VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS)

ELAYAMPALAYAM, THIRUCHENGODE (Tk.), NAMAKKAL (Dt.) - 637 205

(Affiliated to Periyar University, Approved by AICTE & Re-Accredited with "A" by NAAC)

DEPARTMENT OF BOTANY

MASTER OF SCIENCE

SYLLABUS & REGULATIONS

CANDIDATES ADMITTED FROM 2018 -19 ONWARDS
UNDER OBE AND CBCS PATTERN

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

ANGAMMAL EDUCATIONAL TRUST

ELAYAMPALAYAM, THIRUCHENGODE (Tk.), NAMAKKAL (Dt.) - 637 205

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COLLEGE OF ARTS AND SCIENCES FOR WOMEN

(AUTONOMOUS)

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Reaccredited with "A" Grade by NAAC

(Affiliated to Periyar University, Salem – 636 011)

M.Sc., Botany - Branch V

Vision:

To imparting skills and values for the women graduates through innovative teaching, learning and research in plant science to meet the needs of youth and national demand.

Mission:

1. To create demand for Botany.
2. Strengthen the Department by research.
3. To provide quality education through field study and projects, laboratory courses and entrepreneurial skills in Botany to achieve their diligence.
4. To raise the students high academic caliber to meet the requirements of industries through productive research in various fields of Botany.
5. To enhance opportunities to the rural women students for their successful career.

Programme Educational Objectives (PEOs):

1. To acquire knowledge on the basic and applied aspects of various fields of Botany thereby develop a self employment opportunities.
2. To obtain knowledge on logical, creative thinking and analytical aspects on the current of biological sciences.
3. To promote research in various thrust areas of Botany such as diversity of plants, conservation of biodiversity, environmental pollution, cell and molecular biology, taxonomy, anatomy, phytochemistry and pharmacognosy.

Programme Specific Objectives (PSOs):

1. To focus on different fields of plant science to become researcher, entrepreneur and professionals to develop certain life skills and analytical skills in plant science.

2. To expose the students to a wide range of careers that combine biology, plants and medicine and render graduates with field projects and research project in a research laboratory to further development in the career prospects.

3. To create awareness on conservation and to develop aesthetical values on nature and management of plant ecosystem.

Programme Outcomes (PO's):

POs	OUTCOME	CPD
PO-1	Students will able to understand the concepts that mould the understanding of biological function within this organizational hierarchy, and also garner a perspective for the historical development of understanding through the investigative use of life science.	K2
PO-2	Students shall become knowledgeable about molecular, cellular, physiological, behavioural, ecological and evolutionary levels of biological organization, whose emphases will be relevant to each of the courses of bioscience departments.	K1
PO-3	Students shall be able to explain the roles of evolution, information flow, structure – function relationship, transformation of energy matters, and systems in understanding and explaining the biological principles.	K2
PO-4	The postgraduate candidate will be able to develop problem-solving skills through the use of critical thinking, quantitative measurement and analysis in seminar hall, laboratory classes, writing exercises in lecture classes, and in mentored rsesearch experiences.	K4
PO-5	Students are intended that our students will make links among classes to understand how knowledge can be used to promote application for the nature of life on Earth.	K4
PO-6	Students shall able to use research based knowledge and research methods to design an experiment, analysis and interpreting the date to generate appropriate information for coming up with valid conclusions.	K5
PO-7	Students shall be able to design, conduct experiments, analyse and interpret data for investigating problem in biological sectors and allied fields	K3
PO-8	Students shall able to apply knowledge of basic cell systems of living organisms along with master specialization to find out solutions for complex problems and questionnaires that are existing among society	K4
PO-9	Students will be able to write research proposals by adapting appropriate methodologies to fund new research (or) develop new programs that apply biological concepts and encouraged to appreciate ownership of their own intellectual property through recognition of their abilities and efforts to generate ideas, research, concepts and knowledge.	K4

PO-10	Students shall able to demonstrate and develop wide knowledge in diverse life science fields and management principles for effective project management and execution with ethical principles thereby ensuring sustainable development of the society.	K5
PO-11	Students can able to apply selective technical resources and IT tools for predicting and modelling the complex bioscience activities with the knowledge of its shortcomings.	K3
PO-12	Students shall able to generate and develop entrepreneurship ventures, consultancy services and training centres that encourage self employment.	K6
PO-13	Students shall develop tendency to make them enrolled in higher studies (M. Phil., & Ph. D.) related to research, by taking up various competitive examinations such as GATE, ICMR, ICAR, DBT & CSIR-NET which promote financially supported research career.	K6
PO-14	Students shall become as production/technical officer in various sectors such as pharmaceutical companies, fertilizer industries, clinical laboratories, feed formulation firms, food processing industries, environmental assessment units, fisheries units, R&D laboratories of bioscience by developing their technical and managerial skill set.	K6
PO-15	Students shall able to demonstrate the knowledge of life science and biological principles and apply in one's own work, as a team leader and member for managing the projects in multidisciplinary environment in different life science sectors.	K6

For Candidates Admitted from 2018 - 2019 Onwards Under OBE and CBCS Pattern

1. Scope of the Department

Botany is classical science dealing with not merely about morphology of plants but also their functional aspects and economic importance. Further, the study helps us to understand the role of plants in maintaining the environment besides, saving as a renewable energy sources. Plants are most valuable in treating the ailments of mankind. It has several branches such as Plant Morphology, Taxonomy, Anatomy, Embryology, Mycology, Pathology, Physiology, Ecology, Plant Diversity, Ethno Botany etc., besides serving as the basis for several other biosciences. It is a basic science with several research disciplines like modern transgenic biology.

2. Objectives of the course

This course will enable the students

- To gain knowledge of the importance of plants in conserving food and fuel.
- To acquire skills in drawing by actual observation at its original and natural condition.
- To know the nutritive value of food and maintain 'Health and Care Problems'.
- To create awareness in the understanding of extinct plants.

- To create awareness of natural resources and methods of conservation.
- To develop skill in students of growing various horticultural plants thereby to raise a nursery.
- To train in techniques of Vegetative propagation and gardening.
- To motivate for self-employment by knowledging and practicing in the preparation of bio-fertilizers.
- 'Earn while learn' can be done with the acquirement of basic knowledge in growing some medicinal plants.
- To gain knowledge for exploration of new plants unknown value and known plants of unknown value of their secondary metabolites.
- To gain a knowledge of the techniques of producing desirable plants through the study of molecular biology and genetic engineering.

3. Conditions for Admission:

A candidate who has passed B.Sc., Examination with Botany as main subject of any university or an examination accepted as equivalent thereto or as per norms said by the Government of Tamilnadu is permitted to appear and qualify for M.Sc., Degree examination of this university after a course of study of two academic years.

4. Duration of the Course:

The course for the degree of Master of Science in Botany shall consist of two academic years divided into four semesters.

5. Course of Study:

The course of study shall comprise of instruction in the following subjects according to the syllabus and books prescribed from time to time.

Semester I

1. Core Course I - Diversity of Plants – I
2. Core Course II - Diversity of Plants – II
3. Core Course III - Taxonomy of Angiosperms
4. Core Course IV - Practical - I - Comprising Core Course I and II (Examination at the end of the second semester)
5. Core Course V - Practical – II – Comprising Core Course – III (Examination at the end of the second semester)
6. Elective I - Herbal Botany/Plant Breeding and Evolution

Semester II

6. Core Course VI - Anatomy of Angiosperms and Embryology of Angiosperms and Plant Microtechnique

7. Core Course VII - Cell and Molecular Biology and Genetics

8. Core Course VIII - Practical - III Comprising Core Course VI and VII)

10. Elective II - Fundamentals of Computer Technology/Nanotechnology

17. Elective III - Plant Bio-technology and Bioinformatics/Genomics and Proteomics

Semester III

15. Core Course IX - Plant Physiology and Biophysics

13. Core Course X - Environmental Biology and Resource Management

17. Core Course XI - Microbiology and Plant Pathology.

15. Core Course XII - Practical - IV - Comprising Core Course X, XI and XII (Examination at the end of the fourth semester)

16. EDC - Sericulture

Semester IV

17. Core Course XIII - Biochemistry and Biostatistics

18. Core Course XIV - Instrumentation Techniques

19. Core Course XV - Practical – V - Comprising Core Courses XIV and XV)

20. Elective IV - Pharmacognosy and Phytochemistry/Solid Waste Management

21. Project Work

6. Examinations:

The theory examination shall be of three hours duration to each paper at the end of the semester. The candidates failed in any subject will be permitted to appear for each failed subject or subjects in the subsequent examination. The practical examination is of four hours duration at the end of even semester. However in the final semester examination in the failure of one or two subjects they can appear for a supplementary exam within a month.

The examination consists of Continuous Internal Assessment (CIA) and External Assessment (EA).

Internal Assessment Marks for Theory papers are as follows

Attendance	- 5	Marks
Assignment	- 5	Marks
Seminar	- 5	Marks
Test	- 5	Marks
Model	- 5	Marks
Total	- 25	Marks

Internal Assessment Marks for Practical papers are as follows

Attendance	-10	Marks
Observation	-10	Marks
Test	- 20	Marks
Total	- 40	Marks

7. Distribution of Marks for Attendance:

Percentage	Marks	
	Theory	Practical
75 - 80	1	2
81 - 85	2	4
86 - 90	3	6
91 - 95	4	8
96 - 100	5	10

Note:

Minimum 75 % of attendance is compulsory to sit for the exam. A condonation can be permitted between “65 %” and “74.9 %”.

8. Scheme of Examination:

The scheme of Examinations for different semesters shall be as follows.

Vivekanandha

College of Arts and Sciences for Women

(Autonomous)

Elayampalayam, Tiruchengode

M. Sc., Botany – Outcome Based Education

(For the candidates admitted from the Academic year 2018 - 2019 Onwards)

Sem	Course	Code	Course Title	Inst. Hrs.	Credits	Exam Hrs.	Marks		
							CIA	EA	Total
I	Core Course I	18P1BO01	Diversity of Plants - I	5	5	3	25	75	100
	Core Course II	18P1BO02	Diversity of Plants - II	5	5	3	25	75	100
	Core Course III	18P1BO03	Taxonomy of Angiosperms	5	5	3	25	75	100
	Core Course IV (Practical I)	18P2BOP01	Comprising Core Course I and II (Examination at the end of II Semester)	6	3	4	40	60	100
	Core Course V (Practical II)	18P2BOP02	Comprising Core Course III (Examination at the end of II Semester)	6	3	4	40	60	100
	Elective I	18P1BOE01A/B	Herbal Botany/Plant Breeding and Evolution	3	3	3	25	75	100
			Total	**30**	**24**	**-**	**180**	**420**	**600**
II	Core Course VI	18P2BO04	Anatomy of Angiosperms and Embryology of Angiosperms and Plant Microtechnique	6	5	3	25	75	100
	Core Course VII	18P2BO05	Cell and Molecular Biology and Genetics	6	5	3	25	75	100
	Core Course VIII (Practical III)	18P2BOP03	Comprising Core Course VI and VII	8	4	4	40	60	100
	Elective II	18P2BOE02A/B	Fundamentals of Computer Technology/Nanotechnology	5	4	3	25	75	100
	Elective III	18P2BOE03A/B	Plant Biotechnology and Bioinformatics/Genomics and	5	4	3	25	75	100

			Proteomics						
	Total			**30**	**22**	**-**	**140**	**360**	**500**
III	Core Course IX	18P3BO06	Plant Physiology and Biophysics	6	5	3	25	75	100
	Core Course X	18P3BO07	Environmental Biology and Resource Management	5	5	3	25	75	100
	Core Course XI	18P3BO08	Microbiology and Plant Pathology	5	5	3	25	75	100
	Core Course XII (Practical IV)	18P4BOP04	Comprising Core Course IX, X and XI (Examination at the end of IV Semester)	8	4	4	40	60	100
	EDC	18P3ZOED01	Sericulture	4	4	3	25	75	100
	Value Education	18P3HR01	Human Rights	2	1	2	25	75	100
			Total	**30**	**24**	**-**	**165**	**435**	**600**
IV	CoreCourse XIII	18P4BO09	Biophysics and Biochemistry	5	4	3	25	75	100
	CoreCourse XIV	18P4BO10	Instrumentation Techniques	5	4	3	25	75	100
	Core Course XV (Practical V)	18P4BOP05	Comprising Core Course XIII and XIV	8	4	4	40	60	100
	Elective IV	18P4BOE04A/B	Pharmacognosy and Phytochemistry/ Solid Waste Management	4	4	3	25	75	100
	Project Work	18P4BOPR01	-	8	4	-	40	60	100
			Total	**30**	**20**	**-**	**155**	**345**	**500**
							640	**1560**	
			Total No. of Hours and Credits	**120**	**90**	**-**	**2200**		

