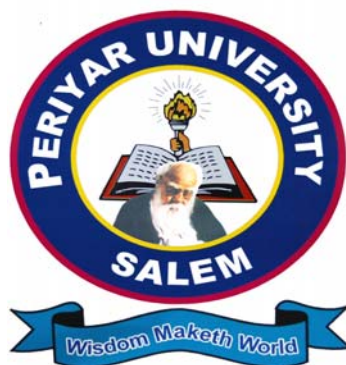


**PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM – 636 011**



**DEGREE OF MASTER OF SCIENCE
CHOICE BASED CREDIT SYSTEM
SYLLABUS FOR M.SC. BOTANY
FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2012 – 2013 ONWARDS**

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PERIYAR UNIVERSITY, SALEM - 636 011
M. Sc., Botany - Choice Based Credit System
Regulations and Syllabus
(Effective from the Academic year 2012 - 13 onwards)

AIMS

1. Aims at providing skills in critical thinking and evaluation of information.
2. To instill knowledge across wide areas of plant science.
3. Help to understand the evolution of land plants from simple ancestors.
4. Providing an opportunity to familiarize with life cycles and mode of Reproduction in Different plant groups.
5. As the course includes units from related branches like Biochemistry, Biophysics, Microbiology, and Biotechnology, Bioinformatics, and Nano biotechnology an Opportunity is provided to understand the relationship between Botany and other Related branches.
6. Appreciating the importance of Ecology of population and communities, the dynamics of Ecosystem, the Biosphere, and future of the Biosphere.
7. Identifying different flowering plants based on their characters.
8. The topics included in different units of different papers aim to enable the Students to develop technical skills and innovative approach in Botanical and Related branches.

SCOPE

- This course considers the patterns of plant diversity and the processes that generate and maintain plant diversity. It is an interdisciplinary approach in which major groups of plants are overviewed in holistic manner.
- This course also considers the Biology of plants. Different branches of Botany are given due importance as they deserve. Practical's are framed with an aim to improve skills in microcopy, observation, drawing, and laboratory exercise. During field trips the students are exposed to basic ecological principles and interactions.

- Students who complete this course will have better understanding on the types and sources of plants by diversity and the role of human and non human factors in plant diversity. Students will better understanding plants and their importance in Biosphere as life sustaining components.
- Students who complete this course can pursue research. As topics from relevant course are included there is a scope for the student to have opportunity in employment in state and central governments. Also the student has a scope for self employment.

**REGULATIONS OF PG COURSE IN BOTANY OFFERED IN THE
AFFILIATED COLLEGES**

1. CONDITION FOR ADMISSION

A candidate who has passed Br. V in Botany or Br. V (a) Botany Vocational - Biotechnology or any of the above degree of any other University accepted by the syndicate as equivalent, there to subject to such condition as may be prescribed therefore shall be permitted to appear examination and qualify for M. Sc. degree in Botany at this University after a course of study of two academic years.

2. DURATION OF THE COURSE

The course for the degree of Master of Science shall consist of two academic years divided in to four semesters. Each Semester consists of 90 working days. Practical examinations will be at the end of even semesters

3. PASSING MINIMUM

THEORY

University Examination (EA)	Internal Assessment (CIA)
75 marks	25 marks

Classification of Internal Assessment Structure

Marks

Test - 10 Marks
Seminar - 5 Marks
Assignment - 5 Marks
Attendance - 5 Marks

Total Marks = 25 Marks

Passing minimum (CIA) 50% - 12 Marks
Passing minimum (EA) 50% - 38 Marks

Total Passing minimum = 50 Marks

PRACTICAL

University Examination (EA)	Internal Assessment (CIA)
60 marks	40 marks

Classification of Internal Assessment Structure

Marks

Submission - 10 Marks

Test - 10 Marks

Attendance - 10 Marks

Continues assessment in Practical class - 10 Marks

Total Marks = 40 Marks

Passing minimum (CIA) 50% - 20 Marks

Passing minimum (EA) 50% - 30 Marks

Total Passing minimum = 50 Marks

- The candidate shall be declared to have passed the examination if the candidates secure not less than 38 marks out of 75 marks in the University examination in each theory paper and 12 marks out of 25 marks in the Internal Assessment and in total not less than 50 marks.
- For the practical paper 30 marks out of 60 marks in the University examination and the record notebook taken together and 20 marks out of 40 marks in the Internal Assessment and in total 50 marks. There is no passing minimum for the record notebook. However submission of a record notebook is a must
- For the project work and viva-voce a candidate should secure 50% of the marks for pass. The candidate should compulsorily attend Viva-voce examination to secure pass in that paper.

