H	S	H

S - Strong **H** - High **M** - Medium **L** - Low

21PBO1CL

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Practical: 1 - PLANT DIVERSITY- I & II, ANATOMY, EMBRYOLOGY OF ANGIOSPERMS AND MICROTECHNIQUES				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**I**	**4**	**60**	**2**

COURSE OBJECTIVES

- To understand the diversity and distribution of lower life forms.
- To obtain insight knowledge on variations in the internal structural organization among plants.
- To impart inherent knowledge on the basic techniques and modern concepts of microtome.

COURSE OUTCOMES

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

K3	CO1	Acquire and analyze interrelationships between various lower life forms
↕	CO2	Examine variations in structural organization and reproduction of Cryptogams and Phanerogams
	CO3	Understand the primary and secondary structure of plants.
	CO4	Analyze data on the types of fossils and distribution pattern of lower life forms in various eras
K5	CO5	Monitor the sequential changes in the internal structural organization of plants by sectioning through Microtechniques

I. PLANT DIVERSITY - I

Study of morphology, anatomy, vegetative and reproductive organs using clear whole mounts / sections of the following genera.

Algae

Cyanophyceae : *Spirulina, Lyngbya, Anabaena, Nostoc* and *Scytonema.*
Chlorophyceae : *Volvox, Ulothrix, Cladophora, Pithophora, Oedogonium, Codium, Caulerpa* and *Chara.*
Xanthophyceae : *Vaucheria*
Bacillariophyceae : *Diatoms*
Phaeophyceae : *Ectocarpus, Dictyota, Padina, Sargassum* and *Turbinaria*
Rhodophyceae : *Gelidium, Amphiroa, Gracilaria* and *Polysiphonia.*

Fungi

Myxomycetes : *Plasmodiophora.*
Oomycetes : *Albugo* and *Phytophthora.*
Zygomycetes : *Rhizopus.*
Ascomycetes : *Saccharomyces, Penicillium* and *Aspergillus.*
Basidiomycetes : *Agaricus* and *Puccinia.*
Deuteromycetes : *Colletotrichum* and *Cercospora.*

Lichens

Morphology of Crustose, Foliose and Fruticose Lichens. Structure and reproduction of *Usnea.*

21PBO1CL

II. PLANT DIVERSITY - II

Study of morphology, anatomy, vegetative and reproductive organs using clear whole mounts / sections of the following genera.

Bryophytes

Marchantiales	:	*Marchantia, Lunularia* and *Reboulia*
Jungermanniales	:	*Fossombronia* and *Pellia*
Anthocerotales	:	*Anthoceros*
Sphagnidae	:	*Sphagnum*
Bryidae	:	*Bryum* and *Funaria*

Pteridophytes

Psilotopsida	:	*Psilotum*
Lycopsia	:	*Lycopodium, Selaginella* and *Isoetes*
Sphenopsida	:	*Equisetum*
Pteropsida	:	*Ophioglossum, Pteris, Adiantum, Marsilea* and *Azolla.*

Gymnosperms: *Cycas, Pinus, Cupressus, Podocarpus, Araucaria, Ephedra* and *Gnetum.*

Fossils: *Rhynia, Asteroxylon, Sphenophyllum, Ankyropteris, Botryopteris, Lagenostoma, Heterangium, Pentoxylon, Medullosa, Cycadeoidea* and *Cordaites*.

Field trip

Three days field visit - Observations of species habits in their natural habitats and collection of specimens.

III. ANATOMY

- Identification using permanent slides / photographs
    i. Structure of tracheids and vessels
    ii. Types of wall thickening
    iii. Types of wood
    iv. Types of cambium
    v. Nodal anatomy
- Anomalous secondary thickening – Dicot – *Aristolochia, Boerhaavia, Piper betel* ; Monocot – *Dracaena.*

EMBRYOLOGY OF ANGIOSPERMS

With the help of permanent slides to study

1. Stages in development of microsporangium and male gametophyte.
2. Configurations of ovules, 2, 4 nucleate embryo sac, mature embryo sac.
3. Types of endosperm.
4. Stages in embryogeny 2 or 3 celled, globular, proembryos and mature embryos of dicot and monocots. Interpretation of embryological drawings.

MICROTECHNIQUES

- Rotary microtome
- Maceration
- Free hand sectioning and preparation of semipermanent slide (Submission of 5 slides for evaluation).
- Histochemical staining for starch, protein, lipid, polyphenol and tannin.

PBO14

21PBO1CL

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	H
CO2	H	S	H	H	S
CO3	H	M	S	H	M
CO4	S		M	H	S
CO5	S	H	S	S	H

S - Strong **H** - High **M** - Medium **L** - Low

PBO15

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

PG MODEL QUESTION PAPER (PRACTICALS)
End of Semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2021-22 onwards)

Time: 4 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 1- PLANT DIVERSITY- I & II, ANATOMY, EMBRYOLOGY OF ANGIOSPERMS AND MICROTECHNIQUES

I. Algal mixture	**- 06 Marks**
II. Micro preparation (5 × 3)	**- 15 Marks**
III. Histochemical staining	**- 04 Marks**
IV. Embryo mounting (2 × 1½)	**- 03 Marks**
V. Spot at sight (6 × 2)	**- 12 Marks**
Submission of permanent slides	**- 05 Marks**
Record	**- 05 Marks**
TOTAL	**- 50 Marks**

21PBO204

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Paper: 4 – BIOINFORMATICS				
Batch **2021-2022**	**Semester** **II**	**Hours / Week** **6**	**Total Hours** **90**	**Credits** **4**

COURSE OBJECTIVES

- To have the knowledge of bioinformatics in various fields.
- To understand the structure of biological databases and their utilities.
- To impart knowledge about various tools to manipulate the biological databases.

COURSE OUTCOME

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

K1	CO1	Grasp knowledge on various biological databases.
↑	CO2	Impart knowledge on gene and its expression both in prokaryotes and eukaryotes.
↕	CO3	Applying the technical skills to know the sequences of amino acids in protein molecules.
↕	CO4	Discover appropriate algorithms to identify the similarities and dissimilarities existing between the genes of various organisms.
K5 ↓	CO5	Evaluate evolutionary relationships between organisms and biomolecular visualization tools.

SYLLABUS

UNIT I **(18 HOURS)**

Introduction to Bioinformatics, Phytoinformatics, Central dogma of molecular biology. Gene structure and information content. Promoter sequences. Genetic code, open reading frames, introns and exons. Gene finding methods, tools and problems in gene finding.

UNIT II **(18 HOURS)**

Regulation of gene expression in prokaryotes and eukaryotes. Transcription factors. Classification of Biological Databases: Sequence, Structural databases, Specialized and Literature databases.

UNIT III **(18 HOURS)**

Protein structures: primary, secondary, tertiary and quaternary structures, domain, motifs and protein families. Protein prediction.

UNIT IV **(18 HOURS)**

Sequence - alignment - definition, types, local, global, pairwise and multiple sequence alignment. Scoring methods - matrices, PAM, BLOSUM and Gap Penalty, Dot plot, dynamic programming, sequence similarity search using BLAST and FASTA.

21PBO204

UNIT V **(18 HOURS)**

Recent trends in Bioinformatics. Biomolecular visualization, phylogenetic analysis and computer aided drug designing. Applications of Bioinformatics in various fields*.

*** Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Mani, K and N. Vijayaraj. (2002). Bioinformatics for beginners. Kalaikathir Achakam, Coimbatore.
2. Dan E. Krane and Michael L. Raymer. (2006). Fundamental concepts of bioinformatics. Dorling Kindersley (India) Pvt Ltd.

REFERENCES

1. Cold Spring Harbor. (2004). Bioinformatics - Sequence and Genome Analysis. (2nd Ed.) Laboratory Press,
2. Arthur M. Lesk. (2002). Introduction to Bioinformatics. Oxford University Press, UK.
3. David W. Mount. (2001). Bioinformatics-Sequence and Genome analysis. Cold Spring Harbor Laboratory Press.
4. D.R. Westhead, J.H. Parish and R.M. Twyman. (2003). Instant Notes in Bioinformatics.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	S	H
CO2	S	S	M	H	H
CO3	H	H	H	S	M
CO4	S	M	H	H	S
CO5	H	S	M	L	H

S - Strong **H** - High **M** - Medium **L** - Low

21PBO205

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Paper 5 - CELL BIOLOGY, GENETICS, PLANT BREEDING AND BIOSTATISTICS				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**6**	**90**	**5**

COURSE OBJECTIVES

- To learn about concept of genes and gene interactions.
- To study about the principles of Mendelian's and non-Mendelian's inheritances
- To assess the methods of plant breeding and crop improvement
- To learn the experimental designs using biostatistical tools

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Acquire knowledge on various fields of genetics
	CO2	Identify the sex linked disease among the population
	CO3	Implement knowledge on the concepts of mutation for the development of new plant varieties
	CO4	Describe various molecular breeding techniques for genetic improvement of the crops
	CO5	Evaluate appropriate biostatistical tools for designing any biological experiments

SYLLABUS

UNIT I **(18 HOURS)**

Structure and functions of cell organelles and nucleus*. Chromosome - Structure, Molecular organization of chromosome, Special type of chromosome - Lamp brush chromosome, Polytene chromosome and Super numerary chromosome, Chromosomal aberration - Numerical and Structural variations. Genes - Features of gene concept, molecular structure of gene, gene function. Genetic code - Salient features & Wobble hypothesis.

UNIT II **(18 HOURS)**

Mendelism - Basic principles, Gene Interaction, Quantitative inheritance, Sex determination: Mechanism (Genetical, Metabolical, Hormonal and Environmental sex determination), Sex linked inheritance - X linked, Y linked and XY linked, Sex influenced and sex limited characters, Cytoplasmic inheritance: Plastid inheritance, Cytoplasmic male sterility, Mitochondrial inheritance and Inheritance in haploid organisms.

UNIT III **(18 HOURS)**

Mutation : Detection of mutation - Lethal mutation and Visible mutation. Molecular basis of mutation, Physical and chemical mutagens. Biochemical genetics: Biochemical mutation in Bacteria and *Neurospora*. Population genetics: Gene pool, gene frequencies, Hardy-Weinburg law, Factors affecting gene frequencies - mutation, selection, migration, genetic drift. Chromosome mapping: Genetic mapping.

21PBO205

UNIT IV **(18 HOURS)**

Plant Breeding –Introduction, History, Major objectives- Principles - important achievements of plant breeding, self and cross pollinated crops - pure line selection and mass selection methods; Line breeding, pedigree, clonal selection. Incompatibility - male sterility. Mutation breeding - methods, limitation and crop improvement. Modern trends in plant breeding.

UNIT V **(18 HOURS)**

Biostatistics - Measures of central tendencies - Mean (only arithmetic), median and mode. Measures of deviation - mean deviation, variance, standard deviation, standard error and co-efficient of variation. Probability of distribution - Binomial, Poison and Normal distribution. Linear regression and correlation (Simple and multiple). Tests of statistical significance - Chi-square test and student t-test. Analysis of variance (ANOVA) - one way and two ways. Recent advances and applications of biostatistics.