Question Paper Pattern for M.Sc., Botany Course

Time: 3 Hrs **Max. Marks: 75**

PART – A (20 x 1 = 20 Marks)
(*Answer all questions*)
(Multiple Choice Questions - Four questions from each unit)

PART – B (5 x 5 = 25 Marks)
(*Answer all questions*)
(One question from each unit with internal choice)

PART – C (3 x 10 = 30 Marks)
(*Answer any three questions)*
(One question from each unit)

9. Format to be followed in dissertation

The formats / certificate for dissertation to be submitted by the students are given below:

1) Format for the preparation of project work

(a) Title page

(b) Bonafide certificate

(c) Acknowledgement

(d) Table of contents

Contents

Format of the title Page

TITLE OF THE DISSERTATION

Dissertation Submitted in partial fulfillment of the

requirement for the award of the Degree of

Master of Science in Botany

to the Periyar University, Salem 636017

By

Student Name

Register Number

Under the Guidance of

Guide Name

College / University Department

Year

Format of the Certificate

CERTIFICATE

This is to certify that the dissertation entitled …….(title of the dissertation)…..submitted by ……. (name of the candidate)…. in partial fulfillment of the requirement of the degree of Master of Science in Botany to the Periyar University, Salem is a bonafide record of independent research work done by her during the period …. (Year)… of her study in the Department of Botany at Vivekanandha College of Arts and Sciences for Women, Elayampalayam, under my supervision and guidance. This dissertation has not formed the basis for the award of any Degree, Diploma, similar titles or associate ship to any candidates of this University.

Viva –Voce Examination Date:

Signature of Head **Signature of the Guide**

Examiners: 1.

2.

10. Passing Minimum:

The Candidate shall be declared to have passed the examination if the candidate secures not less than 38 marks out of 75 marks in the university examination in each theory paper. There is no passing minimum for internal assessment. For the practical paper, a minimum of 30 marks out of 60 marks in the University practical examination and the record notebook taken together. There is no passing minimum for internal assessment and record note book. However submission of a record note book is a must.

For the project work and viva – voce the candidate should secure 30 marks out of 60 marks for pass. There is no passing minimum for internal assessment. The candidate should compulsorily attend viva-voce examination to secure pass in that paper. Candidate who does not obtain the required minimum marks for a pass in a paper / project report shall be required to appear and pass the same at a subsequent appearance.

11. Classification of successful candidates

Candidates who secure not less than **60%** of the aggregate marks in the whole examination shall be declared to have passed the examination in first class. All other successful candidates shall be declared to have passed in the **second class.**

Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in **first class with Distinction** provided they pass all the examinations prescribed for the course at the first appearance.

12. Maximum duration for the completion of the PG Programme

The maximum duration for completion of the PG Programme shall not exceed 4 semesters.

13. Commencement of this Regulation

These regulations shall take effect from the academic year 2018-19, i e., for students who are to be admitted to the first year of the course during the academic year 2018-19 and thereafter.

14. Transitory Provision

Candidates who were admitted to the PG course of study before 2018-19 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April / May 2019. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

SEMESTER I

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P1BO01	Title	Batch	2018 -2020
Hours/Week	5	Diversity of Plants – I	Semester	I
			Credits	05

Course Objective

To study the general characters, classification, thallus structure, reproduction, life cycle and economic importance of algae, fungi, lichens and bryophytes.

Course Outcomes (CO)

K1	CO1	To acquire knowledge on Morphology, Ecology and Economic importance of Algal forms.
K2	CO2	To understand and analyse structure, Reproduction and Characteristic feature of Fungal Organisms.
K3	CO3	To develop an entrepreneurship skill among the plant Science graduates for the production of industrial products.
K4	CO4	To create awareness on conservation of lower plants of Thallophytes.

UNIT - I **(15 Hours)**

Algae: General characteristics with reference to thallus structure, pigmentation and life cycle. Classification of algae (Bold and Wynne, 1978) - Criteria used in algal classification - Ecology of algae - Economic Importance of algae.

UNIT - II **(15 Hours)**

Structure and reproduction of the following genera of algae: *Lyngbya*, *Nostoc*, *Cladophora*, *Codium, Padina*, *Batrachospermum* and *Gracilaria*.

UNIT – III **(15 Hours)**

Fungi: General characteristics of fungi with reference to their occurrence, thallus structure and reproduction - Classification of fungi by Alexopoulos and Mims (1979). Nutrition in fungi - Heterothallism- Parasexuality - Phylogeny and affinities of fungi – Economic importance of fungi.

UNIT - IV **(15 Hours)**

Detailed study of the occurrence, thallus structure and reproduction of the following genera of fungi: *Peronospora*, *Aspergillus*, *Polyporus* and *Fusarium.*

UNTI - V **(15 Hours)**

A general account of lichens with special reference to their structure and reproduction - Life history and classification of Bryophytes (Watson, 1963) - Ecology and evolution of Bryophytes - Fossil Bryophytes - A detailed study of *Targionia*, *Dumortiera* and *Lunularia*.

Text Books:

1. Sharma, P. D. 2003. The Fungi. ELBS Publication, London
2. Alexopoulos, C. J and Mims, C. W. 1979. Introductory Mycology. Wiley Eastern Publication, New Delhi.
3. Chopra, R. N. & Kumar, P. K. 1988. Biology of Bryophytes. John Wiley, New York.
4. Smith, A. J. E. 1982. Bryophyte ecology. Chapman and Hall, London.
5. Dubey, H. C. 1990. An introduction to Fungi. Vikas publishing House, New Delhi.

Reference Books:

1. Sohan Sharma, 2012. Advances In Mycology, Random Publications Publishers and Distributors, New Delhi.
2. Fritsch, F.E.1945, 1955. The structure and reproduction of Algae, (Volume -I and II). Cambridge University Press, London.
3. Lewin, R.A.1972. Physiology and Biochemistry of Algae. Academic Press, New York.
4. Burnett, J.H. 1971. The fundamentals of Mycology. ELBS Publications, London
5. Hale Jr.M.E.1983. Biology of Lichens. Edward Arnold, Mary land.
6. Watson, E.V.1970. Structure and Life of Bryophytes. Hutchinson and Co., London.
7. Watson, E. V. 1968. British Mosses and Liverworts. Hutchinson and Co., London.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER I

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P1BO02	Title	Batch	2018 -2020
Hours/Week	5	Diversity of Plants - II	Semester	I
			Credits	05

Course Objective

To study the general characters, classification, reproduction and life cycle of Pteridophytes, Gymnosperms and fossils.

Course Outcomes (CO)

K1	CO1	To bridge the gap between fossils and present day living forms
K2	CO2	To acquire knowledge on phylogenetic trends occur in Plant.
K3	CO3	To understand the structure and reproduction of Pteridophytes and Gymnosperms.
K4	CO4	To acquire knowledge on plants existing in the past.

UNIT - I **(15 Hours)**

Classification of Pteridophytes (Sporne, 1976) - Evolution of sorus in ferns – General characters of the following orders - Psilotales, Isoetales, Equisetales, Filicales and Salviniales - Stelar evolution in Pteridophytes – Heterospory and seed habit.

UNIT - II **(15 Hours)**

Detailed study of range in structure, reproduction and affinities of the gametophytes and sporophytes with special reference to *Psilotum, Isoetes, Equisetum, Angiopteris, Pteris, Osmunda* and *Salvinia*.

UNIT - III **(15 Hours)**

Classification of Gymnosperms (Sporne, 1967). General account of Pteridospermales and Bennettitales. Comparative morphology and phylogeny of Cycadales, Coniferales and Gnetales. Evolution of male and female gametophyte.

UNTI - IV **(15 Hours)**

Study of morphology and anatomy of the vegetative and reproductive structures of *Araucaria, Podocarpus* and *Cupressus*.

UNTI - V **(15 Hours)**

Fossils and fossilization- methods, types of fossils. Study of morphology and anatomy of the vegetative and reproductive structure in the following fossil forms: *Sphenophyllum, Lyginopteris* and *Cordaites.*

Text Books:

1. Sharma, O.P. 2012. Pteridophyta, Tata McGraw Hill Publishing Company, New Delhi.
2. Biswas, C. and Johri, B. M. 2004. The Gymnosperms. Narosa Publishing House, New Delhi.
3. Sporne, K. R. 1965. The Morphology of Gymnosperms. Hutchinson University Press, London.
4. Sporne, K. R. 1965. The Morphology of Pteridophytes. Hutchinson University Press, London.
5. Shukla, A. C. and Sharma, M. 1992. Plant fossils - A link with the past, Birbal Sahni Institute of Palaeobotany, Lucknow, India.
6. Vashishta, B. R. 1987. Pteridophyta. S. Chand and Company, New Delhi.
7. Smith, G. M. 1935. Cryptogamic Botany. Vol. 11. Tata McGraw Hill Publishing Company, New Delhi.
8. Parihar, N. S. 1965. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
9. Rashid, A. 1979. An Introduction to Pteridophyta. Vikas Publishing House, New Delhi.

Reference books:

1. Foster and Gifford, Jr., 1962. Comparative Morphology of Vascular Plants. Allied Pacific Private Limited, Mumbai.
2. Beek, G. E., 1988. Origin and Evolution of Gymnosperms. Colombia University Press.
3. Bhatnagar and Moitra, 1996. Gymnosperms. New age International Publishers, New Delhi.
4. Chamberlain. J. 1934. Gymnosperms: Structure and Evolution. Chicago Publisher. (Reprinted 1950), New York.
5. Arnolds, C. A., 1947. An Introduction to Paleobotany, McGraw Hill Book Company, New York.
6. Surange, K. R., 1966. Indian Fossil Pteridophytes. CSIR, New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER I

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P1BO03	Title	Batch	2018 -2019
Hours/Week	5	Taxonomy of Angiosperms	Semester	I
			Credits	05

Course Objective

To study the general characters, identification, classification of angiosperms.

Course Outcomes (CO)

K1	CO1	To develop knowledge on identification of plants.
K2	CO2	To develop the skills on cultivation techniques of economically useful plants.
K3	CO3	To understand the different system of classification.
K4	CO4	To apply the knowledge of the herbarium techniques in the preservation, conservation and identification of plants.

Unit - I **(15 Hours)**

History and principles of classification - Detailed account of the system of classification proposed by Taktajan, Bessey, Hutchinson and Cronquist (Including merits and demerits) - Herbarium techniques.

Unit - II **(15 Hours)**

Modern trends in classification - Taximetrics, Chemotaxonomy and Biosystematics. BSI- Organization, function and contribution - Taxonomic literature – Taxonomic index, Monographs and Revisions.

Unit - III **(15 Hours)**

Plant identification – Methods of identification - Keys: Types of keys, rules for construction of keys, advantages and disadvantages - Nomenclature, ICBN, Typification, Priority, Publication, Author citation and retention, Choice and rejection of names.

Unit - IV **(15 Hours)**

A detailed account of the following families and their economic importance- Menispermaceae, Magnoliaceae, Caryophyllaceae, Oxalidaceae, Meliaceae, Sapindaceae, Polygalaceae, Lythraceae, Aizoaceae and Moringaceae.

Unit - V **(15 Hours)**

Boraginaceae, Bignoniaceae, Rhizophoraceae, Oleaceae, Moraceae, Orchidaceae, Nyctaginaceae, Loranthaceae, Aristolochiaceae, Cactaceae, Cyperaceae and Poaceae.

Text Books:

1. T. Pullaiah, 2007 Text Book of Angiosperms, Regency Publications.
2. Annie Roland, 2005. Taxonomy of Angiosperms, Saras Publication, Nagercoil.
3. Lawrence, G.H.M.1955. The taxonomy of vascular plants (Vol. I - IV). Central Book Depot. Allahabad.
4. Singh, V and Jain, V. K. 1989. Taxonomy of Angiosperms. Rastogi Publication, Meerut.
5. Sivarajan, V. V. 1989. Introduction to principles of plant Taxonomy. Oxford and IBH, New Delhi.
6. Subramaniyam, N.S.1995. Modern Plant Taxonomy. Vikas Publishing House, New Delhi.