Internal Assessment (CIA) = 40 Marks

Dissertation = 40 Marks

Viva voce = 20 Marks

Total = 100 Marks

Passing minimum (CIA) 50% - 20 Marks

Passing minimum (Dissertation) 50% - 20 Marks

Passing minimum (Viva voce) 50% - 10 Marks

Total passing minimum = 50 Marks

(Dissertation evaluation and Viva-voce to be conducted by an External Examiner (Appointed by University) and internal examiner).

4. 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.
- Candidates who pass all the examinations prescribed for the course in the first Instance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking

5. MAXIMUM DURATION FOR THE COMPLETION OF THE PG PROGRAMME

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

6. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2012-13, i.e., for students who are to be admitted to the first year of the course during the academic year 2012-2013 and thereafter.

7. TRANSITORY PROVISION

Candidates who were admitted to the PG course of study before 2012 shall be permitted to appear for the examinations under these regulations for a period of three years i.e., up to and inclusive of the examinations of May 2015. Thereafter, they will be permitted to appear for the examination only under the regulation then in force.

PERIYAR UNIVERSITY, SALEM -636011

**M.Sc., BOTANY – CHOICE BASED CREDIT SYSTEM (ACADEMIC YEAR -2012 -2013 ONWARDS)
COURSE STRUCTURE**

Sem	Code	Course Title	Credits	Hrs	Marks		
					CIA	EA	Total
I	Core course -I	Biodiversity of Plants I (Algae, Fungi, Lichen, Bacteria &Viruses)	5	6	25	75	100
	Core course -II	Biodiversity of Plants II (Bryophytes, Pteridophytes , Gymnosperms and Paleobotany)	5	6	25	75	100
	Core course -III	Taxonomy of angiosperms Taxonomy practical (Practical Assessment and credit carried to Core Course VIII)	5	5 3	25	75	100
	Core course IV	PRACTICAL -I Algae, Fungi, Lichen, Bacteria ,Viruses Bryophytes, Pteridophytes , Gymnosperms and Paleobotany)	4	6	40	60	100
	Elective -I	Plant resource and utilization	4	4	25	75	100
	Total			23	30	140	360
II	Core course -V	Plant Pathology and Microbial Technology	4	5	25	75	100
	Core course -VI	Anatomy of Angiosperms , Plant micro techniques and Embryology	5	6	25	75	100
	Core course -VII	Cell and Molecular Genetics	5	6	25	75	100
	Core course -VIII	PRACTICAL II Taxonomy of Angiosperms ,Plant Pathology and Microbial Technology)	4	3	40	60	100
	Core course -IX	PRACTICAL -III Anatomy of Angiosperms , Plant Micro techniques and Embryology ,Cell and Molecular Genetics	4	6	40	60	100
	NME	Non major Elective paper	4	4	25	75	100
Total			26	30	180	425	600
III	Core course -X	Plant Physiology and Biophysics	5	6	25	75	100
	Core course -XI	Environmental Biology	4	6	25	75	100
	Core course -XII	PRACTICAL IV Plant physiology and Biophysics Environmental Biology	4	6	40	60	100

	Elective -II	Herbal Technology	4	6	25	75	100
	Elective III	Plant Biotechnology	4	6	25	75	100
		Total	21	30	140	360	500
IV	Core course- XIII	Biochemistry & Nanobiotechnology	4	6	25	75	100
	Core course -XIV	Bioinstrumentation, Biostatistics and Bioinformatics	4	6	25	75	100
	Core course -XV	PRACTICAL V Biochemistry & Nanobiotechnology, Bioinstrumentation, Biostatistics and Bioinformatics	4	6	40	60	100
	Elective -IV	Horticulture And Forestry	4	6	25	75	100
	Core course XVI	Project and dissertation work	4	6	40	60	100
		Total	20	30	155	345	500
		Grand Total	90	120	615	1485	2100
		Extra disciplinary course (Other than Botany major students)					
	Extra disciplinary Course papers I	Horticulture	4	4	25	75	100
	Extra disciplinary Course papers II	Herbal botany	4	4	25	75	100

PU- M.Sc., Botany (College), 2012-13

5 Credit /6hr/Week/90hr/SEM

FIRST SEMESTER**CORE COURSE - I. BIODIVERSITY OF PLANTS - I
(ALGAE, FUNGI, LICHENS, BACTERIA AND VIRUSES)****Unit I – Algae** 25hr