*** Self study**

Teaching Methods

Smart Class Room/PowerPoint Presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Verma, P.S. and Agarwal, V. K. (1998). Cytology. (1st Ed.). S. Chand & Pvt.Ltd., New Delhi.
2. Veerbala Rastogi. (2004). A Text book of Genetics. Kedarnach & Ramnath, Meerut.
3. Singh, B.D. (2014). Plant Breeding Principles and Methods. (Reprtd.) Kalyani Publisher, New Delhi.
4. Gupta, S.P. (2001). Statistical Methods. Sultan Chand & Sons, Educational Publishers, New Delhi.

REFERENCES

1. De Robertis. (1975). Cell Biology. (6th Ed.) Saunders Philadelphia
2. Gardener, E.J. Peter Suns tad, D. (1975). (5th Ed.). Principles of Genetics. John Wiley & Sons Inc.
3. Strick Berger M.W. (1997). Genetics. (2nd Ed.) MacMillan, New York.
4. Gupta, P.K. (1985 - 91). Genetics. (2nd Ed.). Rastogi Publications.
5. Allard, R.W. (1960). Principles of Plant Breeding. John Wiley & Sons Inc.
6. Shukla R. S. and P. S. Chandel. (1996). Cytogenetics - Evolution and Plant Breeding. S. Chand & Pvt. Ltd. New Delhi.
7. Khan, I.D. and A. Khanum. (1994). Fundamentals of Biostatistics. Mc Graw Hill, New Delhi.
8. Vasantha Pattabhi & N. Gautham. (2004). Bistatistics. Narosa Publishing House, Chennai.

PBO20

21PBO205

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	M
CO2	S	M	H	H	S
CO3	H	S	H	M	H
CO4	H	H	S	S	H
CO5	M	S	S	H	M

S - Strong **H** - High **M** - Medium **L** - Low

21PBO206

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Paper: 6 - ECOLOGY, BIOENERGETICS AND NATURAL RESOURCE MANAGEMENT				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**6**	**90**	**5**

COURSE OBJECTIVES

- To understand the structural and functional organization of the ecosystems.
- To know the causes of environmental deterioration and possible measures for their rejuvenation.
- To understand the natural calamities and disaster management.

COURSE OUTCOMES

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

K1	CO1	Gain knowledge on community concepts and their ecological niches
↑	CO2	Understand the principles and process of biogeochemical cycling between organisms and the environment
	CO3	Apply concepts of energy flow and dispersion in various ecosystems
	CO4	Monitor environmental hazards and their control measures
↓	CO5	Evaluate the changes in biodiversity and their management approaches through remote sensing techniques
K5		

SYLLABUS

UNIT I **(18 HOURS)**

Population and Community Ecology - Ecology - concepts and applications, biotic community concepts, characteristics and structure of population, ecological variants, and methods of studying plant communities. Ecological niches, edge effect and ecotone.

UNIT II **(18 HOURS)**

Ecosystem Ecology - Structural and functional characteristics of ecosystem, major ecosystems of world, biogeochemical cycle - cycling and reservoir pool, gaseous (nitrogen and carbon) and sedimentary pattern (sulphur and phosphorous) of cycling. Nutrient cycling and agricultural patterns in tropical and temperate regions. Plant indicators of conditions, uses and processes.

UNIT III **(18 HOURS)**

Bioenergetics - Energy dispersion, law of thermodynamics, concept and energy flow models, productivity concept, turn over - primary production processes in C_4 and CAM plants, adaptations in C_4 plants for efficient primary production. Productivity in different ecosystems, measurement of primary production.

UNIT IV **(18 HOURS)**

Environmental Pollution and Education - Air, water, soil, noise and radiation pollution - causes and possible control measures*. Climate change. Global warming, green house effect, ozone depletion, Acid rain. Environmental education-principles, Environmental education programmes in India. Environmental organizations and agencies, Man and Biosphere (MAB) and National and International organizations.

21PBO206

UNIT V **(18 HOURS)**

Natural Resource Conservation and Management - Biodiversity - International and National scenarios, importance. Ecological principles and applications in conservation of biodiversity. *ex situ* and *in situ* conservation of species. Biosphere reserves, sanctuaries, national parks, world hot spots. Remote sensing- principle, tools, concepts and applications-mapping of forest cover. Soil conservation - erosion and control. Water standards, quality and management. Surface water and ground water development - BOD and COD - Water conservation and waste water reuse. Afforestation, deforestation and social forestry. Disaster Management - Bhopal tragedy, Tsunami, land Slide, Cyclone, Flood and Earth quake.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Sharma, P.D. (2000). Ecology and Environment. Rastogi Publications, Meerut.
2. Kumar, H.D. (1994). General Ecology. Vikas Publishing Co. New Delhi.

REFERENCES

1. Odum, E.P. (1971). Fundamentals of Ecology. N.B.Saunders Co. Ltd. Philadelphia.
2. Krebs.(1985). Ecology. C.J, Haper & Row, New York.
3. Ambasht, R.S.(1988). Text book of plant ecology. Lanka Publishers, Varanasi.
4. Misra, K.C. (1980). Manual of plant ecology. Oxford and IBH Publishing Co., New Delhi.
5. Alan Wellburm. (1988). Air pollution and acid rain - the biological impact. Longman Scientific and technical, Singapore.
6. Varshney, C.K. (1989). Water pollution and Management. S.P. Printers, Noida.
7. Weaver and Clements. (1929). Plant Ecology. Tata McGraw Hill Publishing Co. New Delhi.
8. Sinha, R.K. and Dalbir Singh. (1997). Global Biodiversity. INA Shree Publishers, Jaipur.
9. Biology of Fresh Water (1981). By Mason, C.F. Longman, London.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	S	H
CO2	H	S	H	H	M
CO3	H	S	M	H	S
CO4	S	M	H	S	H
CO5	M	S	M	S	H

S - Strong **H** - High **M** - Medium **L** - Low

21PBO2CM

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Practical 2 – BIOINFORMATICS				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**2**	**30**	**2**

COURSE OBJECTIVES

- To know the sequence of a gene using bioinformatic tools.
- To acquire knowledge on biological databases maintained by various institutes.
- To analyze the biological databases using computer softwares.
- To realize evolutionary relationships existing between the organisms.

COURSE OUTCOMES

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

K3	CO1	Apply detail knowledge on biological databases.
↕	CO2	Analyze genetic variations existing among organisms.
	CO3	Determine phylogenetic analysis among species diversity
	CO4	Application of various bioinformatic tools in research process
K5	CO5	Evaluate the quality of tools (algorithms) by analyzing same macromolecule using different tools.

LIST OF PRACTICALS

I. BIOINFORMATICS

1. Biological data retrieval from Nucleic acid databases - NCBI,EMBL & DDBJ.
2. Data retrieval from Protein database - PDB.
3. Use of literature database - PubMed.
4. Similarity search using BLASTs and FASTA.
5. 3-D Molecular visualization using RASMOL.
6. Multiple sequence alignment using Clustal Sigma.
7. Phylogenetic analysis using Clustal-X.
8. Prediction of locations of exon and intron structures using Genscan.
9. Protein secondary structure prediction using GOR IV.
10. Protein secondary structure prediction using SOPMA.

MAPPING

PSO / CO	**PSO1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	S	H	H	S	H
CO2	H	S	H	H	M
CO3	H	M	S	H	S
CO4	S	H	S	H	M
CO5	S	H	H	S	H

S - Strong **H** - High **M** - Medium **L** - Low

21PBO2CM

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

PG MODEL QUESTION PAPER (PRACTICALS)
End of Semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2021-22 onwards)

Time: 4 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 3 - BIOINFORMATICS

I. Writing Algorithms for A, B, C & D (11 + 11 + 07 + 07)	**- 36 Marks**
II. Results and Viva-voce for A, B, C & D (03 + 02+ 02 + 02)	**- 09 Marks**
Record	**- 05 Marks**
TOTAL	**- 50 Marks**

21PBO2CN

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Practical: 3 – CELL BIOLOGY, GENETICS, PLANT BREEDING AND BIOSTATISTICS, ECOLOGY, BIOENERGETICS AND NATURAL RESOURCE MANAGEMENT				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**4**	**60**	**2**

COURSE OBJECTIVES

- To acquire knowledge about cellular inclusions and their functions
- To understand genetic analysis at gene, genome and population level
- To learn the experimental designs using biostatistical tools.
- To find out the dominant species in the particular environment.
- To understand the structural and functional organization of an ecosystem.

COURSE OUTCOMES

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

K3 ↕ K5	CO1	Examine various cellular inclusions and their functions
	CO2	Apply the basic principles of genetics and plant breeding for genetic improvement of plants.
	CO3	Design experimental methods using the statistical knowledge.
	CO4	Analyze the physico-chemical nature of the soil.
	CO5	Determine the distribution of vegetation using quantitative ecological characters.

I. CELL BIOLOGY, GENETICS AND PLANT BREEDING

1. Ultra structure of cell organelles, nucleus, chromosome and its special types (electron microscopic photographs).
2. Study of mitosis and meiosis with different materials.
3. Simple problem in genetics - monohybrid cross, Dihybrid cross, Interaction of genes, Sex-determination, Sex-linked inheritance, Gene mapping.
4. Training in hybridization techniques using potted plants.

II . BIOSTATISTICS

1. Analysis of data to find the mean, median and mode.
2. Analysis of a given data for mean deviation variances, standard deviation and standard error.
3. Analysis of a set of data for correlation / regression.
4. Test the significance of a given data using Chi-square test, t-test and ANOVA.

21PBO2CM

III. ECOLOGY, BIOENERGETICS AND NATURAL RESOURCE MANAGEMENT

1. To determine the quantitative characters in the community by using quadrat methods.
   a) Frequency b) Abundance c) Density d) Basal cover e) IVI.
2. Synthetic characters: Similarity index, FICC, dominance index, diversity index.
3. Raunkiaer's life form classes and percentage distribution of species in vegetation.
4. Stratification, Zonation.
5. Soil analysis - Physical - bulk density, water-holding capacity, soil moisture. Chemical - nitrate and carbonate.
6. Mapping of tree species in vegetations.
7. Field visit - Report preparation on vegetation types, conservation measures undertaken in biosphere reserves/ national parks/ sanctuaries etc.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	H	S	H
CO2	H	S	M	H	S
CO3	H	M	S	H	M
CO4	S	H	S	S	H
CO5	H	S	H	H	S

S - Strong **H** - High **M** - Medium **L** - Low

PBO27

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

PG MODEL QUESTION PAPER (PRACTICALS)
End of Semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2021-22 onwards)

Time: 4 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 2 –CELL BIOLOGY, GENETICS, PLANT BREEDING, BIOSTATISTICS ECOLOGY, BIOENERGETICS AND NATURAL RESOURCES MANAGEMENT

I. Any two stages of Mitosis (2 × 2)	**- 04 Marks**
II. Genetics problems of (3 × 4)	**- 12 Marks**
III. Biostatistics problem of (1 × 4)	**- 04 Marks**
IV. Ecology Experiment	**- 10 Marks**
V. Spot at sight (5 × 3)	**- 15 Marks**
Record	**- 05 Marks**
TOTAL	**- 50 Marks**

21PBO307

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Paper 7 - TAXONOMY AND BIOSYSTEMATICS				
Batch **2021-2022**	**Semester** **III**	**Hours / Week** **6**	**Total Hours** **90**	**Credits** **5**

COURSE OBJECTIVES

- To study about the classification and nomenclature of Angiosperms.
- To understand the theory and practices involved in plant systematics.
- To learn the striking affinities of different plant families.