Reference Books:

1. Davis, P.H. and Heywood, V.M. 1965. Principles of Angiosperm Taxonomy. Oliver and Boyd Edinburgh.
2. Gamble J.S. and Fisher, L.E.F. 1967. The flora of the Presidency of madras (volume I. III). BSI, Calcutta.
3. Grant, E.F. 1984. Plant Biosystematics. Academic Press Inc., Canada.
4. Heywood, V.H. 1967. Plant taxonomy. Edward Arnold, Great Britain.
5. Hutchinson, J. 1973. The families of flowering plants. Oxford University Press, London.
6. Mathew, K.M. 1983. The flora of Tamil Nadu Carnatic. The Rapinet Herbarium, Trichy.
7. Santapau, H and Henry, H.D.1994. A dictionary of flowering plants of India. C.S.N., New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER I

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P1BOE01A	Title	Batch	2018 -2020
Hours/Week	3	Herbal Botany	Semester	I
			Credits	03

Course Objective

To study the various Indian systems of medicine, drug classification, adulteration and evaluation and cultivation and uses of medicinal plants.

Course Outcomes (CO)

K1	CO1	To acquire knowledge on traditional medicinal systems and classification of natural drugs
K2	CO2	To acquire knowledge on drug adulteration, drug evaluation and phytochemical investigations
K3	CO3	To understand the cultivation, pharmaceutical and therapeutical uses of medicinal plants.
K4	CO4	To develop entrepreneurship skill on herbal medicine products.

UNIT - I **(12 Hours)**

Traditional Medicinal system: Ayurvedha, Siddha, Unani and Naturopathy. Definition of Drug- Classification of natural drugs (Alphabetical, Morphological, Pharmacological, Chemical and Chemotaxonomical classifications). Traditional and Folklore medicines – Native medicines.

UNIT - II **(12 Hours)**

Pharmacognosy – Definition and Scope. Drug adulteration. Drug evaluation - Chemical evaluation, Physical evaluation and Biological evaluation. Phytochemical investigations.

UNIT - III **(12 Hours)**

Cultivation, collection and preparation of natural drugs- Macroscopic characters (Physical and Organoleptic characters), therapeutical and pharmaceutical uses of the following medicinal plants: *Adadhoda vasica, Centella asiatica, Datura metal, Piper nigrum, Azadirachta indica, Ocimum sanctum* and *Catharanthus roseus*

UNIT - IV **(12 Hours)**

Cultivation and utilization of selected medicinal plants – *Bacopa monnieri, Cassia senna, Gloriosa superba, Phyllanthus amarus* and *Rauwolfia serpentina.*

UNIT – V **(12 Hours)**

A Brief account of the following drugs

Drugs containing carbohydrates- *Isapgo*l.

Drugs containing tannins- *Myrobalan*.

Drugs containing lipids- *Arachis oil*.

Drugs containing resin and resin combination-*Cannabis*

Drugs containing alkaloids- *Cinchona*.

Text book:

1. Agarwal, 1985. Drug plants in India. Kalyani Publishers, Ludhiana.
2. Agarwal, S. S. and Paridhave, M, 2007. Herbal Drug Technology. University Press, New Delhi.
3. Bhattacharjee, S. K. 2004. Hand Book of Medicinal plants. Pointer Publishers, Jaipur
4. Biswas, P. K. 2006. Encyclopedia of Medicinal plants (vol. I-VII).Dominant Publishers, New Delhi.
5. Chopra, R. N. 1980. Glossary of Indian Medicinal plants. CSIR, New Delhi.

Reference Books:

1. Anonymous, 1999. Pharmacognosy of Indigenous Drug (Vol. I-III). Central Council for Research in Ayurvedha and Siddha, New Delhi.
2. Anonymous, 2004. Cultivation of selected Medicinal Plants. National Medicinal Plants Board, Govt. of India, New Delhi.
3. Jaibala, S. and Balakrishnan, G. 1975. Ahand book of common remedies based on Siddha system of Indian medicines. St. Louis institute press, Chennai.
4. John Jothi Prakash, E. 2003. Medicinal Botany and Pharmacognosy. JPR Publication, Valliyur, Tirunelveli.
5. Dhavan, B.N. Ayurvedic Research on Medicinal plants in India. INSA, New Delhi.
6. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. 2003. Pharrmacognosy. Nirali Prakashan, Pune.
7. Hanada, S.S. and V.K. Kapoor, 1993. Pharmacognosy. Vallabh Prakashan. New Delhi.
8. Harbourne, J. B. 1998. Phytochemical methods: A Guide to Modern Techniques of Plant Analysis (3rd edition). Chapman and Hill Co., New York.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER I

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P1BOE01B	Title	Batch	2018 -2020
Hours/Week	05	Plant Breeding and Evolution	Semester	I
			Credits	04

Course Objective

- To study the plant breeding techniques and evolution.

Course Outcomes (CO)

K1	CO1	To learn the selection and methods of plant breeding.
K2	CO2	To acquire knowledge on various hybridization techniques.
K3	CO3	To understand the breeding and theories of evolution.
K4	CO4	To apply the breeding techniques for crop improvement.

Unit – I **(12 Hours)**

Introduction and objectives of plant breeding, its relationship with other sciences. Plant introduction, domestication and acclimatization. Selection and Methods of Plant Breeding- Pure, Clonal and Mass.

Unit - II **(12 Hours)**

Hybridization techniques - interspectific and intergeneric hybridization - heterosis. Hybrid vigour and utilization. Mutation in breeding- Spontaneous Mutations, Mutagens and Induced Mutations. Heterosis, Autoploidy, Polyploids in plant breeding. Genetic erosion: reasonsand preventive methods.

Unit – III **(12 Hours)**

Plant production and haploid plants in breeding. Apomixes- importance of male sterility, Plant Breeding for Production of high yield varieties, developing Resistance to Insect, Pest, Production of disease resistant varieties.

Unit – IV **(12 Hours)**

Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants –Procedure, advantages and limitations.

Unit – V **(12 Hours)**

Evolution -Origin of life-theories of organic evolution: Lamarckism, Neo-Lamarckism, Darwinism, Neo-Darwinism, Mutation theory and synthetic theory-speciation and isolating mechanisms. Modern synthetic theory of Molecular evolution.

Text Books:

1. Allard, R.W (1960). Principles of Plant Breeding. John Wiley & Sons, New York.
2. Chaudhari, H.K. 1984. Elementary Principles of Plant Breeding. Oxford & IBH publishingCo. Pvt. Ltd., New Delhi.
3. Sharma, J. R. (1994). Principles and Practice of Plant Breeding, Tata McGraw Hill PublishingCo Ltd., New Delhi.
4. Shukla, R. S. and Chandel, P. S. (1977). Cytogenetics, Evolution and Plant Breeding, S.Chand & Co., New Delhi.
5. Verma, P. S. and Agarwal, V. K. (1998). Concepts of Evolution. S. Chand & Co, New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

Core Practical

For Students Admitted from the academic year 2018 – 2019

Core Major Practical I – Core Course IV (For Core Course I)

(Paper Code 18P2BOP01)

Algae, Fungi, Lichens and Bryophytes

Algae:

Study of morphology and anatomy of the vegetative and reproductive organs of *Lyngbya, Nostoc*, *Cladophora, Codium, Padina, Batrachospermum* and *Gracilaria*.

Fungi:

Study of morphology and anatomy of the vegetative and reproductive organs of *Peronospora, Aspergillus, Polyporus* and *Fusarium.*

Lichens:

Study of vegetative structures and structure of apothecium.

Bryophytes:

Study of morphology and anatomy of the vegetative and reproductive organs of *Targionia*, *Dumortiera* and *Lunularia*.

Note:

1. Field trip to a hill station and coastal area for a minimum period of five days for the collection of herbarium specimens and to observe and study the lower plants in their natural habitat.
2. Submission of 15 Herbarium sheets from Algae, Fungi, Lichens and Bryophytes.
3. Certified record work done in the laboratory during practical classes.

Practical examination at the end of second semester.

For Students Admitted from the academic year 2018 – 2019

Core Major Practical I – Core Course IV (For Core Course II)

(Paper Code 18P2BOP01)

Pteridophytes, Gymnosperms and Palaeobotany

Pteridophytes:

Study of morphology and anatomy of the vegetative and reproductive organs of *Psilotum, Isoetes, Equisetum, Angiopteris, Pteris, Osmunda* and *Salvinia.*

Gymnosperms:

Study of morphology and anatomy of vegetative and reproductive organs of *Araucaria, Podocarpus* and *Cupressus.*

Palaeobotany:

Study of the fossil forms: *Sphenophyllum*, *Lyginopteris* and *Cordaites*.

Certified record work done in the laboratory during practical classes

Practical examination at the end of second semester.

Core Practical

Model Practical Question Paper M. Sc., Botany Degree Examination

For Students Admitted from the academic year 2018 – 2019

Core Major Practical I – Core Course IV (For Core Course I & II)

(Paper Code 18P2BOP01)

Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms & Palaeobotany

Practical : 50

Record : 5

Viva-voce : 5

Time: 4 Hrs **Max. Marks : 60**

1. Make suitable micro preparations of **A, B, C, D** and **E.** Draw labeled sketches. Identify giving reasons. Submit the slides for valuation. **(5 x 4 = 20 Marks)**

2. Make suitable micro preparation of **F** and **G.** Draw labeled sketches identify giving seasons. Submit the slides for valuation. **(2 x 5 = 5 Marks)**

3. Identify any two algae from the given algal mixture **H**. Draw diagrams only. **(4 Marks)**

4. Name the genus and group of the given specimens **I** and **J.** **(2x2=4 Marks)**

5. Draw diagrams and notes of interest on **K, L**, **M** and **N.** **(4x3=12 Marks)**

Key:

A, B, C, D and **E** - Materials one each from Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms. (Preferably Vegetative)

F and **G -** Reproductive part one each from Pteridophytes and Gymnosperms.

I and **J** - Macroscopic structure one each from Pteridophytes and Gymnosperms.

K, L, **M** and **N -** Materials one each from Algae, Fungi, Bryophytes, Lichens and Fossils.

Note:

1. Submission of 15 Herbarium sheets from Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Gymnosperms.
2. Field trip to a hill station and coastal area for a minimum Period of five days for the collection of herbarium specimens and to observe and study the lower plants in their natural habitat.
3. Certified record work done in the laboratory during practical classes.

Core Practical

For Students Admitted from the academic year 2018 – 2019

Core Major Practical II – Core Course V (For Core Course III)

(Paper Code 18P2BOP02)

Taxonomy of Angiosperms

Taxonomy of Angiosperms

Identification of the specimens at family, Genera and species level belonging to the following hierarchy:

Dicotyledons:

1. Thalamiflorae – Menispermaceae, Magnoliaceae, Oxalidaceae, Caryophyllaceae and Polygalaceae
2. Disciflorae – Meliaceae and Sapindaceae
3. Calyciflorae – Lythraceae, Aizoaceae and Moringaceae
4. Bicarpellatae - Boraginaceae, Bignoniaceae, Oleaceae, Nyctaginaceae and Rhizophoraceae,
5. Monochlamydeae – Cactaceae, Loranthaceae and Aristolochiaceae

Monocotyledons:

6. Orchidaceae, Cyperaceae and Poaceae

Economic Importance

7. Economic importance of families mentioned above.
8. Familiarity with the use of Floras.
9. Preparation of dichotomous artificial keys using locally available plants.
10. A field trip of not less than 3 days to a place of luxuriant vegetation to study the flora and to study the different types of vegetation.
11. Submission of tour report and 25 Herbarium sheets (specimens collected from tour collection/ locally available plants) during practical examination.

- Certified record work done in the laboratory during practical classes.

Practical examination at the end of second semester.