Classification of algae (F.E.Fritsch 1935,1945, Bold &Wynne 1978) - Criteria used for algae classification- Range of thallus structure – Life cycle pattern of algae – Phylogeny and Evolutionary trend in algae - General account on the Structure, Reproduction of algae belonging to Cyanophyceae, Chlorophyceae, Bacillariophyceae, Phaeophyceae, Rhodophyceae – Economic importance of algae – Ecology of algae –Fossil algae – Harmful algae

Unit II- Fungi 25hr

Classification of fungi (J. Alexopoulos and C.W.Mims 1979) - Range of structure, distribution, Reproduction, phylogeny and interrelationship of Myxomycetes, Oomycetes, Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes – Spore dispersal mechanism in fungi -Economic importance of fungi –heterothallism and parasexuality in fungi –Sex hormones and pheromones in Fungi - Mycorrhizae and AM fungi

Unit III -Lichens 10hr

Classification of Lichens (Hale, 1969) - Occurrence and interrelationship of Phycobionts and Mycobionts, Structure and reproduction in lichens – Lichens as indicator of pollution – Role of lichens in soil formation, Economic importance of lichens.

Unit IV - Bacteria 15hr

Classification of bacteria (Bergey, 1923) – Diagnostic feature of Archaeobacteria ,and Eubacteria - Morphology and ultra-structure of bacterial cell – organization of Bacterial cell wall layer, Motility- cilia, flagella and pili – Nutrition, Growth and reproduction - Economic importance. Extremophiles

Unit V – Viruses 15

History of Viruses – Classification (Harrison *et al.*1971) Structure and chemical composition of Double strand DNA viruses , Double strand RNA viruses, Cauliflower mosaic virus – Tobacco mosaic viruses . Bacteriophage – Classification, Morphology, Structure and reproduction, Isolation and purification of plant viruses, HIV/AIDS.

ALGAE

Text books

1. Sharma, O.P. (2011). Diversity of microbes & Cryptogams – Algae, Tata McGraw Hill Education Private Limited, New Delhi
2. Kumar ,H.D. (1985) . Introductory Phycology - East West press , New Delhi.
3. Kumar, H.D and Singh, H.N. (1982) .A text book of Algae. Affiliated East West Press, New Delhi.

Reference books

1. Bold ,H.C and Wyne M.J. (1978). Introduction to algae – Structure & reproduction – Prentice hall , New Jersey
2. Chapman ,V.J and Chapman. (1973). The algae – ELBS & MacMillan, London
3. Fritsch ,F.E. (1935).The Structure & Reproduction of The Algae (Vol1&2)Cambridge University press ,England
4. Round ,F.E.(1982). The Ecology of algae, Cambridge University press ,London
5. Lee, R. E. (2008). Phycology - IV Edition, Cambridge University Press ,New Delhi
6. Venkataraman G.S *et al.*, (1974). Algae form and Function – Today and Tomorrow publishers, New Delhi.

FUNGI

Text books

1. Sharma, O.P. (2011). Fungi and allied microbes The McGraw –Hill companies , New Delhi
2. Alexopoulos, C.J. Mims, CW. (1979). Introductory Mycology , Wiley Eastern ltd., New Delhi
3. Dube, H.C . (1990). An Introduction of Fungi. Vikas Publication House Ltd, New Delhi
4. Dube, H.C (1983). Introduction of Modern Mycology. Blackwell Science Publication. Oxford
5. Sharma, P.D (2003). The Fungi. Rastogi Publications, Meerut

Reference Books

1. Burnett, J.H. (1971). The fundamentals of Mycology. ELBS Publication, London
2. Bessey, E.A (1979) . Morphology and Taxonomy of fungi , Vikas publishing House Pvt ., Ltd , New Delhi.
3. R. S. Mehrotra, Aneja K.R. (1990). An Introduction to Mycology , New Age International Pub ,New Delhi
4. Sundararajan, S. (2004). Practical manual of fungi , Anmol publications Pvt.ltd New Delhi

LICHENS

Reference Books

1. Muthukumar, S. and Tarar, J.L. (2006). Lichen Flora of Central India, Eastern book Corporation, New delhi
2. Dharani Dhar Awasthi .(2000). A Handbook of Lichens Vedams eBooks (P) Ltd. New Delhi .
3. Hale, M.E . (1983). The Biology of Lichens. Edward Arnold, London
4. Nash TH (1996). Lichen Biology. Cambridge University Press, London

BACTERIA

Text books

1. Sharma ,P.D. (1992) . Microbiology , Rastogi & Co.,Meerut
2. Pelzer, M.J, Chan , E.C.S and Krieg, N.R .(1983). Microbiology , Tata MaGraw Hill publishing House , New Delhi.
3. Power and Dagainwala .(1994). General Microbiology , Himalayan publishing House , New Delhi