COURSE OUTCOMES

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

K1 ↑	CO1	Acquire knowledge on principles and objectives of ICN and APG
	CO2	Differentiate various systems of classifications based on natural and phylogenetic characters of flowering plants
	CO3	Explore proficiency skills using keys for identification of any unknown plant species
	CO4	Able to apply basics of biosystematics in various fields of plant sciences
↓ K5	CO5	Evaluate modern advances of taxonomical tools for plant identification

SYLLABUS

UNIT I **(18 HOURS)**

Historical account of the classification of angiosperms up to the present day. Systems of classification- Detailed study of Bentham and Hooker (1862-1883), Bessey (1915), Hutchinson (1954-1960), Cronquist (1981) and APG IV (2016) - merits and demerits. ICN- history, principles, typification, principles of priority and their limitations, Herbarium and its potential role in teaching and research, effective and valid publication, author citation, retention, choice and rejection of names, names of hybrids.

UNIT II **(18 HOURS)**

Computer aided taxonomy (TROPICOS, IPNI, The Plant List - 2010). Taxonomic tools - flora, monograph, icons and journals. Keys - dichotomous keys and their uses. Botanic gardens. Sources of taxonomic information- embryology, cytology, chemotaxonomy. RET species-India, Tamil Nadu and IUCN criteria, 2012.

UNIT III **(18 HOURS)**

Description and economic importance of the following families - Menispermaceae, Polygalaceae, Caryophyllaceae, Portulacaceae, Oxalidaceae, Tiliaceae, Meliaceae, Vitaceae, Rhamnaceae, Sapindaceae, Rosaceae, Combretaceae, Onagraceae, Lythraceae and Aizoaceae.

UNIT IV **(18 HOURS)**

Description and economic importance of the following families - Oleaceae, Gentianaceae, Convolvulaceae, Boraginaceae, Bignoniaceae, Pedaliaceae, Nyctaginaceae, Aristolochiaceae, Loranthaceae, Orchidaceae, Dioscoreaceae, Commelinaceae, Araceae and Cyperaceae.

21PBO307

UNIT V **(18 HOURS)**

Biosystematics- aim and scope. Biosystematics categories. Phenotypic plasticity. Turreson's work. Population concept, speciation. Species and genus concept. Numerical taxonomy, molecular taxonomy. Evolutionary relationship among angiosperm taxa*.

*** Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Subramaniam, N.S. (1997). Modern plant taxonomy. Vikas Publishing House, New Delhi.
2. Sharma, O.P. (1986). Plant taxonomy -Rastogi Publications, New Delhi.
3. Sivarajan, V.V. (1986). Introduction to principles of plant taxonomy. Oxford & IBH Pvt. Company.

REFERENCES

1. Lawrence, H.M. (1951). Taxonomy of vascular plants. Macmillan & Co.
2. Bennet, S.S.R. (1986). An introduction to plant nomenclature. International Book Distribution India.
3. Henry, A.N. and Chandra Bose. (1982). An aid to the International code of Botanical nomenclature. BSI, Calcutta.
4. Jain, S.K. and R.R. Rao. (1977). A hand book of field and herbarium methods. Today & Tomorrow Pvt. Ltd.
5. Pandey, B.P. (1997). Taxonomy of angiosperms. Chand & Co. Ltd., New Delhi.
6. Vasudevan Nair, R. (1997). Taxonomy of angiosperms. APH Publishing Corporation, New Delhi.
7. Sokal, S.R. & P.H. Sneath. (1973). Principles of numerical taxonomy. N.H. Freemen and Co.
8. Gurcharan Singh. (2004). Plant systematic - theory and practices. Oxford and IBH Publishers, New Delhi.
9. Naik, V.N. (1984). Taxonomy of Angiosperms. TATA Mc Graw Hill, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	S
CO2	H	S	H	M	S
CO3	S	S	M	H	H
CO4	S	H	H	H	M
CO5	S	H	M	H	S

S - Strong **H** - High **M** - Medium **L** - Low

21PBO308

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Paper: 8 - MICROBIOLOGY AND PLANT PATHOLOGY				
Batch **2021-2022**	**Semester** **III**	**Hours / Week** **6**	**Total Hours** **90**	**Credits** **5**

COURSE OBJECTIVES

- To disseminate knowledge on pathogenic group of organisms.
- To gain knowledge on disease management.
- To analyze the quality of water.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Recognize evolutionary relationships of microorganisms through various classifications.
	CO2	Understand the techniques of isolation and culture of microorganisms.
	CO3	Apply recent technologies and methods for cultivation of microorganisms.
	CO4	Acquire knowledge on various plant diseases and their control measures
	CO5	Implement the plant disease management techniques in the fields.

SYLLABUS

UNIT I **(18 HOURS)**

Introduction to microbiology: Historical account, Scope of microbiology, major groups and classification - five kingdom concept and three domain system. Prokaryotic and eukaryotic organisms. Bacteria: morphology, classification (Bergey's manual), ultrastructure, chemical composition of cell wall. Bacterial reproduction - conjugation, transformation and transduction. Culture methods - pour plate, spread plate, streak plate and stab inoculation. Bacterial growth curve.

UNIT II **(18 HOURS)**

Classification of plant viruses (outline only). General morphology and symmetrical structures of viruses. Morphology of Bacteriophages (T - types). Ultrastructure of TMV and HIV. Viral replication - lytic and lysogenic cycles in T- even phages. Isolation and purification of viruses.

UNIT III **(18 HOURS)**

Fermentation: Aerobic and Anaerobic fermentation*. Industrial production of Antibiotics - penicillin; Enzyme - amylase, Organic acid - lactic acid, Biofuel - ethanol. Biopolymer - PHB; Microbial cell - Baker's yeast. Waste water treatment, detection of coliform bacteria - membrane filtration technique, multiple tube fermentation test. Milk microbiology - chemical composition of milk, microbes in milk.

21PBO308

UNIT IV **(18 HOURS)**

Plant Pathology: History of Plant Pathology - Effect of pathogens on plants physiological functions. Classification and factors responsible for plant diseases, concepts in epidemiology - Koch's postulates - host parasite interactions, structural, physiological and biochemical defense mechanism in hosts, dissemination of diseases - integrated disease management.

UNIT V **(18 HOURS)**

Common plant diseases of India - symptoms, causal organisms and control measures of Red rust of Tea, Red Rot of Sugarcane, Late blight of Potato, Powdery mildew of Grapes, Black rust of Wheat, Bacterial Blight disease of Paddy, Bunchy top of Banana - general principles of plant quarantine - sanitary and phytosanitary issues - genetic basis of disease resistance and pathogenicity - Protection of Plant Varieties (PPV) - genetically modified varieties.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Michael J. Pelczar, E.C.S. Chan and Noel R. Krieg (2008). 'Microbiology' 5th edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
2. Dubey, R.C. and D.K. Maheshari (2005). A Text Book of Microbiology' S. Chand and Company Limited, New Delhi.
3. Prescott, L.M., Harley, J.P. and Klien, D.A. (1996). Microbiology (3rd ed.), Brown W.C. Publishers, Boston, USA.
4. Bilgrami, K.S. and Dube, H.C. (1990). A text book of modern plant pathology, Vikas Publishing House Pvt. Ltd., New Delhi.
5. Mehrota, R.S. (1994). Plant Pathology, Tata Mc. Graw Hill Publishing Co. Ltd., New Delhi.

REFERENCES

1. Sullia, S.B. and Shantharam, S. (1998). General Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Jay, J.M. (1983). Modern Food Microbiology, CBS Publishers, New Delhi.
3. Reed, G. (1983). Prescott & Dunn's Industrial Microbiology (4th ed.), AVI publishing Co., Connecticut, USA.
4. Schegel, H.B. (1986). General Microbiology (6th ed.), Cambridge University Press, UK.
5. Singh, R.S. (1990). Plant diseases (6th ed.) Oxford and IBH, New Delhi.

PBO32

21PBO308

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	L	S	H
CO2	H	H	S	M	S
CO3	H	M	H	H	M
CO4	S	H	M	H	H
CO5	H	M	S	H	H

S - Strong **H** - High **M** - Medium **L** - Low

21PBO309

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Paper : 9 – BIOTECHNOLOGY AND NANOBIOLOGY				
Batch 2021-2022	**Semester III**	**Hours / Week 6**	**Total Hours 90**	**Credits 5**

COURSE OBJECTIVES

- To know the principles and applications of Plant tissue culture
- To learn and familiarize the plant genetic transformation and its application
- To learn the basic knowledge of Nanobiology

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Acquire knowledge on various developments and potential applications of tissue culture
	CO2	Understand the basic techniques of gene manipulation and their rapid applications in the field of plant tissue culture and genetic engineering
	CO3	Exploit nanotechnological tools to create new biomedical research tools, diagnostic tests and drug delivery systems
	CO4	Apply the concept of nanotechnology for achieving major task using the nanoparticles
	CO5	Evaluate the applications of both biotechnology and nanobiology

SYLLABUS

UNIT I **(18 HOURS)**

Plant tissue culture: History, organization of tissue culture laboratory, sterilization methods, types and chemical composition of media and preparation, Micropropagation, Callus Culture, Cell culture, Protoplast culture-Isolation and fusion, Embryo culture, Somatic embryogenesis and Synthetic seeds preparation. *In vitro* secondary metabolite production - cell immobilization, bioreactors. Cryopreservation and DNA banking for germplasm conservation. Applications of plant tissue culture*.

UNIT II **(18 HOURS)**

Introduction to classical and modern biotechnology - scope and importance. Genetic engineering : Gene cloning, isolation of genes, sequencing of genes, synthesis of genes. Reporter genes-β-glucuronidase (GUS) and Green fluorescent protein (GFP), Selectable marker genes- *NPT*II, *HPT*, *BAR*. Binary vector system and construction. Gene transfer methods in plants - *Agrobacterium* mediated and Biolistic gun method, Ethical and societal issues in biotechnology - GM food and bioterrorism.

UNIT III **(18 HOURS)**

Molecular probing - radiolabelled probes and non-radioactive probes, Western blotting and ELISA techniques. Monoclonal antibodies, Biotechnology in paper industry, biohydro-metallurgy, biomineralization and bioinoculants.