Core Practical

Model Practical Question Paper M. Sc., Botany Degree Examination

For Students Admitted from the academic year 2018 – 2019

Core Major Practical II – Core Course V (For Core Course III)

(Paper Code 18P2BOP02)

Taxonomy of Angiosperms

Practical : 44
Record : 5
Herbarium :6
Viva-voce :5

Time: 4Hrs **Max. Marks: 60**

1 Find out the binomials of **A** and **B.** **(2x3=6)**

2. Refer specimens **C** and **D** to their respective families giving reasons at each level of hierarchy. **(2x4=8)**

3. Construct key using **E**, **F, G, H, I** and **J.** **(6 Marks)**

4. Mention the Family, Genus and Species of **K, L** and **M**. **(3 x 3=9)**

5. Write short notes on Taxonomic Literature on **N** and **O.** **(2 x 3 = 6)**

6 . Write Economic importance of **P, Q** and **R.** **(3 x 3=9)**

Key:

A, B, C and **D** - Flowering plants from families prescribed in the syllabus

E, **F, G, H, I** and **J** - Flowering Twigs.

K, L and **M** - Flowering plants from the families given in the syllabus.

N and **O** - Taxonomic literature mentioned in the syllabus

P, Q and **R** - Economic Botany.

Note:

- A field trip of not less than 4 days to a place of luxuriant vegetation to study the flora and to study the different types of vegetation.
- Submission of tour report and 25 Herbarium sheets (specimens collected from tour collection/ locally available plants) during practical examination.
- Certified record work done in the laboratory during the practical classes.

SEMESTER - II

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P2BO04	Title	Batch	2018 -2020
Hours/Week	6	Anatomy and Embryology of Angiosperms and Plant Micro technique	Semester	II
			Credits	05

Course Objective

- To study the anatomy and embryology of angiosperms, microscopy and plant microtechnique steps.

Course Outcomes (CO)

K1	CO1	To develop the skill of sectioning.
K2	CO2	To understand the internal tissue system of plants.
K3	CO3	To apply the skill of microtechnique for the preparation and identification of slides for industries.
K4	CO4	To acquire anatomical knowledge which are pointers for identification.

Unit - I **(15 Hours)**

Cell wall- pits, plasmodesmata and functions. Meristems – types - theories on shoot and root apical meristems. Procambium - cambium, vascular cambium - structure and function – Seasonal activity, role in wound healing and grafting.

Unit - II **(15 Hours)**

Complex tissues - secondary xylem and secondary phloem - structure and functions. Tyloses, heart wood and sap wood and growth rings. Leaf - structure – types. Secondary thickening in stem and root and periderm formation - lenticels. Anomalous secondary growth in dicot and monocot stems. Nodal anatomy- uni, tri and multilacunar nodes.

Unit – III **(15 Hours)**

Microsporogenesis and Megasporogenesis. Sexual incompatibility - genetic basis, barriers to fertilization, physiology and biochemistry of incompatibility. Endosperm and embryo- structure, types and development. Polyembryony – causes – types. Apomixis, Agamospermy, Apogamy and Parthenocarpy.

Unit – IV **(15 Hours)**

Light microcopy - optical principles, resolution, magnification and aberrations. Phase contrast microscopy - Dark field illumination. Electron microscope Transmission Electron Microscope and Scanning Electron Microscope - Principle and operation techniques. Maceration, Squashes, Smears and Clearing techniques.

Unit – V **(15 Hours)**

Microtechnique steps - fixation and fixatives, dehydration, clearing, infiltration, embedding block making and sectioning. Microtomes types and operating mechanism – Rotary and Sledge microtome. Stains and staining techniques. Camera lucida – types – principle and use. Micrometry

Text Books:

1. Bhojwani, S. S. and Bhatnagar, S. P. 2013. The Embryology of Angiosperms. Vikas Publishing House Private Limited, New Delhi.
2. Dwivedi, J. N. 1988. Embryology of Angiosperms. Rastogi and Company, Meerut.
3. Pandey, B. P. 2010. Plant anatomy, S. Chand and Company Private Limited, New Delhi.
4. Pandey, B. P. 2012. A Textbook of Botany: Angiosperms - Taxonomy, Anatomy, Embryology and Economic Botany, S. Chand and Company Private Limited, New Delhi.
5. Singh, V. 2010. Plant Anatomy and Embryology of Angiosperms, Global Media Publications, Delhi.

Reference Books:

1. Cutter, E. G. 1978. Plant Anatomy: Experimental and Interpretation. Edward Arnold Publishing Limited, London.
2. Esau, K. 1972. Plant anatomy, Wiley Eastern Private Limited, New Delhi.
3. Esau, K. 1977. Anatomy of Seed plants. Wiley Publications, New Delhi
4. Fahn, A. 1989. Plant anatomy. Macmillan Publication Private Limited, Singapore.
5. Fatin, A. 1982. Plant Anatomy (3rd Edition). Pergoman Press, Oxford.
6. Maheswari, P. 1976. An introduction to the Embryology of angiosperms, Tata Mc Graw Hill Publishing Company Limited, New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - II

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P2BO05	Title	Batch	2018 -2020
Hours/Week	6	Cell and Molecular Biology and Genetics	Semester	II
			Credits	05

Course Objective

- To study the structure and functions of cell organelles, DNA structure, RNA, protein synthesis, linkage, chromosome mapping, mutation and Hardy-Weinberg law.

Course Outcomes (CO)

K1	CO1	To acquire knowledge on various organelles present in the plant cell.
K2	CO2	To acquire knowledge on inheritance of characters and structure of genetic material.
K3	CO3	To understand the process of central dogma of molecular biology.
K4	CO4	To enhance the knowledge on cytogenetic research.

Unit - I **(15 Hours)**

Plasma membrane- structure models and functions. Cell wall, Chloroplast, Mitochondria, Golgi apparatus, Lysosomes, Endoplasmic Reticulum, Nucleolus and Nucleus - structure and functions. Apoptosis and programmed cell death.

Unit - II **(15 Hours)**

DNA structure – A, B, C and Z forms – replication, damage and repair. Chromosomes – morphology, ultra structure, types – lamp brush, polytene, isochromosome and B-chromosome. Structural and numerical variations in chromosomes. Modern concept of gene – introns, extrons and their significance.

Unit - III **(15 Hours)**

RNA types and biosynthesis of mRNA - Eukaryotic transcription – RNA polymerase - General and specific transcription factors - regulatory elements and mechanism of transcription regulation- transcriptional and post transcriptional gene splicing. Translation-initiation, elongation and termination.

Unit - IV **(15 Hours)**

Gene interaction and modified Mendel's F_2 ratio. Multiple alleles and pseudo alleles. Polygenic inheritance. Chromosome mapping. Sex determination- sex linked inheritance – cytoplasmic inheritance.

Unit - V **(15 Hours)**

Mutation- types and its role in evolution. Molecular basis of mutation. Mutagens- physical and chemical mutagens. Population genetics. Hardy – Weinberg law and its applications. Cis-trans effects. Regulation of gene expression in prokaryotes. Signal transduction – signaling molecules – signal receptors – signaling pathways.

Text Books:

1. Gupta, P. K. 2008. Cytology, Genetics and Genetic Engineering,. Rastogi Publication, Meerut.
2. Mohan, P. Arora. 1992. Evolutionary Biology, Himalaya Publishing House, New Delhi.
3. Sambamurthy, A. V. S. S. 1999. Genetics. Narosa Publishing House, New Delhi.
4. Sen, S., Kar, D. K. and Johri, B. M. 2005. Cytology and Genetics, Narosa Publishing House, New Delhi.
5. Sharma, A. K. and Sharma, 1965. Chromosome Technique. Theory and Practice Oliver and Boyd, London.

Reference Books:

1. Ayala and Kiegr, 1980. Modem Genetics. Benjamin Publishing Company, Amsterdam.
2. Bodmer, W. F., Cavalli – Sforza, L. L. 1976. Genetics, Evolution and Man. W. H. Freeman and Company, New York.
3. De Robertis. 1975. Cell Biology. W.C. Sander's Company, Philadelphia.
4. Dobzhansky, T. H. 1970. Genetics of the evolutionary process. Columbia University Press, New York.
5. Dupraw, E. J. 1969. Cell and Molecular Biology. Academic Press, New York.
6. Freifelder, 2008. Molecular Biology. Narosa Publishing House, New Delhi.
7. Harvey Lodish. 2008. Molecular Cell Biology. W. H. Freeman Publication, New York.
8. Lewin. 1994. Genes: (Vol. VII). Oxford University Press, London.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - II

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P2BOE02A	Title	Batch	2018 -2020
Hours/Week	5	Fundamentals of Computer Technology	Semester	II
			Credits	04

Course Objective

To study the classification, language, number system, computer software, MS Office, MS Excel, MS Power Point and MS Access.

Course Outcomes (CO)

K1	CO1	To study the classification, language and number system.
K2	CO2	To understand the computer software.
K3	CO3	To acquire knowledge on MS Office, MS Excel and MS Power Point.
K4	CO4	To develop the skill of applying the MS Access.

Unit - I **(12 Hours)**

Introduction to computers – Classification – Anatomy of a Digital Computer – Computer Architecture – Language – Number System – Logic gates (AND, OR, NOT, NAND, NOR).

Unit - II **(12 Hours)**

Computer software – operating system – programming languages – Computer networks – Internet and www. Electronic mail: Introduction – e-mail – Domain name and addresses – advantages and disadvantages of internets.

Unit -III **(12Hours)**

Introduction to Microsoft Office – MS Word – Creating and Editing Documents – Formatting Document – Creating Tables. MS – Excel: Spreadsheet Overview – Creating Worksheets –Editing and Formatting – Excel Formulas and Functions – Creating a Chart Data Forms, Sorts, Filter.

Unit - IV **(12 Hours)**

MS Power Point – Introduction – Menus – Toolbars – Text and Formats – Animations – Arts and Sound – Making the Presentation templates.

Unit - V **(12 Hours)**

MS – Access: Database Overview – Creating a Database – Modifying Tables and Creating Forms – Query – Creating Reports – Mailing Labels.

Text Books:

1. Alexis Leon and Mathews Leon, Fundamentals of Information Technology, Vikas Publishing House Private Limited.
2. Peter Norton, Introduction to Computer, 2nd Edition, TMH.
3. Sanjay Saxena. MS Office 2000 for Every One. Vikas Publishing House Private Limited.
4. June Slton. MS Office 2000 Professional Fast and Easy. BPB Publications.

Reference books:

1. Rajagopalan, S. P. Computer Applications in Business, Vikas Publishing House Private Limited.
2. Alexis Leon and Mathews Leon. Fundamentals of Computer Science and Communication Engineering. Vikas Publishing House Private Limited.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - II

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P2BOE02B	Title	Batch	2018 -2020
Hours/Week	5	Nanotechnology	Semester	II
			Credits	04

Course Objective

To study the origin, scope and importance of nanotechnology.

Course Outcomes

Unit -III

K1	CO1	To study scope and importance of nanotechnology.
K2	CO2	To understand the role of biomolecules.
K3	CO3	To acquire knowledge on detection and measurement of nanoparticles.
K4	CO4	To develop the skill of applying nanotechnology methods.

Unit – I **(12 Hours)**

Nanotechnology - origin, scope and importance. Nanoparticles - definition.Principles: quantization effects - inverse relationship between size and reactive surface area. Properties: surface effects, the effects of size, shape and surface area.

Unit - II **(12 Hours)**

Advances made with plant nanobionics - bomb detection, glowing plants, augmented photosynthesis, etc. Essentials of nanostructure generation: top-down vs. bottom-up. Physical, chemical and biogenic synthesis of nanomaterials- biomimetics, green plants and microorganisms. Role of biomolecules - reducing and/or capping agents: proteins, viruses and carbohydrates.

Unit-III **(12 Hours)**

Detection and measurement of nanoparticles-physical characterization by UV, FTIR, SEM, FESEM, DLS, X-ray diffraction and Zeta potential. Targeted nanoparticles: active & passive targeting.

Unit – IV **(12 Hours)**

Application: medicine, manufacturing & materials, delivery vehicles, cancer therapy, tissue engineering, fluorescent biological labels, biological assays, imaging agents, biosensors,manipulation of cells and biomolecules.

Unit -V **(12 Hours)**

Interactions between nanoparticles and living systems, interaction with cells, exposure of living systems to nanomaterials - toxicity effects. Mediators of the toxicity of particles. Factors influencing the interaction of nanomaterials over mammalian cells: uptake, transport and biodistribution of nanoparticles in living system, toxicity on cellular processes. Overview of EU regulatory aspects.