Reference Books

1. Stainer ,R.Y . Adelberg ,E.A and Ingram,J.L.(1978). General Microbiology , Mac Millan & Co,London .

VIRUSES

Text Books

1. Biswas ,S.B, Biswas ,A.(1997). An introduction to viruses (4th edition .Vikas .pub.House .Pvt. Ltd , Newdelhi

Reference Books

1. Cooper, J.J. (1995). Viruses and the environment (2nd edition) Chapman &Hall ,London
2. Nayudu M.V .(2008) . Plant viruses, Tata McGraw-Hill Education, New Delhi
3. Mandahar , C.l (1987). Introduction to plant viruses, S. chand & company , Pvt .Ltd , New delhi

PU-M.Sc., Botany (College), 2012-13

5 Credit /6hr/Week/90/SEM

FIRST SEMESTER
CORE COURSE -II . BIODIVERSITY OF PLANTS – II
(BRYOPHYTES, PTERIDOPHYTES , GYMNOSPERMS AND PALEOBOTANY)

Unit I - Bryophytes 25hrs

Classification of Bryophytes (Sporne, K.R. 1956), Distribution, Structures ,Reproduction and Life cycle of Marchantiales, Jungermanniales, Anthocerotales and Polytrichales – Comparative study of gametophytes and Sporophytes of major classes. Spore dispersal mechanisms - Economic importance with special reference to Chemical constituents, Bryophytes as indicator of Pollution, Succession of bryophytes. Evolutionary trends in Sporophytes and gametophytes of bryophytes.

Unit II - Pteridophytes 25hrs

Classification of *Pteridophytes* (Sporne, K.R. 1956), Morphology, anatomy, reproduction and evolution of the gametophytes and saprophytes of the following Families Isoetaceae, Equisetaceae, Ophioglossaceae, Osmundaceae, Gleicheniaceae, Pteridaceae, and Azollaceae

Unit III - Evolutionary approach in Pteridophytes 10 hrs

Phylogenetic trends in Pteridophytes - Evolution of Stele, Sorus – Origin of sporangium - Heterospory and seed habit –Alternation of generation – Affinities of various classes of pteridophytes

Unit IV - Gymnosperms 20hrs

Classification of gymnosperms (Sporne, K.R. 1956) - Comparative study of vegetative, anatomical and reproductive characteristics of major families Araucariaceae, Podocarpaceae, Cupressaceae, Gnetaceae– Economic importance of gymnosperms – Living fossils - Affinities with Angiosperms and pteridophytes.

Unit V - Paleobotany 10hrs

Geological time scale – fossilization and types of Fossil, carbon dating –Role of fossil in oil exploration- Fossil Bryophytes – Fossil Pteridophytes– *Rhynia*, *Sphenophyllum* , *Lepidocarpon* , *Cladoxylon* , *Pentoxylon*, *Botryopteris* - Fossil Gymnosperms – *Lyginopteris* – *Lagenostoma* – *Cordaites*.

BRYOPHYTES

Text Books

1. Rashid, A. (1998). An introduction to bryophyte. Vikas Publishing Co.New Delhi.

2. Vashishta, Sinha A.K, Adarsh Kumar. (2011). Bryophytes, S.Chand &Company ltd., New Delhi

Reference books

1. Cavers, F. (1971). The interrelationship of Bryophyta, Dawsons of Pall Mall, London.
2. Chopra, R. N. (1998). Topics in Bryology, Allied Published Ltd, Mumbai
3. Chopra, R.N and Kumar P.K. (1988). Biology of Bryophytes, John Wiley, New York.
4. Garham, L.E. (1993). Origin of land Plants. John Wiley, New York
5. Prem Puri, P. (1990). Bryophytes: Morphology, Growth and Differentiation.
6. Atmaram and Sons.
7. Smith, A.J.E. (1982). Bryophyte Ecology. Chapman and Hall. London
8. Watson E.V. (1968). British Mosses and Liverworts, Hutchinson and Co., London
9. Watson, E.V. (1970). Structure and life of Bryophytes. Hutchinson and Co, London