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UNIT IV **(18 HOURS)**

Definition - Historical aspects, classification of nanomaterials, General properties of nanoparticles, types of nanoparticles - metallic, semiconductors and polymeric types, carbon nanotubes, buckyballs, methods of synthesis of nanoparticles-top down and bottom up approach, Nanoparticle size analyzer-Dynamic light scattering (DLS), Principle, working mechanism and applications –TEM, SEM, AFM and X-ray diffraction (XRD).

UNIT V **(18 HOURS)**

Application of nanoscience and nanotechnology in agriculture, nanofoods, nanotherapeutics, environmental applications, fuel energy resources. Biosensors and biochips.

***Self study**

Teaching Methods

PowerPoint presentation/Quiz/Discussion/Assignment

TEXTBOOKS

1. Gupta, P.K. (1998). Biotechnology and Genetics. Rastogi Publications, Meerut.
2. Gregory, L. Timp. (1998). Nanotechnology (1st Ed.). American Institute of Physics.
3. Bharat Bhusan. (2006). Hand Book of Nanotechnology. (1st Ed.).Springer.
4. Madhuri Sharon (2011). Bio-Nanotechnology: Concepts and Applications. CRC Press. Taylor & Francis Group
5. Subbaiah Balaji (2013). Nanobiotechnology. MjP Publishers, India.
6. Kalyan Kumae De (2020). Plant Tissue Culture. New Central Book Agency (NCBA), Kolkata, West Bengal.
7. R.C. Dubey (2014). A Text book of Biotechnology. S Chand & Company P. Ltd, New Delhi.
8. V. Kumaresan (2015). Biotechnology. Saras Publication, Nagercoil, Tamil Nadu.

REFERENCES

1. Kartha, K.K. (1985). Cryopreservation of plant cells and organs. CRC Press Boca Raton, Florida, USA.
2. Ignachimuthu, S. (1995). Basic Biotechnology. Tata Mc Graw-Hill Publishing Company Ltd., Madras.
3. Callow, J.A., Ford Lloyd, B.V. and Newbury, H.J. (1997). Biotechnology and Plant Genetics Resources: Conservation and Use. CAB International, Oxon, UK.
4. Gupta, P.K. (1998). Elements of Biotechnology. Rastogi Publications.
5. Santharam, S. and J.F. Montgomery (1999). Biotechnology, Biosafety and Biodiversity. Oxford and IBH Publishing Co. New Delhi.
6. Meyyan, R.P. and V. Kumaresan. (2004). Genetics and Biotechnology. Saras Publication, Nagercoil.
7. S.B. Primrose and R.M. Twyman (2006). Principles of Gene Manipulation and Genomics. Blackwell Publishing, New Jersey, USA.

PBO35

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	S
CO2	S	S	H	S	M
CO3	H	M	S	H	H
CO4	H	H	S	M	S
CO5	H	S	S	S	M

S - Strong **H** - High **M** - Medium **L** - Low

21PBO3CO

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Practical: 4 – TAXONOMY AND BIOSYSTEMATICS, MICROBIOLOGY AND PLANT PATHOLOGY, BIOTECHNOLOGY AND NANOBIOLOGY				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**III**	**4**	**60**	**2**

COURSE OBJECTIVES

- To identify selected taxa using taxonomic keys.
- To understand the pathogenic organisms causing various diseases.
- To learn the basic techniques of biotechnology and nanobiology

COURSE OUTCOMES

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

K3	CO1	Acquire knowledge on identification of plants using taxonomic keys
↑	CO2	Analyze techniques used for cultivation of microorganisms
↕	CO3	Explore knowledge on disease causing microorganisms and their control measures
↕	CO4	Gain the hands-on exposure on plant cell and tissue culture and molecular technique
↓ K5	CO5	Demonstrate inherent knowledge on nanotechnological tools and their varied applications

I. TAXONOMY AND BIOSYSTEMATICS

1. Identification of plant specimens with reference to their families prescribed in the syllabus following Bentham & Hookers system of classification
2. Identification of economically important products with reference to their plant name and family
3. Technical description of plant parts, including floral parts L.S. of flower, floral diagram and floral formula with reference to the families mentioned in the theory
4. Field visit to nearby floristic regions for the study of flora
5. Submission of 50 herbarium sheets (relevant to syllabi) with field notes for internal and external valuation

II. MICROBIOLOGY AND PLANT PATHOLOGY

1. Culture of microbes using serial dilution and pure culture techniques.
2. Isolation of microbes by pour plate, spread plate and streak plate methods.
3. Hydrogen sulphide test.
4. Methylene blue reductase test for milk.
5. Mobility by Hanging drop method.
6. Isolation of Acetobacter from soil.
7. Lab level production of wine.
8. Differential staining of bacteria using Gram stain.
9. Antimicrobial assay - disc - diffusion / agar well method.
10. Book photographs/diagrams: morphology - bacteria, viruses, media, serial dilution methods and any tools used in microbiology.
11. Books / Photographs/ diagrams of plant diseases mentioned in theory

21PBO3CO

III. BIOTECHNOLOGY AND NANOBIOLOGY

1. MS medium preparation
2. Micropropagation-Nodal culture
3. Callus culture
4. Synthetic seed preparation
5. Plant genomic DNA isolation
6. Agarose Gel Electrophoresis
7. Polymerase Chain Reaction (PCR) programming
8. Carbon nanotubes (Demo)
9. Buckyballs (Demo)
10. Electron microscope (Demo)

MAPPING

CO \ PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	H
CO2	H	S	M	H	H
CO3	S	M	H	H	M
CO4	S	H	S	H	S
CO5	S	H	M	S	M

S - Strong **H** - High **M** - Medium **L** – Low

PBO38

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

PG MODEL QUESTION PAPER (PRACTICALS)
End of Semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2021-22 onwards)

Time: 4 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 4 – TAXONOMY AND BIOSYSTEMATICS, MICROBIOLOGY, PLANT PATHOLOGY, BIOTECHNOLOGY AND NANOBIOLOGY

I. Specimen identification (2 × 2)	**- 04Marks**
II. Identification of the family (4 × 2)	**- 08 Marks**
III. Find out the binomial and family (2 × 3)	**- 06 Marks**
IV. Microbiology Experiment	**- 06 Marks**
V. Biotechnology experiment	**- 06 Marks**
V. Spotters (5 ×2)	**- 10 Marks**
V. Herbarium	**- 05 Marks**
Record	**- 05 Marks**
TOTAL	**- 50 Marks**

21PBO410

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Paper: 10 – BIOPHYSICS, BIOCHEMISTRY AND BIOINSTRUMENTATION				
Batch 2021-2022	**Semester IV**	**Hours / Week 7**	**Total Hours 105**	**Credits 5**

COURSE OBJECTIVES

- To know the biological importance of the macromolecules
- To learn about the hormones and vitamins and their roles
- To know the principles and operational techniques of bioinstruments
- To understand the role of electrons in absorption of light and To impart knowledge on bioenergetics of living organisms

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Acquire knowledge on properties and nature of macromolecules.
	CO2	Understand the importance of enzymes and immunological techniques.
	CO3	Apply current biochemical and molecular techniques to plan and carry out their experiments.
	CO4	Study and analyze various biological samples
	CO5	Value the instruments in biochemical studies

SYLLABUS

UNIT I **(21 HOURS)**

Electromagnetic radiation - Nature, absorption, absorption spectrum and action spectrum, law of absorption, interaction with matter, role of electrons in absorption of light, electron multiplicity. Excitation, de-excitation and path of de-excited electrons. Bioluminescence, Fluorescence and Phosphorescence. **Bioenergetics** - Energy and work, laws of Thermodynamics. Energy transductions in biological systems - Redox couple, redox potential, ATP bioenergetics, NADP/NAPH redox couple, mitochondrial bioenergetics and chloroplast bioenergetics.

UNIT II **(21 HOURS)**

Carbohydrates: Introduction to carbohydrates – classification and properties - monosaccharides, oligosaccharides and polysaccharides. Linear/ open chain and ring forms of monosaccharides. Isomerism, structural and functional polysaccharides. Biosynthesis of carbohydrate and their regulation. **Lipids:** Classification and properties - simple, complex and derived lipids - fatty acids - types - nomenclature - isomerism - Biosynthesis of fatty acids, fatty acid oxidation (α and β - oxidation)

UNIT III **(21 HOURS)**

Aminoacids: General structure - optical isomerism - classification (based on side chain and polarity) - properties - nonprotein aminoacids- Biosynthesis of aminoacids. **Proteins:** Introduction - structure and configuration of proteins - different bonding systems - classification of proteins based on chemical nature and solubility - properties - denaturation. **Nucleic acids**: Nitrogenous bases- purine and pyrimidine biosynthesis, DNA and RNA-structure and types. Biosynthesis of nucleotides

21PBO410

UNIT IV **(21 HOURS)**

Enzymes: Introduction to enzymes – classification, chemical nature and properties, theories of enzyme action, enzyme inhibitors and factors affecting enzyme activity, Michael - Menton's constant, coenzyme - FAD, NAD **Vitamins:** Classification - chemical structure and biochemical properties of vitamins A, D, E and K and B complex.

UNIT V **(21 HOURS)**

Bioinstrumentation: Photometry- Beer and Lambert's law, Colorimeter, UV - visible spectrophotometer, Atomic absorption spectrometer. Centrifuge - types and their applications*. Chromatography - TLC, HPTLC, column, ion exchange and molecular exclusion chromatography, GLC and HPLC and Lyophilizer.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Daniel, M. (1989). Basic Biophysics for Biologists, Agro-Botanical Publishers, Bikaner, India.
2. Srivastava, H.S. (1999). Elements of Biochemistry. Rastogi publications, Meerut.
3. Asokan, P. (2002). Analytical Biochemistry (Biochemical Techniques). Chinna Publications, Chennai.
4. Palanisamy, S. (2008). Principles of biophysics, Palani Paramount Publications
5. Thiraviyaraj, S. (2009). Biophysics. Saras Publications, Nagercoil, Tamilnadu.
6. Janin, K.L. Sunjay Jain and Nitin Jain, (2009). Fundamentals of Biochemistry, S.Chand and Company Ltd, New Delhi.
7. Veerakumari, L. (2015).Bioinstrumentation. MJP Publishers, Chennai-600005, Tamilnadu, India

REFERENCES

1. Albert L. Lehninger (1984). Principles of Biochemistry. ICAR, Delhi.
2. Weel, J.H. (1990). General Biochemistry. Wiley Eastern Ltd.
3. Zubay, (1995). Biochemistry, Brown Publishers.
4. Voet & Voet, (2000). Fundamentals of Biochemistry, John Wiley, New York.
5. Wilson, K. and Walker, J. (2000). Principles and Techniques of Practical Biochemistry, 5th edition, Cambridge University Press, Cambridge.
6. L. Stryer, (2002). Biochemistry,W.H. Freeman.
7. Satyanarayana, V. (2005). Essentials of Biochemistry. Arunabha Sen & Allied Pvt., Ltd
8. Narayanan, P. (2007). Essentials of Biophysics. Second Edition. New Age International Publishers.