Text Books:

1. Sharon, M. & Sharon, M 2012. Bio-Nanotechnology- Concepts and Applications,CRC Press.

2. Atkinson WI.2011. Nanotechnology. Jaico Book House, New Delhi.

3. Imtiaz Alam Khan.(2005). Elementary bioinformatics. Pharma Book Syndicate, Hyderabad.

4. Rastogi, S.C., Mediarattta, N. and Rastogi. P. (2004). Bioinformatics, methods and applications, genomics, proteomics and drug discovery, Prentice hall of India, Pvt. Ltd., New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - II

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P2BOE03A	Title	Batch	2018 -2020
Hours/Week	5	Plant Bio-technology and Bio-informatics	Semester	II
			Credits	04

Course Objective

- To study the application of biotechnology, DNA recombinant technology, genetic engineering, enzymes, cloning and bio-informatics.

Course Outcomes (CO)

K1	CO1	To apply the skill of invitro regeneration techniques in plants.
K2	CO2	To create awareness on conservation of rare species through the tissue culture technique.
K3	CO3	To apply the skill of amplifying the industrial useful genes through PCR technology.
K4	CO4	To acquire knowledge on biological databases for analyzing and sequencing genomes of plants.

UNIT - I **(12 Hours)**

Biotechnology - scope and potentialities. Plant tissue culture – concept of totipotency –organization of tissue culture laboratory. Sterilization methods – Plant tissue culture media (MS) and plant hormones, Surface sterilization, callus culture, Micro-propagation, Organogenesis –Application of plant tissue culture in agriculture and crop improvement.

UNIT - II **(12 Hours)**

Somatic embryogenesis –encapsulated seeds. Production of haploids plants through anther culture –Protoplast isolation, culture and regeneration, methods of fusing protoplasts, somatic hybridization. Introduction to plant secondary metabolites. DNA transfer by particle bombardment, micro and macro injection methods – lipofection and electroporation.

UNIT - III **(12 Hours)**

Recombinant DNA technology – gene transfer in plants – aims, strategies for development of transgenic plants — organization of Ti plasmid, *Agrobacterium tumifaciens* mediated gene transfer. Transgenic plants with stress tolerance for drought and salinity, crop improvement, herbicide resistance, insect resistance, virus resistance, plants as bioreactors.

UNTI - IV **(12Hours)**

Genetic engineering – enzymes – nucleases, polymerases, ligases, alkaline phosphatase, reverse transcriptase – SI nucleases – vectors – use of plasmids, cosmids, phage and transposans as vectors – gene cloning – cloning in eukaryotes. Amplification of genes by PCR. Germplasm storage – Cryopreservation.

UNTI - V **(12 Hours)**

Bio-informatics – introduction, role of bioinformatics in various fields. Biological databases – Classification of biological databases – protein data base (SWISS-PROT). Bioinformatics tools – Fasta and Blast Version. Nanobiotechnology – Applications of nanotechnology in biology. Drug discovery. Diagnosis – DNA microarray.

Text books:

1. Dubey, R.C. 2001. A text book of biotechnology. S. Chand and Company Private Limited, New Delhi.
2. Gupta, P.K. 1994. Elements of Biotechnology. Rastogi Publications, Meerut.
3. Ignacimuthu, S. J. 2003. Plant Biotechnology. Oxford and IBH Publishing, New Delhi.
4. Kalyankumar, 1992. Plant tissue culture. New Central Book Agency, Calcutta.
5. Kumar, H. D. 1998. A Text book of Biotechnology. EWP, New Delhi.
6. Kumaresan, P. 2007. Biotechnology. Saras Publications, Nagercoil.
7. Shanmugavel, P. 2005. Principles of Bioinformatics, Pointer Publishers, Jaipur, India.

Reference Books:

1. David W. Mount. 2001. Bioinformatics Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press, New York.
2. Levin. 2000. Genes (Vol. I-VII). Oxford University Press, London.
3. Nicholl, D. S. T. 1994. Introduction to Genetic Engineering. Cambridge University Press, London.
4. Old, R. N. and Primrose. 1994. Principles of Gene Manipulation. Blackwell Scientific Publications, Oxford.
5. Pennigton, S. R. and Dunn, M.J. 2002. Proteomics. Viva Books Private Limited, New Delhi.

6. Purohit, S. S. 2003. Biotechnology – Fundamentals and Applications. Agrobios, New Delhi.
7. Satyanarayana, U. 2005. Biotechnology. Books and Allied Private Limited, Kolkata.
8. Singh, B. D. 2003. Biotechnology. Kalyani Publishers, New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER II

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P2BOE03B	Title	Batch	2018 -2020
Hours/Week	5	Genomics and Proteomics	Semester	II
			Credits	04

Objective of the Course:

- To acquaint the student with genome organization, gene identification, expression and applications of genomics analysis. Also about proteomics, analysis and its applications.

Course Outcomes (CO)

K1	CO1	To study the organization and structure of genomes.
K2	CO2	To understand the applications of genomics.
K3	CO3	To acquire knowledge on microarray technology in treating disease..
K4	CO4	To develop the skill on analysis of genomes.

Unit – I **(12 Hours)**

Introduction – Organization and structure of genomes, Genome size, Sequence complexity, Introns and Exons, Genome structure in viruses and prokaryotes, Isolation of Chromosomes, chromosome micro dissection, Retrofitting. Introduction to Proteomics – The Proteome, Mining proteomes, Bridging Genomics and Proteomics. Proteomics and thenew biology.

Unit – II **(12 Hours)**

Genome annotation, traditional routes of gene identification, detecting open-reading Frames, software programs for finding genes, Identifying the function of a new gene, gene ontology, overview of comparative genomics, Protein structural genomics, determining gene function by sequence comparison and through conserved protein structure Global expression profiling – Introduction, traditional approaches to expression profiling, Analysis of RNA expression, applications of genome analysis and genomics.

Unit – III **12 Hours)**

Analysis of proteomes - Two-dimensional polyacrylamide gel electrophoresis, Sample Preparation, Solubilization, Reduction, Resolution, Reproducibility of 2-DE- Detecting proteins in polyacrylamide gels, Image analysis of 2-DE gels.

Unit -IV **(12 Hours)**

Mass spectrometry based methods for protein identification- De novo sequencing using mass spectrometric data- Correlative mass spectrometric based identification strategies, 2-DE gel electrophoresis coupled with mass spectrometry, Micro array techniques- Types of micorarrays, Designing a microarray experiment, Microarray Technology in Treating Disease.

Unit - V **(12 Hours)**

Analysis of Genomes – Human, Mouse, *Plasmodium falsiparum*, *Saccharomyces cerevisiae*, Mycobacterium tuberculosis. Application of proteomeanalysis- drug development and toxicology, Pharmaceutical Applications, Proteomics in drug Discovery in human, phage antibodies as tools, Glycobiology and Proteomics in plant genetics and breeding.

Text Books

1. S. B. Primrose and R.M. Twyman - Principles of Genome Analysis and Genomics, 7th Edition, Blackwell Publishing, 2006.
2. Andrezej K Konopka and James C. Crabbe, Compact Hand Book - ComputationalBiology, Marcel Dekker, USA, 2004.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

Core Practical

For Students Admitted from the academic year 2018 – 2019

Core Major Practical III – Core Course VIII (For Core Course VI)

(Paper Code 18P2BOP03)

Anatomy and Embryology of Angiosperms and Plant Micro technique

Anatomy:

1. Study of the anatomical characters and anomaly of *Nyctanthus.*
2. Study of the anatomical characters and anomaly of *Bignonia.*
3. Study of the anatomical characters and anomaly of *Boerhaavia.*
4. Study of the anatomical characters and anomaly of *Leptadenia.*
5. Study of the anatomical characters and anomaly of *Bougainvillea.*
6. Study of the anatomical characters and anomaly of *Cucurbita.*
7. Study of the anatomical characters and anomaly of *Achyranthus.*
8. Study of the anatomical characters and anomaly of *Dracaena.*

Embryology:

1. With the help of suitable examples, to illustrate the features of the theory syllabus by whole mounts, embryo mounting and permanent micro-slides.

Plant micro-technique

1. Knowledge of functioning of rotary and sledge microtome.
2. Demonstration of section cutting using a rotary microtome and staining.
3. Measurement and calculation of macerated elements by micrometry.

Note:

- Submission of five double stained permanent slides as follows: Microtome section- 2 (or) Free hand sections- 2, Peel-1, Cleared material- 1, Maceration- 1
- Certified record work done in the laboratory during practical classes.

Core Practical

For Students Admitted from the academic year 2018 – 2019

Core Major Practical III – Core Course VIII (For Core Course VII)

(Paper Code 18P2BOP03)

Cell and Molecular Biology and Genetics

1. Study of squash with suitable materials.
2. Study of smear with suitable materials.
3. Observation of electron micrographs of sub-cellular structures.
4. Simple problems on monohybrid cross
5. Simple problems on monohybrid test cross
6. Simple problems on Dihybrid cross
7. Simple problems on Dihybrid test cross
8. Physical basis of monohybrid cross
9. Physical basis of Dihybrid cross
10. Simple problems on genetic interaction
11. Chromosome mapping from three point test cross – data, Calculation & Interference (Linkage & Crossing over Percentage).
12. To study the population genetics problems applying Hardy-Weinberg law.

- Certified record work done in the laboratory during practical classes.

Core Practical

Model Practical Question Paper M.Sc., Botany Degree Examination

For Students Admitted from the academic year 2018 – 2019

Core Major Practical III – Core Course VIII (For Core Course VI & VII)

(Paper Code 18P2BOP03)

(Anatomy of Angiosperms, Embryology of Angiosperms and Plant Micro technique, Cell and Molecular Biology and Genetics)

Practical : 50
Record : 5
Viva-voce: 5

Time: 4Hrs. **Max. Mar: 60**

1. Cut transverse section of **"A".** Identify the anomaly by giving reasons. Draw diagrams and submit the slides for valuation. **(6)**
2. Macerate and identified the elements in the **"B".** Measure the length or breadth using micrometer. **(6)**
3. From the given material **"C"** dissect and mount any two stage of embryo. Draw diagrams. Submit the slides for valuation. **(6)**
4. With the flower bud given in **"D",** identify any 2 developmental stages of microsporogenesis. Draw diagrams. Submit the slides for valuation. **(6)**
5. Prepare a squash of **"E".** Display any 2 stages of cell divisions. Draw labeled sketches. **(4)**
6. Construct a chromosome map of a three point test cross using the given data **F**. **(8)**
7. Solve the genetic problem **"G"** and **"H"**. **(2 x 3=6)**
8. Write notes of interest on **"I, J, K** and **L"**. **(2 x 4=8)**

Key:

A, B, C, D and **E**	- Material given in the practical class.
F	- Chromosome map data
G & H	- Genetic problem given in the practical (Mono & Dihybrid ratio)
I, J & K	- Spotters from Anatomy, Micro technique and Embryology (Slide/ Chemical/instrument)
L	- Spotter from molecular Biology

Note:

• Submission of 5 double stained permanent slides (Microtome or free hand sections – 2, Cleared material-1, Peel –1 and Maceration-1)

• Certified record work done in the laboratory during practical classes.

SEMESTER - III

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P3BO06	Title	Batch	2018 -2020
Hours/Week	6	Plant Physiology and Biophysics	Semester	III
			Credits	05

Course Objective

- To study the water and plant relation, photosynthesis, mechanism of respiration and role of plant growth regulators.

❖ **Course Outcomes (CO)**

K1	CO1	To acquire knowledge on water and plant relation, stomatal physiology, mechanism of mineral absorption and types of stress.
K2	CO2	To understand the pigment system and photosynthesis cycles.
K3	CO3	To develop an entrepreneurship skill among the plant science graduates for the production of plant growth regulators.
K4	CO4	To create awareness on physiological effects of plant growth regulators.

UNIT - I **(15 Hours)**

Water and plant relations - Absorption of water and its mechanism – Apoplast – symplast and Trans membrane transports. Mechanism of ascent of sap. Stomatal physiology, transpiration flux, antitranspirant. Mechanism of mineral absorption - passive and active uptake and transport, H+ ATPase as carrier, Nernst equation, donnan's potential and phloem transportation. Hydroponics. Environmental stress: Types of stress. Effect of water stress on crop plant.