PTERIDOPHYTES

Text books

1. Vashishta, P.C, Sinha and Anilkumar (2010). Pteridophytes, S.Chand &company Ltd, New Delhi
2. Sharma, O.P. (1990). Textbook of Pteridophyta, MacMillan India Ltd., New Delhi
3. Smith, G.M (1955). Cryptogamic Botany Vol. II, Tata Mcgraw Hill Publishing Co., Ltd., New Delhi.
4. Rasheed, A. (1999). An Introduction to Pteridophyta, Vikas Publishing Co., New Delhi.
5. Vashishta, P.C. (1990). Pteridophyta, S.Chand & Co. Ltd, New Delhi
6. Johri, R.M. Sneh Lata and Sandhya Sharma, (2004). A Textbook of Pteridophyta. Vedams Books (P) Ltd., New Delhi

Reference books

1. Eames, A.J.(1936). Morphology of Vascular Plants - Lower groups, Tata Mcgraw Hill Publishing company Ltd., New Delhi.
2. Sporne, K.R. (1972). The Morphology of Pteridophytes, B.I. Publications, Madras
3. Sporne, K.R. (1970). The morphology of Pteridophytes (The structure of Ferns and Allied Plants) Hutchinson University, London.
4. Bower. F. O (1939). The Ferns (Vol. I,II,III), Today & tomorrow's Printers, New Delhi

GYMNOSPERMS

Text books

1. Sharma, O.P. (1997). Gymnosperms, Pragati Prakashan, Meerut, India
2. Bhatnagar and Moitra, (1996). Gymnosperms. New age International Publishers, New Delhi.
3. Johri, R.M, Lata S, Tyagi K (2005), A text book of Gymnosperms, Dominate pub and Distributer, New Delhi

4. Biswas, C. and Johri, B.M. (2004). The Gymnosperms. Narosa Publishing House, New Delhi.
5. Vashista P.C. (1990) . Gymnosperms, S. Chand & Co. Ltd., New Delhi

Reference books

1. Bierhost, D.W. (1971). Morphology of Vascular plants. McMillan Company, New York.
2. Chamberlain, C.J. (1934). Gymnosperms: Structure and Evolution. Chicago Reprinted 1950) New York.
3. Delveloryas, T. (1962). Morphology and evolution of fossil plants.
4. Doyle, W.T. (1970). Non Vascular Plants: Form and function. Belmont, California.
5. Foster and Gifford, Jr., (1962). Comparative Morphology of Vascular Plants. Allied Pacific Pvt. Ltd., Bombay.

PALEOBOTANY

Reference Books

1. Atchlay W.R & Woodnuff D.S. (1981). Evolution and speciation, Cambridge University Press, Cambridge.
2. Kimura, M. (1983). The natural theory of molecular evolution, Cambridge University Press, Cambridge.
3. Arora M.P. (1990). Evolutionary biology, Himalaya Publication House, Delhi.
4. Arnold C.I.A() – An Introduction to Paleobotany
5. Kirkaldy, J.E. (1963). The study of Fossils. Hutchinson Educational, London

PU-M.Sc., Botany (College), 2012-13.

5 Credits /6hrs/week/90hrs/Sem

FIRST SEMESTER**CORE COURSE –III. TAXONOMY OF ANGIOSPERMS****Unit -I** 25 hrs.

A brief historical account on the classification of angiosperms up to the present day. Systems of classification: Detailed study of classification of Linnaean, Bentham and Hooker, Engler and Prantl, Takhtajan, Cronquist, Bessy dicta, APG I, II,III systems – Merits and demerits. International code of Botanical Nomenclature, Typification, Principles of priority and their limitations, Effective and valid publication, citation, retention, choice and rejection of names.

Unit-II 15 hrs.

Magnoliaceae, Menispermaceae, Polygalaceae, Caryophyllaceae, Portulacaceae, Aizoaceae, Oxalidaceae, Tiliaceae, Combretaceae, Onagraceae, Lythraceae.

Unit- III 15 hrs.

Oleaceae, Gentianaceae, Scrophulariaceae, Bignoniaceae, Pedaliaceae, Nyctaginaceae, Casuarinaceae, Commelinaceae, Typhaceae, Cyperaceae, Orchidaceae. Economic importance of families mentioned

Unit - IV 20hrs

Flora and Monograph, Botanical gardens. Source of Taxonomic information. Modern trends - anatomy, Embryology, Palynology, Cytology and Phytochemistry in relation to taxonomy -DNA barcoding in plants

Unit- V 20hrs

Biosystematics – its aim and scope, biosystematic categories, Phenotypic plasticity, Phylogeny terms and concept – (Mono, para, Polyphyly) Turrens work, Species concept, Numerical taxonomy, Chemotaxonomy, Serotaxonomy, and Molecular systematics