PBO41

21PBO410

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	M	S	S	M
CO2	L	H	M	H	H
CO3	S	H	S	M	S
CO4	S	M	M	S	L
CO5	S	H	M	S	H

S - Strong **H** - High **M** - Medium **L** – Low

21PBO411

Programme Code: 05		**Title: M.Sc., BOTANY**		
Core Paper: 11 - PLANT PHYSIOLOGY				
Batch **2021-2022**	**Semester** **IV**	**Hours / Week** **7**	**Total Hours** **105**	**Credits** **5**

COURSE OBJECTIVES

- To study the basic physiological functions of plants.
- To learn about the metabolic pathways in plants.
- To understand the importance of phytohormones in the growth of plants.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Acquire knowledge on plant - water relations in a plant cell
	CO2	Understand the significance of metabolic pathways in plants.
	CO3	Acquire knowledge in terms of pathways of photosynthesis, respiration and nitrogen metabolism in higher plants
	CO4	Assess stress resistance mechanism for the better yield of crops.
	CO5	Apply acquired knowledge on phytohormones and their applications in fruit ripening process.

SYLLABUS

UNIT I **(21 HOURS)**

Water relations - Structure and properties of water. Water transport - diffusion, Osmosis and Imbibition, water potential. Absorption of water, Active and Passive absorption. Water relations of plants – Structure and Physicochemical properties of water, soil and plant atmosphere, stomatal physiology and regulation.

UNIT II **(21 HOURS)**

Transpiration - types, mechanism and factors affecting transpiration. Ascent of sap* - Theories, Mechanism and Factors influencing on ascent of sap. Mineral salt absorption - Mechanism and Types. Translocation of organic solutes - Mechanism, Phloem loading and unloading and Factors affecting translocation.

UNIT III **(21 HOURS)**

Mechanism of photosynthesis - Light reaction, Carbon fixation in C_3 & C_4 plants. Outline of CAM pathway. Photorespiration, Respiration, Glycolysis, Krebs cycle & Pentose phosphate pathway, ATPase and Mechanism of ATP synthesis. Biological Nitrogen Fixation - Symbiotic & Non-Symbiotic.

UNIT IV **(21 HOURS)**

Stress physiology - Classification of stress - abiotic and biotic stress factors. Stress effects - morphological, biochemical, physiological changes, associated with stress due to heat, water, salinity and metal. Stress resistance and mechanism.

21PBO411

UNIT V **(21 HOURS)**

Phytohormones - Fruit ripening - Introduction, Climacteric and non-climacteric fruits, Role of ethylene in fruit ripening, symptoms of fruit ripening. Environmental control of fruit ripening. Circadian rhythms-Biological clock. Plant movements-nastic and Tropic movements, Photomorphogenesis - Phytochrome and Cryptochrome response in plants.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. V. K. Jain. (1999). Fundamentals of Plant Physiology. S. Chand and Company Ltd, New Delhi.
2. Verma, V. (2001). Plant physiology. Emkay Publication, New Delhi.

REFERENCES

1. Devlein, R.E. (1986). Plant Physiology. CBS Publishers and Distributors, New Delhi.
2. Srivastava, H.S. & N. Shankar. (2005). Plant physiology & Biochemistry. Rastogi publications, Meerut.
3. Ray Noggle, G. and George J. Fritz. (2002). Introductory plant Physiology. Prentice Hall of India, Pvt., Ltd., New Delhi.
4. Hess, D. (1975). Plant Physiology. Narosa Publishing house, New Delhi.
5. Hewilt, E.J. and Cutting, C.V. (1979). Nitrogen Metabolism in Plants. Academic Press London.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	L
CO2	H	M	H	H	H
CO3	S	M	H	S	S
CO4	S	S	S	H	M
CO5	S	S	M	H	M

S - Strong **H** - High **M** - Medium **L** – Low

21PBO4CP

Programme Code: 05	**Title: M.Sc., BOTANY**			
Core Practical : 5 - BIOPHYSICS, BIOCHEMISTRY AND BIOINSTRUMENTATION & PLANT PHYSIOLOGY				
Batch 2021-2022	**Semester IV**	**Hours / Week 4**	**Total Hours 60**	**Credits 2**

COURSE OBJECTIVES

- To quantify the biochemical contents present in a given plant sample.
- To utilize the applications of instruments for biochemical studies.
- To obtain knowledge on physiological functions of the plants.

COURSE OUTCOMES

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

K3 ↕ K5	CO1	Provide knowledge on the concepts and principles of radioactive emissions
	CO2	Apply principles and procedures for the estimation of macromolecules in plant samples.
	CO3	Able to utilize protocols for research process
	CO4	Handle instruments for biophysics and biochemical practicals
	CO5	Study the physiological process of plants

LIST OF PRACTICALS

BIOPHYSICS

1. Nature of EMR and Spectrum (Demo)
2. Path of de-excitation - Fluorescence, Phosphorescence, Radiationless transition and Delayed light emission (Demo)
3. Radioactive emission (alpha, beta & gamma), Autoradiography, Geiger-Muller counter and Scintillation counter(Demo)

BIOCHEMISTRY

1. Preparation of phosphate & citrate buffers
2. Estimation of carbohydrates, proteins, amino acids & lipids
3. Preparation of molal, molar, normal and percentage solutions
4. Estimation of Vitamin C
5. Estimation of DNA and RNA
6. Total RNA isolation

BIOINSTRUMENTATION

1. Haemocytometer
2. pH meter
3. UV - visible spectrophotometer
4. Centrifuge
5. Lyophilizer (Demo)
6. HPLC (Demo)

21PBO4CP

PLANT PHYSIOLOGY

1. Measurement of stomatal index and frequency.
2. Measurement of membrane permeability as affected by pH, chemicals and temperature.
3. Separation of photosynthetic pigments by TLC.
4. Estimation of chlorophyll pigments.
5. Measurement of Hill reaction in the chloroplast suspension.
6. Measurement of the rate of photosynthesis under varying condition of CO_2 concentration.
7. Rate of respiration in flower buds/germinated seeds using simple respiroscope.
8. Determine the rate of transpiration using Ganong's potometer.
9. Determination of water absorption and transpiration ratio.
10. Nitrogen fixation through nodule formation in leguminous plants.
11. Solution culture.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	S
CO2	S	M	H	S	H
CO3	H	H	M	H	H
CO4	H	S	S	M	S
CO5	S	H	M	S	S

S - Strong **H** - High **M** - Medium **L** - Low

21PBO4CP

KONGUNADU ARTS AND SCIENCE COLLEGE (Autonomous)
COIMBATORE - 641 029

PG MODEL QUESTION PAPER (PRACTICALS)
End of Semester Examination Question Paper Pattern
(For the candidates admitted from the academic year 2021-22 onwards)

Time: 4 Hours **Max. Marks: 50 Marks**

BREAK UP OF MARKS

Core Practical: 4 - BIOCHEMISTRY, BIOINSTRUMENTATION AND BIOPHYSICS PLANT PHYSIOLOGY AND HORTICULTURE

I. Explain the principle of Biophysics- D	**- 05 Marks**
II. Biochemistry experiment - B	**- 10 Marks**
III. Bioinstrumentation experiment- C	**- 10 Marks**
IV. Physiology experiment - A	**- 10 Marks**
V. Spotters E, F, G, H & I (5 × 2)	**- 10 Marks**
Record	**- 05 Marks**
TOTAL	**- 50 Marks**

PBO47

21PBO4Z1

Programme Code: 05		**Title: M.Sc., BOTANY**		
PROJECT WORK & VIVA – VOCE				
Batch **2021-2022**	**Semester** **IV**	**Hours / Week** **5**	**Total Hours** **75**	**Credits** **5**

COURSE OBJECTIVES

- To acquire inherent knowledge and exposures on relevant practical problems in various fields.
- To execute appropriate analytical skills and skills sets on selected problems.
- To impart insight knowledge on problem solving skills and their proper execution.

COURSE OUTCOME

On successful completion of the project work, the students will be able to

K3 ↕ K5	CO1	Applying theoretical knowledge in the real field of research
	CO2	Analyzing the importance of tasks in collecting the datas
	CO3	Evaluating relationships existing between theories and experiments
	CO4	Provide problem solving skills on selected problems in any disciplines of plant sciences
	CO5	Executing appropriate statistical tools and interpretation of appropriate results

Individual project work will be allotted to individual students under the supervision and guidance of the Faculty members during IV Semester. Project works will be given based on the various fields of specialization of the supervisors under whom the students are allotted. They are allotted based on the lot system. The fields of specialization are Systematic Botany, Microbiology and Plant Pathology, Medicobotany & Ecology and Conservation Biology. The students shall do their projects under their supervisors and submit their dissertations at the end of IV Semester. Both the Internal and External Examiners shall jointly evaluate the project reports submitted by the students and marks will be awarded on the basis as mentioned below.

Guidelines to the Distribution of Marks:

CIA	Project Review	45	**50**
	Regularity	05	
ESE	Project Report Present	35	**50**
	Viva – Voce	15	
	Grand Total		**100**

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MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	S
CO2	S	M	H	S	H
CO3	H	H	M	H	H
CO4	S	H	S	S	H
CO5	S	H	S	H	H

S - Strong **H** - High **M** - Medium **L** - Low

Major Elective Papers

PBO50

Programme Code: 05	Title: M.Sc., BOTANY		
	Major Elective: 1 - FOREST RESOURCES AND UTILIZATION		
Batch 2021-2022	**Hours / Week 6**	**Total Hours 90**	**Credits 5**

COURSE OBJECTIVES

- To understand the importance and value of trees.
- To learn the revenue sources of the forests.
- To grasp various products derived from forests for the betterment of the human beings.

COURSE OUTCOMES

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

K1	CO1	Recognize the forest cover in India and their deterioration.
K2	CO2	Understand the significance of forest and climate change for the enhancement of environmental quality.
K3	CO3	Apply inherit knowledge on major and minor forest produce for the betterment of human welfare.
K4	CO4	Analyze forest based products and their varied applications.
K5	CO5	Implement acquired knowledge on conservation of bioresources.

SYLLABUS

UNIT I **(18 HOURS)**

Forest cover and national status. Factors for the deterioration of forest cover. Major forest types in India-Nature and Manmade (Miyawaki)

UNIT II **(18 HOURS)**

Forest and climate, forest as carbon sink, forest and water, forest and soil, forest and air.

UNIT III **(18 HOURS)**

Major forest products- Timber, charcoal. Minor forest products resource of fibers and flosses, bamboos and canes, essential oils, including those from grasses, Tannins and dyes, gums , resins and oleo resins, drugs, spices, poisons and insecticides, edible products , minerals and miscellaneous products.