UNIT - II **(15 Hours)**

Photosynthesis: pigment system I and II – Emerson's enhancement effect. Photochemical reactions. Cyclic, non-cyclic and pseudocyclic Photophosphorylation. Oxygen Evolving Complex (OEC), Kok's model. C3 and classification of C4 pathways. Photorespiration, CAM pathway.

UNIT - III **(15 Hours)**

Respiration- mechanism of respiration – Glycolysis – oxidation of Pyruvic acid – Krebs'cycle - Electron transport system – Hexose Monophosphate shunt – Enter- Doudoroff pathway – Respiratory quotient. Nitrogen Metabolism: Asymbiotic and symbiotic nitrogen

fixation. Nitrogenase, Leghamoglobin, nod and nif genes. Nitrate and Nitrite reduction. NR and NIR–assimilation of ammonia. Transamination interrelation between photosynthesis and nitrogen fixation.

UNTI - IV **(15 Hours)**

Physiological effects of plant growth regulators- Auxins, Gibberellins. Cytokinins, Ethylene, Abscisic acid, Morphatins, Cycocel (CCC) and Malic hydrazide (MH). Phytochrome – role and mode of action. Photoperiodism and mechanism of flowering. Vernalaization – Senescence – Dormancy. Physiology of seed germination.

UNTI - V **(15 Hours)**

Bioenergetics – laws of thermodynamics. Enthalpy, Entropy, free energy. Mitochondrial bioenergetics, chloroplast bioenergetics, ATP bioenergetics, NADP / NADPH redox couple bioenergetics. Photobiology – light characterization of solar radiation. Absorption spectrum, action spectrum and emission spectrum in molecules Fluorescence and Phosphorescence. Bioluminescence.

Text Books:

1. Noggle, GR. and Fritz, GJ. 1976. Introductory Plant Physiology, Prentice - Hall, India.
2. Verma, S. K., Mohit Verma. 2008. A Textbook of Plant Physiology, Biochemistry and Biotechnology, S. Chand and Company Private Limited, New Delhi.
3. Pandey, S.N and Sinha, B .K (2001). Plant Physiology. Third revised Edition, Vikas Publishing House Private Limited, New Delhi.
4. Jain, V. K. 2007. Fundamentals of Plant Physiology, S. Chand and Company Limited, New Delhi.

Reference Books:

1. Devlin, RM. 1974. Plant Physiology, Affiliated East West Press Private Limited.
2. Noggle, GR. and Fritz, GJ. 1976. Introductory Plant Physiology, Prentice - Hall, India.
3. Nobel, PS. 1970. Introduction to Biophysical Plant Physiology. W. H. Freeman and Company, San Francisco.
4. Beevers, L. 1976. Nitrogen Metabolism in Plants. William and Sons Limited, London.
5. Bray, CM. 1983. Nitrogen Metabolism in Plants, Longman.
6. Salisbury, F. B. and Ross, C.W. 1986. Plant Physiology. Third edition, CBS Publishers and Distributors, New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - III

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P3BO07	Title	Batch	2018 -2020
Hours/Week	5	Environmental Biology and Resource Management	Semester	III
			Credits	05

Course Objective

- To study the ecology, ecosystem, environmental pollution, biodiversity, threats to biodiversity, endemism, vegetation and afforestation.

Course Outcomes (CO)

K1	CO1	To study the autecology, population ecology, positive and negative interactions between species and qualitative and quantitative characters of community.
K2	CO2	To understand the various types of ecosystem.
K3	CO3	To develop an entrepreneurship skill among the plant science graduates for the eco-friendly products.
K4	CO4	To create awareness on conservation of biodiversity.

UNIT - I **(15 Hours)**

Aim and scope of Ecology. Autecology – Population ecology – characteristics of Population. Positive and negative interactions between species (Plant and animal interactions) – Synecology - Qualitative and Quantitative characters of community. Niche – definition and types. Methods of studying plant community.

UNIT - II **(15 Hours)**

Ecosystem: Kinds and structure – trophic levels. Food chain, Food webs and Ecological pyramids. Energy flow in the ecosystem. Characteristic features, structure and functions of forest, Grassland, Pond, Estuary and Manmade Ecosystem (Crop land). Biogeochemical cycles – Hydrological, Carbon and Nitrogen and Phosphorus cycles.

UNIT - III **(15 Hours)**

Environmental pollution – Air, Water, Soil, radiation and noise pollution – Ozone depletion – global warming and climate change – consequence –Rio de Janeiro summit (1992), Kyoto protocol (2005). Disaster management – floods, earth quake, cyclone, Tsunami and Landslides. Dams and their effects on forest and tribal people.

UNTI - IV **(15 Hours)**

Biodiversity: Definition - Genetic, species and ecosystem diversity. Value of biodiversity, consumptive use, productive use, social, ethic, aesthetic values. Biodiversity - at global and national levels. Hot – spots of biodiversity. Threats to biodiversity – IUCN. Red data book. Ecosystem approaches – species based approaches – social approaches – Chipko movement – *insitu* and *exsitu* conservation. Ecological indicators.

UNTI - V **(15 Hours)**

Endemism – Continuous and discontinuous distribution of vegetation. Phytogeographical regions of World – Types of vegetation in India. Deforestation and Afforestation - Age and area hypothesis – Remote sensing – Principle, tools and application in agriculture and forestry.

Text books:

1. Sharma, P. D. 2009. Ecology and Environment, Rastogi Publishers, Meerut.
2. Ambasht, R. S. 1988. A text books of plant ecology. Students, Friends & Co., Varanasi.
3. Shukla, R. S. and Chandel, P. S. 2006. A Text Book of Plant Ecology, S. Chand and Company Limited, New Delhi.
4. Mishra, D. D. 2009. Fundamental Concepts in Environmental Studies, S. Chand and Company Limited, New Delhi.

Reference books:

1. Edward J. Kormondy. 1996. Concept of Ecology, Prentice Hill of India Private Limited, New Delhi.
2. George L. Clarke. 1954. Elements of Ecology. John Wiley and sons. Inc., New York.
3. Mishra, K. C. 1980. Manual of Plant Ecology (Second edition), Oxford and IBH Publishing Company, New Delhi.
4. Odum E. P. 1971. Fundamentals of Ecology, W. B. Saunders Company, Philadelphia, London.
5. Mishra, D. D. 2009. Fundamental Concepts in Environmental Studies, S. Chand and Company Limited, New Delhi.
6. Asthana, D. K. and Meera Asthana. 2010. Environment Problems and Solutions. S. Chand and Company Limited, New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - III

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P3BO08	Title	Batch	2018 -2020
Hours/Week	5	Microbiology and Plant Pathology	Semester	III
			Credits	05

Course Objective

- To study the microbes classification, microbial culture, beneficial and harmful role of microbes, biodegradation, role of microbes in agriculture and plant diseases.

Course Outcomes (CO)

K1	CO1	To study the sterilization techniques and culture media.
K2	CO2	To understand the biopesticide, viral insecticide and fungal insecticide.
K3	CO3	To develop an entrepreneurship skill among the plant science graduates for the production of biofertilizer.
K4	CO4	To create awareness on plant diseases management.

Microbiology

Unit - I **(15 Hours)**

Microbiology – Definition – Sterilization techniques. Culture media (Chemical, complex and special media). Decimal dilution techniques. Soil and rhizosphere microorganisms. Microbial stains - staining methods - simple, differential and special stains.

Unit - II **(15 Hours)**

Microorganism – sources and types - air and water- source and types. Water and air sample techniques. Food spoilage. Microbes of milk and milk products. Viruses – general characters, structure, plant viruses- types. Bacteriophage, Cyanophage, Mycophages and Mycoplasma. Viroids and Interferons. Biopesticide - *Pseudomonas putida*, *Bacillus thuringiensis*, viral insecticides, fungal insecticides –*Trichoderma sp., Gliocladium virens*.

Unit - III **(15 Hours)**

Waste as a resource; organic compost – factor affecting composting – Sewage treatment –microbial leaching – biodegradation: biodegradation of petroleum, Xenobiotics; biosorption of heavy metal – biofiltration – bio deterioration of leather, paper, metal, plastics, safe practices. Agricultural microbiology - Biofertilizer - mass cultivation of *Rhizobium*, *Azotobacter* production of mycorrhizal biofertilizer - phosphate solublizing bacteria.

Plant Pathology

Unit - IV **(15 Hours)**

Introduction to plant pathology – disease – concept , component and causes – classification of disease, brief account on general symptoms of Plant disease – modes of Infection and dissemination – defense mechanisms in plants – phytoalexin – pathogen related protein, Systemic Acquired Resistance (SAR)- Plant diseases forecasting – Plant disease management – plant quarantine, chemical, cultural and biological control – bioformulation – integrated disease management.

Unit - V **(15 Hours)**

Study of the disease symptoms, causal organism, and transmission and control Measures of the following plant diseases.

1. Damping off of *Pythium.*
2. Little leaf of Brinjal (Mycoplasma).
3. Bacterial Blight of Paddy.
4. Bunchy top of Banana (Virus).

Text Books:

1. Powar, C. B. and Dagniwala, H. F. 1986. General Microbiology, Himalaya Publishing House, Bombay.
2. Singh, R. S. 1980. Plant Diseases. Oxford & IBH Publishing Co., Pvt., Ltd., New Delhi.
3. Subba Rao, N. S. 1977. Soil Microorganisms and Plant growth. Oxford & IBH Publishing Co., Pvt., Ltd., New Delhi.
4. Annadurai, B. 2008. A text book of Immunology and Immunotechnology. S. Chand & Co., Ltd. New Delhi.
5. Kuby, J. 2000. Immunology. 4th ed. W. H. Freeman & Co., New York.
6. Dubey, R. C. and Maheswari, D. K. (2010). A text book of Microbiology. S. Chand & Co. Ltd.
7. Rangasami, G. 1972. Diseases of Crop Plants in India. Prenticen Hall India (Pvt.) Ltd., New Delhi.
8. Pelezar Jr. M. J. Chan, E.C.S. and Krieg, N. R. 1986. Microbiology (5th edn.). Tata Mc Graw Hill Publication.

Reference Books:

1. Alexander, 1978. Introduction to soil microbiology, Willey Eastern.
2. Carpenter, P. L. 1977. Microbiology, W. B. Saunders Co., London.
3. Darglos, J. 1975. Bacteriophages, Chapman and Hall.
4. Freifelder, D. 1987. Microbial Genetics. Narosa Publishing House.
5. Ketchum, Paul, A. 1988. Microbiology: Concepts and Application, John Wiley and Sons.
6. Mandahar, C. L. 1978. An introduction to Plant Viruses. S. Chand & Co., New Delhi.
7. Mehotra, R. S. and Ashok Agarwal, 2003. Plant Pathology. Tata Mc. Graw-Hill Publication.
8. Microbes in action: A laboratory manual of Microbiology. W. H. Freeman & Co., New York.
9. Smith, K. M. Viruses. Cambridge University Press, London.
10. Nandhini Shetty. 2008. Immunology introductory text book. New age International Publishers, New Delhi.
11. Wein and Stewart, J. 1997. Immunology, Churchill Livingston, New York.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - III

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P3BOED01	Title	Batch	2018 -2020
Hours/Week	4	Herbal Botany	Semester	III
			Credits	04

Course Objective

- Acquiring knowledge on Indian systems of medicine, drug adulteration, drug evaluation, therapeutical and pharmaceutical uses and cultivation of selected medicinal plants.

Course Outcomes (CO)

K1	CO1	To study the various Indian systems of medicines and classification of crude drugs.
K2	CO2	To understand the drug adulteration, drug evaluation and phytochemical investigation.
K3	CO3	To develop entrepreneurship skill on cultivation of medicinal plants.
K4	CO4	To create awareness on importance of natural drugs preparation and natural pesticides.

Unit - I **(12 Hours)**

Traditional medicinal system: Ayurveda, Siddha. Unani and Naturopathy. Definition of Drug- Classification of natural drugs (Alphabetical, Morphological, Pharmacological, Chemical and Chemotaxonomical classifications). Traditional and folklore medicine – native medicine.

Unit - II **(12Hours)**

Pharmacognosy – Definition and Scope. Drug adulteration, Drug evaluation, Chemical evaluation, Physical evaluation and Biological evaluation. Phytochemical investigations, standardization and quality control of herbal drugs.