Text books

1. Lawrence, GHM. (1995). The Taxonomy of vascular Plants (Vol I-IV) ,Central Book, Dept., Allahabad
2. Heywood VH. (1967). Plant Taxonomy , Edward Arnold , London
3. Jeffery C. (1982). An introduction to Plant Taxonomy, J& A Churchill Ltd., London
4. Mathew, K.M. (1983). The Flora of Tamil Nadu Carnatic, The Rapinat Herbarium, Trichy

5. Sivaraajan ,V.V.(1989). Introduction to Principle of Plant Taxonomy, Oxford and IBH, New Delhi.
6. Pandey, B.P.(1997).Taxonomy of Angiosperms , S.Chand & Co., New Delhi.
7. Singh, V. & Jain, K.K. (1989). Taxonomy of Angiosperms – Rastogi, Meerut
8. Vashista, P.C. (1990). Taxonomy of Angiosperms – S.Chand & Co., New Delhi.

Reference books

- 1) Hutchinson, J. (1973). The Families of Flowering plants , Oxford University press, London
- 2) Gamble,J.S , Fisher,L.E.F .(1967). The Flora of The presidency of madras (Vol-III) BSI, Calcutta
- 3) Davis , P.H and Heywood ,V.M. (1965). Principles of Angiosperm Taxonomy ,Oliver and Boyd Edinburgh
- 4) Kress J.W, Wurdack, K.J., E.A C., Zimmer, L.A .Weigt and Janzen D.H. (2005). Use of DNA bar codes to identify flowering plants. Proc. Natl. Acad .Sci USA 102, 8369-374.
5. Stoeckle , M.(2003).Taxonomy ,DNA and the bard code of life .bioscience 53: 796-797.
6. Simpson M.G.(2006). Plant systematics , Elsevier Academic Press,USA
7. Takhtajan, A.L. (1969). Flowering Plants – Origin and dispersal – Oliver & Boyed
8. Takhytajan A. (1991). Evolutionary trends in flowering plants , Bishen Singh Mahendra Pal Singh, Dehra dun

PU-M.Sc., Botany (College), 2012-13.

4 Credits /6hrs/week/90hrs/Sem

CORE COURSE IV – PRACTICAL –I**(COVERING THE CORE COURSE I AND II)****(ALGAE, FUNGI, LICHENS, BACTERIA, VIRUSES, BRYOPHYTES, PTERIDOPHYTES
GYNMOSPERMS AND PALEOBOTANY)**

Study of the Morphology and Anatomy of the vegetative and Reproductive parts of the following

- | | |
|---------------------------------------------------------------------------------------------------|------------|
| I. Algae | 20hrs. |
| a) Cyanobacteria : <i>Gloeocapsa, Spirulina, Nostoc, Scytonema</i> | |
| b) Chlorophyceae : <i>Dunaliella, Pandorina, Cladophora, Spirogyra, Codium, Caulerpa, Nitella</i> | |
| c) Bacillariophyceae : <i>Cyclotella and Navicula (Diatoms)</i> | |
| d) Phaeophyceae : <i>Padina, Turbinaria</i> | |
| e) Rhodophyceae : <i>Gracilaria</i> | |
|
II. Fungi |
15hrs. |
| a) Myxomycetes : <i>Plasmodiophora</i> | |
| b) Oomycetes : <i>Saprolegnia</i> | |
| c) Zygomycetes : <i>Pilobolus, Rhizopus</i> | |
| d) Ascomycetes : <i>Neurospora, Tapharina</i> | |
| e) Basidiomycetes : <i>Pleurotus, Lycoperdon,</i> | |
| f) Duteromycetes : <i>Cercospora, Fusarium, Colletotrichum</i> | |
|
III. Lichens |
2hrs |
| <i>Usnea</i> | |
|
IV. Bacteria |
13hrs |
| a) Growth measurement – Turbidity method, Colony counting by using Hemacytometer | |
| b) Microscopical observation of Colony morphology of bacteria | |

c) Preparation of Nutrient media

V. Viruses

a) Photographs of TMV Viruses, Cauliflower Mosaic virus, Bacteriophage, HIV Viruses
2hrs

VI. Bryophytes 10hrs

- a) Marchantiales : *Marchantia*, *Lunularia*
- b) Jungermaniales: *Porella*
- c) Anthocerotales : *Anthoceros*
- d) Sphangales : *Sphagnum*
- e) Polytrichales : *Polytrichum*, *Pogonatum*

VII. Pteridophytes 10hrs

- a) Isoetaceae : *Isoetes*
- b) Equisetaceae : *Equisetum*
- c) Ophioglossales : *Ophioglossum*
- d) Osmundaceae : *Osmunda*
- e) Gleicheniaceae : *Gleichenia* (*Dicryopteris*)
- f) Pteridaceae : *Pteris*
- h) Azollaceae: *Azolla*