UNIT IV **(18 HOURS)**

Forest industries- composite wood industries, match industry, Pulp and paper industry, furniture and other timber utilizing industries. Industries utilizing forest products resins.

UNIT V **(18 HOURS)**

Conservation and plantation forestry - reserve forests, commercial forestry, social forestry, agro forestry and energy plantations. Biomass conversion - technologies - pyrolysis* and gasification for thermal and electric applications.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Sharma, V.B. (1998). Trees and Environment. APH Publishing Corporation, New Delhi.
2. Sagreiya, K.P. (1994). Forests and Forestry. National book Trust, India, New Delhi.
3. S.S Negi, (2002). Forest products and their utilization. International book distributiors, 9/3 Rajpur road, Dehradun.
4. Tribhawan Mehta, (1981). A hand book of Forest Utilization. Periodical Expert Book Agency. New Delhi.

REFERENCES

1. Subrahmanyam, N.S. and A.V.S.S. Sambamurty. (2004). Ecology. Narosa Publishing House. New Delhi.
2. Sharma, P.D. (2004). Ecology and Environment. Rastogi Publications, Meerut.
3. Arvind Kumar. (2004). Biodiversity and Environment. APH Publishing Corporation, New Delhi.
4. Singh, M.P. and Vinita Vishwakarma. (1997). Forest Environment and Biodiversity. Daya Publishing House, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	H	H	M
CO2	S	H	H	M	H
CO3	H	M	S	M	S
CO4	S	S	H	H	M
CO5	H	M	S	M	S

S - Strong **H** - High **M** - Medium **L** - Low

PBO52

Programme Code: 05	Title: M.Sc., BOTANY		
	Major Elective: 2 - SEED TECHNOLOGY		
Batch 2021-2022	Hours / Week 6	Total Hours 90	Credits 5

COURSE OBJECTIVES

- To understand the principles of agronomy of seeds.
- To learn the methodology of seed germination, seed drying and seed treatments.
- To know the seed dormancy and their significance

COURSE OUTCOMES

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

K1	CO1	Recognize seed borne diseases due to genetic constitution and storage of seeds.
↕	CO2	Gain inherent knowledge on seed viability and vigour.
	CO3	Apply knowledge on seed processing and storage techniques.
	CO4	Assess various feasible seed treatment and marketing strategies for various crop plants.
K5	CO5	Evaluate various methods of breaking seed dormancy.

SYLLABUS

UNIT I **(18 HOURS)**

Seed production- genetic and agronomic principles - Disease and insect control - nutrition - irrigation - harvesting - storage.

UNIT II **(18 HOURS)**

Seed germination test - (using paper, sand and soil) seed viability - Tetrazolium test, Embryo excision method - Seed vigour Test - concept - direct and indirect vigour test. Seed health testing - objectives - Methods of seed health test for fungi, virus and insects.

UNIT III **(18 HOURS)**

Seed drying - sun drying, forced air drying, process and equipments. Determination of seed moisture methods - one and two stage determination. Seed testing and quality control - principles and importance, sampling rules.

UNIT IV **(18 HOURS)**

Seed treatment - significance, - packaging, - certification, - storage and marketing- demand forecast, marketing structure, marketing organization, arrangement for storage of seed, factors affecting seed marketing*.

UNIT V **(18 HOURS)**

Seed dormancy - primary and secondary dormancies, - significance, - factors involved, - methods to break dormancy.

***Self study**
Teaching Methods
Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Agrawal, R.L. (1997). Seed Technology. Oxford & IBH Publishing Co. Pvt. Ltd. Calcutta
2. Dahiya, B.S & Rai K.N (1998). Seed Technology. Kalyani publishers. Calcutta

REFERENCES

1. Dhirendra khara & Mohan S.Bhale. (2000). Seed technology, Scientific Publishers Jothpur, India
2. Lawrence O.copeland, Miller B. McDonald (1936). Principles of seed science and Technology IV Edition Springer Pvt Ltd , New Delhi.
3. Agarwal P.K, M.Dadlani (1980). Techniques in seed science and Technology, South Asian publishers, Ned Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	S	S
CO2	H	S	H	M	H
CO3	S	H	H	H	M
CO4	S	H	M	H	S
CO5	S	S	M	H	H

S - Strong **H** - High **M** - Medium **L** - Low

PBO54

Programme Code: 05	Title: M.Sc., BOTANY		
	Major Elective: 3 - FOOD SCIENCE AND NUTRITION		
Batch 2021-2022	Hours / Week 6	Total Hours 90	Credits 5

COURSE OBJECTIVES

- To learn the importance of different kinds of foods.
- To acquire knowledge on nutritive values of the foods.
- To create awareness about the food adulterations.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Recognize various nutritive composition of cereals and cereal products.
	CO2	Understand processing practices of various foods based on their nutrients composition.
	CO3	Apply acquired knowledge on food processing technology in vegetables and fruits.
	CO4	Assess nutritive evaluation of spices and sugar based products.
	CO5	Evaluate the technologies employed for the processing of beverages.

SYLLABUS

UNIT I **(18 HOURS)**

Introduction of food science - classification according to function, food groups (ICMR) - Classification); Cereals and cereal products - composition, nutritive value and processing of Rice, Wheat, Maize; Fermented products- Bread- ingredients; Unfermented products - Cakes - Classes and ingredients.

UNIT II **(18 HOURS)**

Pulses- Nutrient values and processing and products of Black gram, Soya bean- Medicinal values of pulses. Nuts and Oilseeds- Coconut, Groundnut-Nutritive values, processing and products, role of nuts and oil & seed in cooking.

UNIT III **(18 HOURS)**

Vegetables- classification*-composition and nutritive values**,** - storage; Fungi as food- Mushroom - Algae - *Spirulina*. Role of vegetables in cookery. Fruits- classification, composition and nutritive values - storage of fruits- Enzymatic Browning- Prevention - Non-enzymatic browning.

UNIT IV **(18 HOURS)**

Sugar - nutritive values, - properties, - sugar related products. - Role of sugar in cookery. Spices - General function of spices - Asafoetida, Clove, Garlic, Turmeric - role of spices in cookery

UNIT V **(18 HOURS)**

Beverages - classification - Coffee, Tea, Cocoa - processing, - adulterants; Fruit beverages - types. Food adulteration - types of adulterants. Food preservation - principles and methods.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Swaminathan, M. (2006). Handbook of food and nutrients. The Bangalore printing & Publishing Co Ltd, India

REFERENCES

1. Sumati R Mudambi (2001). Fundamentals of foods and nutritions , New age International publishers, New Delhi.
2. Mahtab s. Bamji, N. Pralhad Rao and Vinodini Reddy (2003). Text book of Human nutrition Second Edition, Oxford &IBH Publishing Co.Pvt, New Delhi.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	H	M	H	M
CO2	H	S	H	S	M
CO3	S	H	M	H	H
CO4	H	H	S	M	S
CO5	H	H	S	M	M

S - Strong **H** - High **M** - Medium **L** - Low

PBO56

Programme Code: 05		Title: M.Sc., BOTANY		
		Major Elective: 4 - HORTICULTURE		
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**II**	**6**	**90**	**5**

COURSE OBJECTIVES

- To learn about the propagation methods of horticultural crops.
- To study about gardening, landscaping and their maintenance.
- To acquire knowledge about commercial floriculture and cut flower arrangements.

COURSE OUTCOMES

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

K1	CO1	Gain knowledge on solutions for a wide spectrum of plant health issues.
↕	CO2	Understand the components and adornments of gardening.
	CO3	Apply inherent knowledge on various plant propagation techniques.
	CO4	Explore knowledge on cultivation practices of fruits and vegetables.
K5	CO5	Demonstrate the aesthetic value of gardening .

SYLLABUS

UNIT I **(18 HOURS)**

Scope and importance - Divisions of horticulture - classification of horticultural crops - climate, soil and nutritional needs - Irrigation. Organic horticulture - definition, synonyms, principles, methods, merits and demerits.

UNIT II **(18 HOURS)**

Gardening and landscaping - Importance and scope of gardening - Gardens in India* - types - layout of a garden - Garden components and adornments - Special types of garden - principles and design - Water garden, bog garden, terrace garden, rockery garden, vertical garden, clock garden, colour wheels and temple garden. Terrarium and Bonsai techniques.

UNIT III **(18 HOURS)**

Asexual propagation - Advantages and disadvantages - Cuttings:- types, factors influencing rooting of cuttings - use of growth regulators in relation to horticulture - layering - types - Grafting and Budding - methods - factors for successful graft union - Stock scion relationship - Factors influencing the healing of graft union.

UNIT IV **(18 HOURS)**

Pomology - Establishment of orchard***** - cultivation of Banana, Citrus - Fruit carving - Olericulture - cultural aspects of vegetables - types of vegetable growing - Kitchen garden, Market garden, vegetable garden - Preservation of fruits and vegetables -

ornamental floriculture - Cultivation of Jasmine and Rose - Extraction of Jasmine concrete.

UNIT V **(18 HOURS)**

Bio-aesthetic planning, eco-tourism, theme parks, indoor gardening, therapeutic gardening, non-plant components, water scaping, xeriscaping and hardscaping.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Kumar, N.(1999). An introduction to horticulture.Rajalakshmi Publication, Nagarcoil.
2. Chaha, K.L. (2001). Handbook of horticulture. ICAR, New Delhi.
3. Prasad, S., U.Kumar. (2013). A handbook of Floriculture. Agrobios, Jodhpur.

REFERENCES

1. Bose, T.K., J. Kabir, P. Das and P.P. Joy. (2001). Tropical Horticulture. Naya Prakash Publications, Calcutta.
2. George Acquaach. (2003). Horticulture - Principles and practices.
3. Edwin Biles. (2003). The complete book of gardening. Biotech book, New Delhi.
4. Singh, S.P. (1999). Advances in Horticulture and Forestry - Scientific Publishers, Jodhpur.
5. Sharma, V.K. (2004). Advances in Horticulture: Strategies, Production, Plant Protection and Value Addition - Deep and Deep Publications, New Delhi.
6. Bhattacharjee, S.K. (2006).Advances in Ornamental Horticulture -Pointer Publications, Jaipur.
7. Desh Beer Singh and Poonam Wazir. (2002). Bonsai-An Art. Scientific Publishers, Jodhpur.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	S
CO2	S	H	M	H	H
CO3	H	S	H	M	H
CO4	S	M	S	H	S
CO5	H	S	H	M	H

S - Strong **H** - High **M** - Medium **L** - Low

Non-Major Elective Papers

PBO59

Programme Code: 05	Title: M.Sc., BOTANY		
	Non-Major Elective: 1 – PHARMACOGNOSY		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**6**	**90**	**4**

COURSE OBJECTIVES

- To apply the gained knowledge and advice the community on issues concerning the cultivation, harvesting and processing of medicinal plants and their products.
- To classify crude drugs based on their morphological, taxonomical, chemical or pharmacological characters.
- To know the methodology for component analysis of plants.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Recollect indigenous knowledge on Indian systems of traditional medicine
	CO2	Provide therapeutic and pharmaceutical aspects of traditionally used medicinal plants
	CO3	Apply various methods of plant analysis for the exploitation of phytochemical constituents from plant sources
	CO4	Analyze cultivation and marketing strategies of medicinal plants
	CO5	Assess the potential applications of natural plant based drugs in pharmaceutical, nutraceutical and cosmeceutical industries

SYLLABUS

UNIT I **(18 HOURS)**

Scope of Pharmacognosy and modern medicines. Indian medicinal system - AYUSH (Ayurveda, Unani, Siddha and Homeopathy) - principles and diagnostic methods.