Unit - III **(12Hours)**

Therapeutical and pharmaceutical uses of the following medicinal plants: *Adadhoda vasica, Centella asiatica, Piper nigrum, Ocimum sanctum* and *Vinca rosea.*

Unit - IV **(12Hours)**

Cultivation and utilization of selected medicinal plants – *Bacopa monnieri, Aloe vera, Gloriosa superba, Phyllanthus amarus* and *Rauwolfia serpentina.*

Unit – V **(12Hours)**

A Brief account of the following drugs - Drugs containing carbohydrates- *Isapgol* and Indian gum, Drugs containing resin and resin combination-*Cannabis* and Drugs containing alkaloids- *Cinchona*. Natural pesticides – Neem.

Text Books:

1. Arumugam, K. R. and Murugesh, N. 1990. Text book of Pharmacognosy. Sathya Publishers, Chinnalapatti, Tamil Nadu.\
2. Bhattacharjee, S. K. 2004. Hand Book of Medicinal plants. Pointer Publishers, Jaipur.
3. Biswas, P. K. 2006. Encyclopedia of Medicinal plants (vol. I-VII). Dominant Publishers, New Delhi.
4. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. 2003. Pharrmacognosy. Nirali Prakashan, Pune.
5. John Jothi Prakash, E. 2003. Medicinal Botany and Pharmacognosy. JPR Publication, Valliyur, Tirunelveli.

Reference Books:

1. Agarwal, S.S. and Paridhave, M, 2007. Herbal Drug Technology. University Press, New Delhi.
2. Anonymous, 2004. Cultivation of selected Medicinal Plants. National Medicinal Plant Board, Govt. of India, New Delhi.
3. Chaudhuri, A. B. 2007. Endangered Medicinal plants. Daya Publishing House, Delhi.
4. Chopra, R. N. 1980. Glossary of Indian Medicinal plants. CSIR, New Delhi.
5. Hanada, S.S. and Kapoor, V.K. 1993. Pharmacognosy. Vallabh Prakashan. New Delhi.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

Core Practical - Syllabus

For Students Admitted from the academic year 2018 – 2019

Core Major Practical IV – Core course - XII (For Core Course IX, X and **XI)**

(Plant Physiology and Biophysics, Environmental Biology and Resource Management and Microbiology and Plant Pathology – 18P4BOP04)

Plant Physiology:

1. Measurement of stomatal index and frequency.
2. Measurement of membrane permeability as affected by chemicals and temperature.
3. Separation of photosynthetic pigments by paper chromatography.
4. Estimation of photosynthetic pigments by Arnon's method.
5. Estimation of leghaemoglobin content of root nodules.
6. Estimation of total nitrogen by Microkjeldhal method.
7. Seed viability - Tetrazolium chloride test.
8. Measurement of Hill reaction.

Demonstrations:

9. Determination of relative water content of leaf material.
10. Preparation of knops' solution - Hydroponics study.
11. Warburg manometer - principle and application.
12. Absorption spectrum of chlorophylls.

Environmental Biology and Resource Management:

1. Estimation of soil moisture content.
2. Determination of soil pH.
3. Study the plant community by Quadrat method by determining frequency, density and abundance of different species.
4. Determination of minimum size of the quadrats by species area curve method.
5. Determining minimum number of quadrats required to study vegetation.
6. Line transects method to study vegetation.
7. Belt transect method to study vegetation
8. Measuring the transparency level of an aquatic system using Secchi disc.
9. Spotting of Phytogeographical regions of India in maps - Soil
10. Spotting of Phytogeographical regions of India in maps - Vegetation
11. Spotting of Phytogeographical regions of India in maps - Botanical.
12. Study the Ecological interest of Ecosystems / Ecological tools / Photographs / Models / Plants - studied in the theory syllabus (spotters).

Microbiology:

1. Cleaning and sterilization methods. (Laminar air flow chamber, Autoclave and Oven)
2. Preparation of culture media -agar slant- agar plate.
3. Isolation of Microbes by streak and pour plate method.
4. Isolation of microbes by soil dilution techniques.
5. Isolation and identification of Bacteria and fungi from spoiled food.
6. Gram staining of Bacteria.
7. Simple staining of Bacteria (Ethylene blue/ crystal violet).
8. MBRT of milk (Phosphates test).

Plant Pathology:

Study the disease symptoms causal organisms, transmission and control measures of the following plant diseases:

9. Damping of Pythium
10. Little leaf of brinjal (Mycoplasma)
11. Bacterial blight of paddy
12. Bunchy top of banana (Virus)

Note:

1. Field study of an area (not less than a period of 4 days) to document environmental assets and study the ecosystems and different types of vegetation (Forest / Grassland / Mountain / National parks / Sanctuary / Botanical garden / Lake / Pond / River / Waterfalls / Estuary / Mangrove / Sea coast) submit a tour report (during the Internal practical examination).

Certified record of work done in the laboratory during practical classes.

Model practical question paper for M. Sc., Botany Degree Examination

Core Major Practical IV - Core course XII (For Core Course IX, X & XI)

(Plant Physiology and Biophysics, Environmental Biology, Resource Management and Microbiology and Plant Pathology) – 18P4BOP04

Practical: 50

Record : 5

Viva-voce: 5

Time: 4 Hrs

1. Set up the experiment **A** assigned to you. Record your observation and interpret the results. Leave the set up for valuation. (1X10=10)
2. Write notes on physiological interest of **B, C** and **D.** **(**3X3= 9)
3. Construct a meter quadrat **E**. Study the plant community by determining frequency, density and abundance of different species. Analysis the vegetation. (1X10=10)
4. Write notes of ecological interest of **F** and **G.** **(**3X2=6**)**
5. Determine whether the given sample **H** is contaminated with bacteria or not. Leave the sample for valuation. (1X5=5)
6. Name the causal organism, disease symptoms and control measures of the given material **I.** (1X4=4)
7. Write notes on **J** and **K.** (3 X 2=6)

Keys:

A - Plant Physiology experiment given in the syllabus (Selected by each student by lot)

B, C and **D** - Charts / Figures / Graphs/ Tables / Instruments / Apparatus / Chemicals / Models/ Photographs

E - Simple quadrat

F and **G** - Ecological tools / Chemicals / Graphs / Photographs / Maps of Phytogeographical regions / Vegetations of India

H - Samples given in the practicals

I - Pathological material specified in the syllabus

J and **K** - Spotters from Microbiology (Equipments / Instruments/ Chemicals / Culture media/ Stains/ Photographs /Slides)

SEMESTER - IV

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P4BO09	Title	Batch	2018 -2020
Hours/Week	5	Biochemistry and Biostatistics	Semester	IV
			Credits	04

Course Objective

- Acquiring knowledge on basic concepts of atoms and molecules and occurrence, structure and properties of carbohydrates, proteins and lipids.

Course Outcomes (CO)

K1	CO1	To study the bioenergetics and photobiology.
K2	CO2	To understand the carbohydrates, proteins and lipids.
K3	CO3	To develop the entrepreneurship skill on industrial production of carbohydrates, proteins and lipids.
K4	CO4	To create awareness on methods of sampling, classification and tabulation of data.

UNIT - I **(15Hours)**

Basic concepts of atoms and molecules – chemical bonds – covalent bonds, hydrogen bond, electrostatic interactions, hydrophobic interactions, Vander Waals forces. Optical isomerism, pH and its significance, isoelectric point. Buffer systems, Redox potential, Molarity, Molality and Normality.

UNIT - II **(15Hours)**

Carbohydrates: Occurrence, structure and properties of monosaccharides, oligosaccharides and polysaccharides. Biological significance of carbohydrates. Protein: Classification, structure – primary, secondary, tertiary and quaternary. Properties and purification of protein.

UNIT - III **(15Hours)**

Amino acids – classification and peptide bonds, Ramachandran plots, properties of amino acids, non-protein amino acids, amines and the role in cell function- amino acids metabolism. Enzymes: Chemistry of Enzymes- Classification – Mechanism of action – Factors affecting enzyme activity. Michaelis – Menten model of enzyme kinetics. Co-enzymes, isoenzymes allosteric enzymes, ribozymes and abzymes.

UNIT - IV **(15Hours)**

Lipids: Components of lipids – classification of fatty acids. Simple lipids, compound lipids and derived lipids (Steroids) – properties of lipids. Secondary metabolites - Biosynthesis and function of terpenoids, tannins, alkaloids and flavanoids. Vitamins: Structure, type, source and their role.

UNIT - V **(15Hours)**

Methods of sampling, classification and tabulation of data. Histograms – frequency polygon, frequency curve, Measures of central tendency – mean median and mode. Measures of dispersion – standard deviation and standard error. Student 't' test, Chi-square test and analysis of variance.

Text Books:

1. Rastogi, S. C. 2003. Outlines of Biochemistry, CBS Publishers and Distributors, New Delhi.
2. Stryer, L. 1988. Biochemistry, WH Freeman and Company, New York.
3. Jain, J. L., Sanjay Jain and Nitin Jain. 2009. Fundamentals of Biochemistry, S. Chand and Company, New Delhi
4. Conn, E. E., Stump, Bruening, G. and Doi, R. H. 2005. Outlines of Biochemistry 5th Edition, Wiley and Sons Private Limited, New York.
5. Satyanarayana, U. and Chakrapaani, U. 2009. Essential of Biochemistry, Books and Allied Private Limited, Kolkata.

Reference Books:

1. Richard, A., Harvey, Richard A. Harvey and Denise R. Ferrier. 2011. Biochemistry, Lippincott Williams and Wilkins, Philadelphia.
2. Nelson, D. L. and Cox, M. M. 2005. Principles of Biochemistry, W.H. Freeman and Company, New York.
3. Zuley, G. L. 1998. Biochemistry, Wm. C. Brown Publishers, United States of America.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - IV

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P4BO10	Title	Batch	2018 -2020
Hours/Week	5	Instrumentation Techniques	Semester	IV
			Credits	04

Course Objective

- Acquiring knowledge on principles, components, working mechanism and applications of biological instruments.

Course Outcomes (CO)

K1	CO1	To know the principle, components and working mechanism Colorimeter, UV and Visible Spectrometer, AAS and NMR.
K2	CO2	To understand the centrifugation basic principles and types chromatography.
K3	CO3	To develop entrepreneurship skill on bioscience research laboratories.
K4	CO4	To create awareness on importance of biological research.

UNIT - I **(15 Hours)**

Spectroscopy- Principle, components and working mechanism of Colorimeter, UV and Visible Spectrophotometer. Principle, working mechanism and applications of Flame photometer, Atomic Absorption Spectrophotometer (AAS) and Nuclear Magnetic Resonance Spectrometry (NMR).

UNIT – II **(15 Hours)**

Centrifugation – Principles, types of centrifuges- low speed, high speed and ultra centrifuges - preparative and analytical centrifuges. Types of centrifugation- Differential centrifugation and Density gradient centrifugation– operations and uses. Chromatography – basic principles and types – Paper Chromatography, Thin Layer Chromatography (TLC), Ion – exchange Chromatography, Gas Chromatography (GC) and High Performance Liquid Chromatography.

UNIT – III **(15 Hours)**

Basic principles, types of electrodes, working mechanism, standardization of pH meter and measurement of pH. Electrophoresis – Principles and types- Agarose Gel Electrophoresis, SDS - PAGE. Isoelectric focusing- principles and applications.

UNTI - IV **(15 Hours)**

Radiation dosimetry- Radioactive isotopes and half life of isotopes - Effects of radiation on biological system– G.M. counter and Scintillation counter – Autoradiography and Application of tracer technique in Biology. Photomicrography: Digital camera types – shutter speed – aperture – depth of field- digital imaging, transfer of digital signals to computer.

UNIT - V **(15 Hours)**

Choosing the problem for research –literature collection – Primary, secondary and tertiary sources – information from internet – indexing and abstracting – Reporting the results of research - in conferences: Oral and Poster presentation. Thesis writing - proof correction – Bibliography – Journals – types – Full paper – Short Communication – Review paper - monographs.