V. Gymnosperms 10hrs.

- a) Araucariaceae : *Araucaria*
- b) Podocarpaceae: *Podocarpus*
- c) Cupressaceae: *Cupressus*
- d) Gnetaceae: *Gnetum*

VI. Fossil 10hrs

- a) Pteridophytes - *Rhynia*, *Sphenophyllum*, *Lepidocarpon*, *Cladoxylon*, *Pentoxylon*, *Botryopteris*
- b) Gymnosperms - *Lyginopteris* – *Lagenostoma* – *Cordaites*

Note

- A) Submission of 15 herbarium sheets from Algae /Fungi /Lichens /Bryophytes/ Pteridophytes / Gymnosperms
- B) Field trip to hill stations 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.
- C) Certified record work done in the laboratory during practical classes

* Practical examination at the end of Second semester

PU-M.Sc., Botany (College), 2012-13

4 Credits /4hrs/week/60hrs./Sem

FIRST SEMESTER**ELECTIVE COURSE-I. PLANT RESOURCE AND UTILIZATION****Unit-I**

5hrs.

Plant Biodiversity: concepts and status in India - World centers of primary diversity of domesticated plants – Plant introduction and secondary centers – Useful aspects of lower plants: Algae, Fungi and Lichens.

Unit - II

15hrs.

Binomial, Cultivation and uses of food crops: cereals (Rice and Pennisetum); Pulses- [Gram and Soya bean]; Vegetables-[Cauliflower, Potato]; Fodder crops-[Natural grass and cultivated fodder] oil cakes, Poultry feeds. Fiber and fiber plants: Nature of fibers. Binomial and uses of Cotton and Jute.

Unit - III

15hrs.

Medicinal plants: Classification of drugs, drugs from various parts of plants – chemical constituents– alkaloids– therapeutic uses. Binomial, cultivation, medicinal properties and uses of: *Dioscorea*, *Colchicum*, *Curcuma*, *Asafoetida*, *Adathoda vasica*, *Solanum nigrum*, *Piper betel*, *Phyllanthus emblica*, *Aegle marmelos*, *Trigonella foenum-graceum*.

Unit -IV

15hrs.

Vegetable oil yielding plants: Classification of vegetable oils – chemical constituents, nature of vegetable oils. Binomial classification and uses of corn oil, sunflower oil, Vegetable fat– *Cocos nucifera*. Forest resources: Wood – its importance and structure – types, properties, uses. A brief account of bio- diesel plants. Paper industry – raw materials, manufacturing process. Gums, tannins, dyes, resin yielding plants and their uses.

Unit-V

10hrs.

Plants used as avenue tree for shade, hedges, pollution control and Aesthetics . Strategies for conservation – *In situ* conservation; protected areas in India- Sanctuaries, National Parks, Biosphere Reserves, Wetlands, Mangroves and Coral reef for conservation of wild biodiversity, Strategies for conversation *ex situ* conservation; principle and practices; Botanical garden.

Text books

1. Sambamurthy, A.V.S.S. and Subramanyam, N.S. (1989). A Text Book of Economic Botany, Wiley Eastern Limited, New Delhi.
2. Sharma, O.P. (1996) .Economic Botany. Tata McGraw Hill Co. Ltd., New Delhi.
3. Youngken. Natural Drugs: Morphological and Taxonornic Consideration. Tirumalai Book House, Triplicane, Chennai.
4. Agrobios (India). A Hand Book of Medicinal plants – A complete Source, Agrobios , Jodhpur

Reference books

1. Agarwal, (1985). Drug Plants in India. Kalyani Publishers. Ludhiana.
2. Agrobios (India). Bio- diesel and *Jatropha* cultivation. Agrobios, Jodhpur.
3. Anonymous. (1980). Forest Research Institute. Indian Forest Utilization, Vols. I & II . The Manager of publications, Government of India Press. New Delhi.
4. Bhat. Chemistry of Natural Products.Tamilnadu Book House.Triplicane, Chennai.
5. Brown, A. Edith. Vegetable Oils, A & C Black Ltd. London.
6. Council of Scientific and Industrial Research, (1986). The Useful Plants of India.
7. Frankel, D.H. and Benneth, E. (1970). Genetic Resources in Plants: The Exploitation.
8. Gupta, P.K. (1996). Transgenic Plants: Some Current issues. Current. Sci. 70:
10. Kumar, U. (2004). Biodiversity: Principles and Conservation, Agrobios. Jodhpur.
11. Resources (Booklet). National Bureau of plant Genetic Resources. New Delhi.
13. Shani, K.C.(2000). The Book of Indian Trees. Oxford University Press, Mumbai.
14. Trivedi, P.C. (2005). Biodiversity Assessment and Conservation, Agrobios, Jodhpur.
15. Maiti and Singh. (2006) .Modern Economic botany , Agrobios (india), Jodhpur.
16. Mohamed Ali (2008). Pharmacognosy (Vol1&II) .B.S.Pub.&Distributer Pvt.Ltd , New Delhi.
17. Tyagi, B.K.(2009). Biodiversity and conservation of medicinal plants , Swashik Pub. NewDelhi