UNIT II **(18 HOURS)**

Morphological and histological studies, therapeutic and pharmaceutical uses of the following drugs; Bark - *Cinnamomum zeylanicum;* Leaves - *Rubus idaeus,* Flower - *Syzygium aromaticum,* Fruit - *Citrus limon,* Seed - *Trigonella foenum-graecum*; Rhizome - *Zingiber officinale*, Gum - *Acacia senegal*, Gum resin - *Commiphora* sp., Fixed oil - *Ricinus communis*, Essential oil - *Eucalyptus globulus*.

UNIT III **(18 HOURS)**

Method of Plant Analysis - Phytochemical tests and application of plant derived alkaloids, flavonoids, terpenoids, phenols and steroids. A general procedure for solvent extraction. Separation of the compounds by TLC technique.

UNIT IV **(18 HOURS)**

Medicinal plants and their chemical constituents (brief account), plant remedies for diabetes, anti-fertility, rheumatism, drugs acting on the central nervous system, cardiovascular system and cancer. Potential plant derived drugs in market - Taxol, Camptothecin, Vincristine - source, morphology and properties.

UNIT V **(18 HOURS)**

Cultivation and role of medicinal plants: - *Catharanthus roseus, Digitalis purpurea, Aloe vera, Withania somnifera* and *Papaver somniferum.* Recommendations for promoting traditional medicinal plants cultivation in India*.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Trease, G.E. and Evans, W.C. (1985). Pharmocognosy. (12th Ed.). English Language books Society, Baillie Tindall.
2. Wallis, T.E. (1985). Textbook of Pharmocognosy (5th Ed.). CBS Publishers & Distributors, New Delhi.

REFERENCE

1. Satoskar, R.S., S.D. Bhandarkar and Nimala N. Rege. (2005). Pharmocognosy and pharmacotherapueatics. (12th Ed.). Popular Prakashan Pvt., Ltd., Mumbai.
2. Jain, S.K. (1996). Ethnobotany in human welfare (Ed.). Deep Publishers, New Delhi.
3. Nadkarni, K.M. (1954). Indian Materia medica. Karnataka Printing Press, Mumbai.
4. James A. Duke. (1996). The Green Pharmacy. Scientific Publishers, Jodhpur.
5. Guha Bakshi, Sensararma and Pal. (2001). A Lexicon of Medicinal Plants in India. Nayaprokas, Kolkatta.
6. Shah, C.S. and J.S. Qadry. (1996). A Textbook of Pharmocognosy. Unique Offset Printers, Ahemedabad.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	S	S	S
CO2	H	S	S	H	S
CO3	S	S	S	S	S
CO4	H	H	H	S	H
CO5	H	H	M	H	M

S - Strong **H** - High **M** - Medium **L** - Low

PBO61

Programme Code: 05	Title: M.Sc., BOTANY		
	Non-Major Elective: 2 -LIMNOLOGY		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**6**	**90**	**4**

COURSE OBJECTIVES

- To study morphological and anatomical characters of aquatic flora.
- To understand the significance of the diffused light for the planktons.
- To find the gross and net productivity in fresh water life forms.

COURSE OUTCOMES

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

K1 ↑	CO1	Acquire knowledge on structural and functional aspects of freshwater ecosystem
	CO2	Understand the factors responsible for lotic and lentic ecosystems
	CO3	Implement knowledge on methods of conservation of fresh water bodies
	CO4	Apply inherent knowledge on various kinds of planktonic communities and their adaptations
↓ K5	CO5	Compare various aspects of biomass efficiency and their productivity

SYLLABUS

UNIT I **(18 HOURS)**

Definition, facts of limnology - scope and importance of limnology, structure of freshwater aquatic system - lentic, lakes, - their distribution, origin and forms, morphology, physical, chemical and biological structure, watershed. Ponds - swamps and estuaries. Lotic - stream, springs and rivers - discharge, temperature, nutrient, biotic categories and drift.

UNIT II **(18 HOURS)**

Physical factors influencing lotic and lentic type of vegetation - light, heat, water movements. Chemical factors - O_2 and CO_2, Nitrogen, Phosphorus, other nutrients, alkalinity and pH.

UNIT III **(18 HOURS)**

Water pollution and eutrophication* - effluent water, - nature, treatment, and uses. Freshwater formation in India. Conservation and management of freshwater bodies.

UNIT IV **(18 HOURS)**

Planktonic communities - phyto and zoo planktons. Littoral communities - algae and zoo planktons, large plants, benthos formation organisms - knowledge of adaptations of the above mentioned formations.

UNIT V **(18 HOURS)**

Freshwater ecosystem - energy and production, community concept, diversity, community succession, food chains and bio-geochemical aspects of ecosystems, energy flow in ecosystem and community metabolism. Productivity - primary, biomass and efficiency of primary production, secondary production. Biomass and efficiency- gross and net productivity.

***Self study**

Teaching Methods

PowerPoint presentation/Quiz/Discussion/Assignment

TEXT BOOKS

1. The text book of limnology. Cole. The C.V. Morby Company

REFERENCES

1. Charles R. Goldmen, Alexander, Jorne. (1994). Limnology.. International students Edition.
2. Wezel. Sauders, (). Limnology College Publishing Co

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	S
CO2	H	M	H	S	H
CO3	H	H	M	H	H
CO4	S	H	S	M	M
CO5	S	S	H	M	M

S - Strong **H** - High **M** - Medium **L** - Low

PBO63

Programme Code: 05	Title: M.Sc., BOTANY		
	Non-Major Elective: 3- PLANT BIOTECHNOLOGY		
Batch 2021-2022	Hours / Week 6	Total Hours 90	Credits 4

COURSE OBJECTIVES

- To study the basic of plant genome and tissue culture techniques
- To equip students with theoretical knowledge regarding the techniques and applications of Plant Biotechnology and Genetic Engineering
- To help students to get a career in Industry/R&D/Academic

COURSE OUTCOMES

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

K1	CO1	Describe the genome organizations in plants
↕	CO2	Elaborate plant cell and tissue culture systems
	CO3	Explain the genetic transformation techniques in plants
	CO4	Demonstrate the application of genetic transformation techniques in plants
K5	CO5	Analyze and evaluate the importance of metabolic engineering and molecular farming technology in plants

UNIT-I **(18 HOURS)**

Genome organization: Nucleus, Chloroplast and Mitochondria. Molecular Markers: RFLP, RAPD, AFLP and Microsatellites (SSR/STR). Model Plant: Arabidopsis

UNIT-II **(18 HOURS)**

Plant Cell and Tissue Culture: Tissue culture media (composition and preparation), Plant growth regulators, Micropropagation, Callus culture, Cell culture-single cell and suspension culture, Somatic embryogenesis and Artificial seeds, Protoplast culture-isolation, fusion and somatic hybridization, Haploid production: Anther and Pollen culture, Somaclonal variation.

UNIT-III **(18 HOURS)**

Genetic transformation and vectors: *Agrobacterium* characteristics; Ti and Ri plasmids and mechanism of T-DNA transfer, Physical and chemical methods of gene transfer Binary and cointegrate vector systems. CaMV and Gemini viruses, Markers genes for selection of transformants and Gene silencing. Chloroplast transformation.

UNIT-IV **(18 HOURS)**

Application of plant transformation: Nutraceuticals-Golden Rice and Flavr Savr, herbicide resistance- EPSP and Glyposate, bacteria, virus and insect resistance. Terminator technology and Marker free transgenics. Abiotic stress resistance-drought, cold and salt.

UNIT-V **(18 HOURS)**

Plant molecular farming and metabolic engineering: Plantibodies and Biodegradable plastics and Edible vaccines. Metabolic engineering for plant secondary metabolites-Introduction, alkaloid and flavonoid biosynthesis.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

Text books

1. Chawla, H. S. 2002. Introduction to Plant Biotechnology. 2nd Edition, Science Publishers, Inc., Enfield, NH, USA.
2. Kalyan Kumar De. 2004. An Introduction to Plant Tissue Culture.2008. New Central Book Agency, Kolkata.
3. Dubey, R.C., 2013. A text book of Biotechnology (Revised Edition), S. Chand & Company Ltd. New Delhi.
4. Razdan, M. K., 2003. Introduction to Plant Tissue Culture. 2nd Edition, Science Publishers, Inc., Enfield, NH, USA.

References

1. Slater, Scott and Fowler, 2008. Plant Biotechnology, 2nd Edition, Oxford University Press.
2. Primrose, S.B. and Twyman, R. 2006. Principles of Gene Manipulation and Genomics. 7th Edition, Blackwell Publishing, Malden, MA, USA.
3. Buchanan, Gruissem and Jones.2000. Biochemistry and Molecular Biology of Plants. John Wiley & Sons, UK.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	S	M	H
CO2	H	M	H	H	H
CO3	S	M	H	S	S
CO4	S	S	S	H	M
CO5	S	S	S	H	H

S - Strong **H** - High **M** - Medium **L** – Low

PBO65

Programme Code: 05	Title: M.Sc., BOTANY		
	Non-Major Elective : 4 - MEDICINAL PLANTS		
Batch	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**6**	**90**	**4**

COURSE OBJECTIVES

- To learn about the ethnobotanical knowledge and its traditional significance.
- To understand the role of governmental and non-governmental organizations and their recommended conservation strategies.
- To acquire key knowledge on herbal home remedies.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Recognize about the ethnobotanical significance of medicinal plants
	CO2	Understand the traditional practices for curing various ailments
	CO3	Implement knowledge on the ethnomedicinal aspects of medicinal plants for preventing life threatening diseases
	CO4	Apply ethnopharmacological knowledge for the development of novel lead drugs
	CO5	Evaluate the medicinal efficacy of selected plant species and their conservation measures

SYLLABUS

UNIT 1 **(18 HOURS)**

Ethnobotany-definition - sub divisions-methodology-major tribes in southern India-regional studies-Ethnobotany in human welfare – food and medicine. Rural and Tribal Medicine: Principles, importance, Merits and Demerits of tribal Medicines. Role of tribes in medicinal plants conservation-crop protection.

UNIT II **(18 HOURS)**

Sources of drugs - adulteration - collection and processing of vegetable drugs - role of growth regulators - drug deterioration and their control measures. Herbal home remedies in Tamil Nadu*.