. **Text Books:**

1. Kothari, C. R. 1991. Research Methodology – Methods and Techniques, Wiley Eastern Limited, New Delhi.
2. Sree Ramulu, V. S. 1988. Thesis Writing, Oxford and IBH Publishing Company Private Limited, New Delhi.
3. Marimuthu, R. 2008. Microscopy and Microtechnique. MJP Publishers, Chennai.
4. Sivasankar, B. 2009. Bioseparations - Principles and Techniques. PHI Learning Private Limited, Delhi.

References Books:

1. Dey, P. M. and Harborne, J. B. 2000. Plant Biochemistry, Harcourt Asia Private Limited, New Delhi.
2. Plummer, D. T. 2003. An Introduction to Practical Biochemistry. 3rd Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.
3. Palanivelu, P. 2009. Analytical Biochemistry and Separation Techniques, Kalaimani Printers, Madurai.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER - IV

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P4BOE04A	Title	Batch	2018 -2020
Hours/Week	4	Pharmacognosy and Phytochemistry	Semester	IV
			Credits	04

Course Objective

To study the classification, nomenclature, source, importance, structure and chemistry of steroids, terpenoids, flavonoids, alkaloids and cardiac glycosides.

Course Outcomes (CO)

K1	CO1	To study scope and development of pharmacognosy and methods and types of extraction.
K2	CO2	To understand the classification, nomenclature, source, importance, structure and chemistry of steroids, terpenoids and flavonoids.
K3	CO3	To develop entrepreneurship skill on drug production.
K4	CO4	To create awareness on problems involved in standardization of herbal medicine.

UNIT – I **(15 Hours)**

Definition, history, scope and development of pharmacognosy. Importance of pharmacognosy with special reference to herbal drug industry. Sources of natural medicinal products.

UNIT - II **(15 Hours)**

Extraction - Introduction, definition, factors influencing the choice of extraction, principles of extraction methods, types of extraction (extraction of plant drugs). Selection and purification of solvents for extraction. Methods of isolation, (including industrial methods), purification and characterization.

UNIT – III **(15 Hours)**

Introduction, definition, classification, nomenclature, source, importance, structure and chemistry of Steroids, Terpenoids and Flavonoids.

UNIT – IV **(15 Hours)**

Introduction, definition, classification, nomenclature, source, importance, structure and chemistry of alkaloids - quinine, morphine, atropine, reserpine and ergot alkaloids and cardiac glycosides.

UNIT – V **(15 Hours)**

Importance of standardization and problems involved in the standardization of herbs. Standardization of single drugs and compound formulations. WHO guidelines for quality standardized herbal formulations. Estimation of the parameter limits used for standardization.

Text Books:

1. Agarwal, 1985. Drug Plants in India. Kalyani Publishers, Ludhiana.
2. Agarwal, S.S. and Paridhave, M, 2007. Herbal Drug Technology. University Press, New Delhi.
3. Bhattacharjee, S. K. 2004. Hand Book of Medicinal Plants. Pointer Publishers, Jaipur
4. Biswas, P. K. 2006. Encyclopedia of Medicinal Plants (Volume I - VII). Dominant Publishers, New Delhi.
5. Chopra, R. N. 1980. Glossary of Indian Medicinal Plants. CSIR, New Delhi.
6. Wallis, T. E. 2005. Text Book of Pharmacognosy. CBS Publishers and Distributors Private Limited, Bengaluru.
7. Sujata, V. Bhat, Nagasampagi, B. A. and Meenakshi, S. 2009. Natural Products - Chemistry and Applications. Narosa Publishing House, New Delhi.
8. Horborne, J. B. 1973. Phytochemical Methods: A guide to Modern Techniques of Plant Analysis. Chapman and Hall Limited, London.
9. Gokhale, S. B., Kokate, C. K. and Purohit, A. P. 2009. Pharmacognosy. Nirali Prakashan, Pune.

Reference Books:

1. Anonymous, 1999. Pharmacognosy of Indigenous Drug (Volume I - III). Central Council for Research in Ayurvedha and Siddha, New Delhi.
2. Anonymous, 2004. Cultivation of Selected Medicinal Plants. National Medicinal Plants Board, Government of India, New Delhi.
3. Jaibala, S. and Balakrishnan, G. 1975. A Hand Book of Common Remedies Based on Siddha System of Indian Medicines. St. Louis Institute Press, Chennai.
4. John Jothi Prakash, E. 2003. Medicinal Botany and Pharmacognosy. JPR Publication, Valliyur, Tirunelveli.
5. Dhavan, B.N. Ayurvedic Research on Medicinal Plants in India. INSA, New Delhi.
6. Gokhale, S. B., Kokate, C. K. and Purohit, A. P. 2003. Pharrmacognosy. Nirali Prakashan, Pune.

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

SEMESTER IV

Programme Code	M. Sc.	Programme Title	Master of Science (Botany)	
Course Code	18P4BOE04B	Title	Batch	2018 -2020
Hours/Week	5	Solid Waste Management	Semester	II
			Credits	04

Course Objective:

- To understand the importance of solid waste management.

K1	CO1	To acquire knowledge on decomposition of organic matter.
K2	CO2	To know the methods of solid waste management.
K3	CO3	To understand the importance and medicinal values of mushroom.
K4	CO4	To learn the technology of vermicomposting.

Unit – I **(12 Hours)**

Definition-scope and importance of solid waste management-Types of solid wastes-garbage, rubbish, agricultural, hospital and domestic wastes. Collection-transport and processing of solid wastes.Waste as a resource- organic compost-process of composting-Role of microbes in composting. Significance of organic compost.

Unit – II **(12 Hours)**

Organic matter decomposition- Decomposition of litter, cellulose, hemicelluloses, lignin, water soluble components and proteins. Carbon assimilation and immobilization. Microbes associated with organic matter decomposition. Factors affecting organic matter decomposition.

Unit – III **(12 Hours)**

Solid waste management- methods of solid waste management- open dumping, land, filling, incineration, pyrolsis Biogas production-mechanism of methane gas formation. Factors affecting methane formation. Utilization of Biogas.

Unit – IV **(12 Hours)**

Vermicomposting - Earthworm and it's characteristics-internal anatomy- digestive, excretory, respiratory and reproductive systems. Preparatory methods of vermiculture. Economic and ecological importance of vermicompost and vermiwash.

Unit – V **(12 Hours)**

Mushroom culture- classification-Tests for identification-Characteristics of common edible mushrooms-Nutritive value of mushrooms. Culture techniques-preparation of spawn-Preparation compost- spawn running and harvesting. Preservation and storage.Recipes of mushroom.

Text Book:

1. Dubey, RC. (2009). A Text book of microbiology, S. Chand & Co. Ltd, New Delhi.

Reference Books:

1. NIIR Board, 2004, The Complete Technology Book on Biofertilizers and Organic Farming, National Institute of Industrial Research.

2. Mohoney, R. Lab Techniques in Zoology, (UK: Butterworth, 1966)

3. Vasantaraj David, S. and Kumaraswamy, T. Elements of Economic Entomology, (Chennai: Popular Book Depo, 1998).

Mapping

PSO / CO	PS01	PS02	PS03	PS04	PS05
CO1	√	√	√	√	√
CO2	√	√	√	√	√
CO3	√	√	√	√	√
CO4	√	√	√	√	√

Core Practical Syllabus

Core Course - XV: Practical -V – (Covering the Core Courses XIII and XIV) (Biophysics and Biochemistry and Instrumentation techniques) - 18P4BOP05

Biochemistry and Biostatistics:

1. Preparation of solutions - percent - PPM, molal, molar and normality concentrations.
2. Preparation of buffers (phosphate & citrate)
3. Estimation of reducing sugars (Nelson - Somogyi method, 1952)
4. Estimation of total free amino acids (Moore & Stein, 1948).
5. Estimation of proline (Bates et al., 1973).
6. Estimation of protein (Lowry's Method, 1951).
7. Estimation of phenol (Mahadevan, 1996)
8. Analysis of a sample (leaf/fruit/seed) covering Mean, Median and Mode, Histograms, Frequency curve, Standard deviation and Standard error.
9. Estimation of ascorbic acid (Titration method).

Demonstration experiments:

10. Estimation of oil in oil seeds.
11. Assay of amylase (or) Peroxidase.
12. Study the spotters from the theory syllabus in Biochemistry and Biostatistics (Instruments/ Apparatus / Chemicals / Photographs / Charts / Figures/ Graphs / Tables / Diagrams / Models).

Instrumentation techniques:

1. Measurement of conductivity of water sample.
2. Verification of Beer's law using $CuSO_4$ / K_2Cr_2O7 solution.
3. Preparation of standard graph for Amino acid.
4. Estimation of dissolved Oxygen (Winkler's method).
5. Separation of photosynthetic pigments by Thin Layer Chromatography.
6. Separation of sugars by Thin Layer Chromatography.
7. Quantitative separation of any three standard amino acids by paper chromatography method.

Demonstration Experiments

8. Analysis of minerals K, Ca, Na from soil / water / plant samples using Flame Photometer.
9. Separation of proteins by Electrophoresis.
10. Isolation of DNA from plant tissue.
11. Study the spotters from the theory syllabus in research methodology (Instruments /Apparatus / Chemicals)
12. Study the spotters from the theory syllabus in research methodology (Photographs Charts / Figures/ Graphs/ Tables / Diagrams / Models).

Note:

1. Submit a data collection (not less than 20 pages) using internet for Literature Review / References to any one topic in the theory syllabus of Biochemistry / Biostatistics / Research Methodology (during the Internal practical examination).
2. Certified record work done in the laboratory during practical classes.

Model practical question paper for M. Sc., Botany Degree Examination

Core Course - XV: Practical -V (For Core Courses XIII & XIV)

(Biophysics and Biochemistry and Instrumentation Techniques) - 18P4BOP05

Practical: 50

Record : 5

Viva-voce: 5

Time: 4 Hrs

1. Conduct the experiment **A** assigned to you. Record your results. Leave the set up for valuation. (10)
2. From the given material **B** find out the mean and calculate the standard deviation with reference to its length. Present your data in the form of a graph. (07)
3. Determine the dissolved oxygen of the given sample **C** by Winkler's method**.** (08)

   (Or)

   Prepare a standard graph of the given amino acid **D.** (08)
4. Separate and identify the photosynthetic pigments from the given sample **E** using thin layer chromatography. (10)

   (Or)

   Separation of amino acid from the given sample **F** by Paper Chromatography method. (10)
5. Write notes on **G, H, I, J** and **K.** (5x3=15)

Key:

A - Biochemistry experiment from the syllabus (Selected by each student by lot)

B - Leaf / Fruit (anyone – 50 numbers)

C - Given Sample

D - Glycine

E - Leaves

F - Given Sample

G and **H** - Biochemistry (Equipments / Apparatus / Chemicals / Photographs / Charts/ Diagrams)

I - Biostatistics (Charts/ Diagrams)

J and **K** - Instrumentation techniques (Charts/ Figures/ Graphs/Tables/ Instruments/ Apparatus / Chemicals /Models / Photographs)

Project Work – 18P4BOPR01

4 Credits /6hrs/Week

Project is a component of the active learning module that teaches approach and research techniques. Students would have hands on experience in investigating a selected research problem where he/she shall be trained in framing and testing hypothesis through suitable research design. Students are required to select their research topic in the one of the following domain.

Allocation

- Student may select their broad research area during the end of the second semester and will be guided by a suitable research supervisor in the area allotted by the HOD.
- Each research supervisor may be allotted with one or two students based on the number of students
- Summer vacation may be used by the students to initiate their project work.

Objective of the study

- Topic investigated will have defined area of study.
- Project students will have hands on experience in all the instruments and techniques o conduct his/her original research.
- Minimum of 5-10 yrs of literature will be added in the review with recent publication of the year.
- Standard of the project work should be high enough to be presented in conferences or to communicate as a paper and be subjected to peer review.

Evaluation

- Interim reports should be submitted by the students during the mid of fourth semester to the Head of the Department. This interim report should form the basis for the final project report. (Change in project work after the submission of interim report may be carried out only with prior permission of the HOD).
- Even at instances where research is carried out as a group, individual students will be evaluated.
- Evaluation will be based on the norms that will look into nature of the project work, the content of the dissertation, presentation duly summed up by a viva-voce examination.
- Attendance of the student for presentation and viva-voce is a must.

Dissertation format

- Introduction
- Review of literature
- Materials and methods
- Results
- Discussion
- Summary
- Bibliography