UNIT III **(18 HOURS)**

Cultivation of medicinal plants - Medicinal plants in trade-cultivation practices and medicinal uses of *Cinchona officinalis, Mentha arvensis, Phyllanthus emblica, Cymbopogon martinii, Rauwolfia serpentina, Allium sativum* and *Gloriosa superba.*

UNIT IV **(18 HOURS)**

Nutraceuticals and cosmeceuticals. Natural pesticides. Immuno modulators. Drugs from mineral origin.

UNIT V **(18 HOURS)**

Biopiracy - bioprospecting - recommendation for promoting traditional medicines in India. Role of NBA, AYUSH, NMPB, CDRI, FRLHT, NBRI, BSI - Role of biotechnology in medicinal plant conservation.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Purohit and Vyas. (2005). Medicinal plant cultivation- A scientific approach, Agrobios, Jodhpur.
2. Rajiv, K. Sinha & Shweta Sinha, (2001). Ethnobiology. Surabi Publications, Jaipur.

REFERENCES

1. Anonymous (1970). The pharmocopoea of India - Govt. of India, New Delhi.
2. Jain. S.K.(Ed.) (1996). Ethnobiology in human welfare. Deep. Pub. New Delhi
3. Jain, S.K. (1989). Methods and approaches in Ethnobotany, Society of Ethnobotanist, Lucknow.
4. Jain, S.K. (1987). A manual of Ethnobotany. Oxford publication, Jodhpur.
5. Trease G.e. and Evans, W.C. (1978). Pharmacognosy Bailliere Trinda, London.
6. Kokatae, C.K. A.P. Purohit and S.B Gokhale (2007). Pharmacognosy. Nirali Prakashan, Pune.

8. Jain, S.K. (Ed). (1981). Glimpses of Ethnobotany. Oxford & IBH Publications.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	S	M	H	H
CO2	H	M	H	H	M
CO3	S	H	S	M	H
CO4	S	M	H	S	M
CO5	H	S	M	H	M

S - Strong **H** - High **M** - Medium **L** - Low

Extra Departmental Course

21PBO3X1

Programme Code: 05		For PG STUDENTS		
Extra Departmental Course (EDC) - APPLIED HORTICULTURE				
Batch	**Semester**	**Hours / Week**	**Total Hours**	**Credits**
2021-2022	**III**	**2**	**30**	**2**

COURSE OBJECTIVES

- To learn about the propagation methods of horticultural crops.
- To study about gardening, landscaping and their maintenance.
- To acquire knowledge about commercial floriculture and cut flower arrangements.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Demonstrate solutions for a wide spectrum of plant health issues
	CO2	Understand the components and adornments of gardening
	CO3	Develop employability skills in the field of gardening and landscaping
	CO4	Analyze inherent knowledge on various nursery practices and their management systems
	CO5	Evaluate the concepts and principles of floriculture

SYLLABUS

UNIT I **(6 HOURS)**

Landscaping: Importance and scope of Landscape Architecture. Functional uses of plants for landscape and pollution control. Landscaping for specific areas (home garden, public parks, educational institutes).

UNIT II **(6 HOURS)**

Principles of Garden Designs: Styles of gardens - English, Italian, French, Persian, Mughal, Japanese gardens and its layout. Some Famous gardens of India.

UNIT III **(6 HOURS)**

Gardening: Definition, objectives and scope - different types of gardening - Special types of gardens (rock, water, terrace, vertical and terrarium).

UNIT IV **(6 HOURS)**

Nursery Management and Routine Garden Operations: Definition of a nursery. Different types of nursery beds – (flat beds, raised beds and sunken beds), their merits and demerits. Different nursery techniques and their management. Propagation Methods: Advantages and disadvantages.

21PBO3X1

UNIT V **(6 HOURS)**

Cut flowers - Identification and selection of flowers and plant parts, value addition in cut flowers, flower arrangement, styles, Ikebana, morebana, free style, bouquets, flower baskets, garlands. Selection of containers and accessories for floral products and decorations. Dry flowers - Designing and arrangement

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXTBOOKS

1. Kumar, N.(1999). An introduction to horticulture. Rajalakshmi Publication, Nagarcoil.
2. Chaha, K.L. (2001). Handbook of horticulture. ICAR, New Delhi.
3. Prasad, S., U.Kumar. (2013). A handbook of Floriculture. Agrobios, Jodhpur.

REFERENCES

1. Bose, T.K., J. Kabir, P. Das and P.P. Joy. (2001). Tropical Horticulture. Naya Prakash Publications, Calcutta.
2. George Acquaach. (2003). Horticulture - Principles and practices.
3. Edwin Biles. (2003). The complete book of gardening. Biotech book, New Delhi.
4. Singh, S.P. (1999). Advances in Horticulture and Forestry - Scientific Publishers, Jodhpur.
5. Sharma, V.K. (2004). Advances in Horticulture: Strategies, Production, Plant Protection and Value Addition - Deep and Deep Publications, New Delhi.
6. Bhattacharjee, S.K. (2006).Advances in Ornamental Horticulture -Pointer Publications, Jaipur.
7. Desh Beer Singh and Poonam Wazir. (2002). Bonsai-An Art. Scientific Publishers, Jodhpur.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	H	S	H	M	S
CO2	S	H	M	H	H
CO3	H	S	H	M	H
CO4	S	M	S	H	S
CO5	H	S	H	M	S

S - Strong **H** - High **M** - Medium **L** - Low

Job Oriented Course Papers

21PBO2J1

Programme Code: 05	Title: M.Sc., BOTANY	
JOC: 1 - Floriculture and Landscaping		
Batch 2021-2022	**Hours / Week 4**	**Credits 2**

COURSE OBJECTIVES

- To know the latest development in the field of floriculture.
- To develop skills in the area of floriculture and landscaping.
- To create knowledge on self employment through entrepreneur skills.

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Acquire knowledge on cultivation of economic flowers.
	CO2	Understand the techniques involved in flower arrangement and decoration.
	CO3	Apply knowledge on green house cultivation practices.
	CO4	Implement tacquired knowledge on commercial applications of plants in landscape gardening.
	CO5	Demonstrate strategic plans for designing various types of gardens

SYLLABUS

UNIT I

Floriculture - Global floriculture - Floriculture in India - Economic flowers - Rose, Jasmine, Crossandra, Chrysanthemum - Cultivation and uses.

UNIT II

Cut flowers - Significance of cut flower industry in India* - Export - Flower arrangement and decoration - dehydrated flowers, foliage and floral craft.

UNIT III

Green house cultivation of cut flowers -Green house technology - advantages - Green house cultivation of Orchids - Anthurium - Gerbera - Dahlia - Tuberosa - Gladioli.

UNIT IV

Landscape gardening - important principles in layout a garden - Aboriculture - Shrubs and climbers - annual, biennial herbaceous perennials - Ornamental palms - Succulents and Cacti.

UNIT V

Water garden, Rock garden, Roof garden, Vertical garden, Hydrophonics, Lawn, Bonsai - Horticultural shows.

21PBO2J1

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Kumar, N. (1999). An introduction to horticulture. Rajalakshmi Publication, Nagarcoil.
2. T.K. Bose, R.G. Maity, R.S. Dhua and P.Das, (1999). Floriculture and Landscaping, Naya Prokash, Calcutta.
3. S.Prasad and U.Kumar. (2013). A handbook of Floriculture Agrobios (India),

REFERENCES

1. Roy Edwin Biles, (2003). The complete Book of Gardening. Biotech Books, Delhi - 35.
2. Bhattacharjee, S.K. (2006). Advances in Ornamental Horticulture. Pointer Publication, Jaipur.
3. Doesh Beer Singh and Poonam Wazir, (2002). Bonsai - An art. Scientific Publishers, Jodhpur.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	H	M	H
CO2	S	M	H	H	M
CO3	H	S	M	H	H
CO4	S	H	M	S	M
CO5	S	S	H	H	M

S - Strong **H** - High **M** - Medium **L** - Low

21PBO2J2

Programme Code: 05	Title: M.Sc., BOTANY	
JOC: 2 - Food Processing and Preservation		
Batch	**Hours / Week**	**Credits**
2021-2022	**4**	**2**

COURSE OBJECTIVES

- To know the recent technologies developed in the field of food science
- To develop skills in the area of Food processing and Preservation
- To get employment opportunities in food processing industries

COURSE OUTCOMES

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

K1 ↕ K5	CO1	Recognize about preliminary preparation of food through various processes
	CO2	Understand the nutritive values and significance of cereals
	CO3	Apply knowledge on pulses and nuts and their nutritive aspects
	CO4	Implement food preservation techniques applicable for day to day life
	CO5	Evaluate strategies for the preservation of food products and their quality enhancement

SYLLABUS

UNIT I

Food groups - Basic groups **:** basic Four, Five and Seven, food in relation to health. Preliminary preparation of food - cleaning, peeling, stinging, cutting and grafting, soaking, marinating, sprouting, fermenting, grinding, drying and filtering - their advantages and disadvantages.

UNIT II

Cereals and cereal products, structure composition and nutritive value of cereals - wheat and wheat products, rice and its products; fermented and unfermented products.

UNIT III

Pulses composition and nutritive value, toxic constituents, rypsin inhibitor, hemagglutinins, cyanogenic glucoside, saponins and tannins. Nutritive values of nuts and oil seeds, toxins - aflatoxins and gossypol. Fruits and Vegetables - classification, composition and nutritive values.

UNIT IV

Milk and milk products, nutritive value of milk, processing - clarification, pasteurization and homogenization. Milk products - fermented milk products - butter, cheese and curd. Preparation of cheese. Non-fermented products - skimmed milk, dry milk, ice cream. Flesh foods - meat, fish and poultry - composition and nutritive values.

UNIT V **21PBO2J2**

Food preservation by high and low temperatures (outline). Preservation by high osmotic pressure, high concentration of sugar, jam and jelly preparation, high concentration of salts. Principles and preparation of pickles - preservation by dehydration*. Principles and methods of drying - freeze drying, sun drying, mechanical driers - spray drying and foam mat drying and by smoking.

***Self study**

Teaching Methods

Smart Class Room/PowerPoint presentation/Seminar/Quiz/Discussion

TEXT BOOKS

1. Srilakshmi. B. (2003). Food Science, New Age International Publishers, New Delhi.
2. Frazier W.C. and Westhoff. D.C. (1978). Food Microbiology, Tata McGraw-Hill, Chennai.

REFERENCES

1. Subbulakshmi, G. (2006). Food processing and preservation, New Age International Pvt Ltd Publishers.
2. Adams M.R. and Moss M.O. (2008). Food Microbiology, The Royal Society of Chemistry, Cambridge.
3. Swaminathan M.S. (1985). Essentials of food and nutrition, Bappco Publisher, Bangalore.

MAPPING

PSO / CO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	S	H	M	H	S
CO2	H	H	S	H	H
CO3	S	M	H	M	H
CO4	S	M	S	H	M
CO5	H	H	M	S	M

S - Strong **H** - High **M** - Medium **L** – Low