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4 Credits /5hrs/week /75hr/Sem

SECOND SEMESTER**CORE COURSE – V. PLANT PATHOLOGY AND MICROBIAL TECHNOLOGY****Unit I****Plant pathology****15hrs**

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 II**General microbiology****5hrs**

History, Scope and branches of microbiology - Staining procedure and confirmatory test, Growth Curve, Sterilization and inoculation procedures– Establishment of pure culture, Culture media – Synchronous, Batch and continuous culture, chemostate and turbidostate – preservation of microbes .

Unit III**Microbial genetics****15hrs**

Organization of Bacterial genome, Plasmids and extra chromosomal material– Conjugation- the F–factor, Hfr strains, F' strain– transformation; competence, mechanisms of transformation, Transduction–generalized transduction, Specialized transduction. Recombination and mechanisms - Transposable elements – classes, evolutionary significance of transposable elements. Genomics and Proteomics.

Unit IV**Agricultural and environmental microbiology****20hrs**

Waste as a resource; organic compost – factor affecting composting – Biogas production – Sewage treatment –microbial leaching – Biodegradation: Biodegradation of petroleum, Xenobiotics. Biosorption of heavy metal – biofiltration – bio deterioration of leather,

paper, metal, plastics, safe practices. Agriculture microbiology- Biofertilizer - mass cultivation of cyanobacteria, *Rhizobium*, *Azotobacter* production of mycorrhizal bio fertilizer- phosphate solubilizing bacteria – biopesticides – *Pseudomonas putida*, *Bacillus thuringiensis*, Virus insecticides, Fungi – *Trichoderma sp.*, *Gliocladium virens* – Mushroom cultivation.

Unit V

Food and Industrial microbiology

20hrs

Microorganisms growth in food – Controlling food spoilage pathogen- food borne disease – detection of food born pathogen – Aflatoxins, structure, function. Fermentation techniques – basis of fermentation process – surface culture process, submerged culture process – screening, detection and assay of fermentation products, stock culture and production media development. Microbiology of fermented foods– cheese production – Alcoholic beverages, Antibiotic, Vitamins, citric acid, organic acid, amino acid, single cell protein– factor affecting fermentation process– Food preservation methods – physical, chemical, biological.

Text books

1. Dubey RC, Maheswari DK (2007). A text book of Microbiology, S.chand & company, New Delhi
2. Powar, C.B. and Dagniwala, H.F. (1986). General Microbiology. Himalaya Publishing House, Bombay
3. Bilgrami, K.S. & H.C.Dube (1990) A text book of Modern Plant Pathology – Vikas Publishing House (P) Ltd., New Delhi
4. Freifelder, D. (1987). Microbial genetics. Narosa Publishing House, New Delhi
5. Sharma, P.D. (1992). Microbiology – Rastogi & Co, Meerut

Reference books

1. Prescott, Harley and Klein' S. (2008). Microbiology 7th edition, McGraw hill International Edition, New York
2. Alexander, (1978). Introduction to soil Microbiology, Wiley Eastern Private Ltd., New Delhi.
3. Carpenter, P.L. (1977). Microbiology, W.B. Saunders Co., London.
4. Darglos, J. (1975). Bacteriophages. Chapman & Hall Ltd., London
5. Ketchum, Paul, A. (1988). Microbiology: Concepts and application, John Wiley and Sons, New York
6. Mandahar, C.L. (1978). An Introduction to Plant Viruses. S. Chand & Co., New Delhi
7. Mehrotra R.S. and Ashoka Agarwal.(2003). Plant Pathology. TATA McGraw-Hill Publishing Co., Ltd., New Delhi
8. Pelezar Jr. M.J., Chan, E.C.S. and Krieg, N.R. (1986). Microbiology (5th edn.). TATA McGraw-ill publishing Co., Ltd., New Delhi.

9. Rangasami, G. (1972). Diseases of Crop Plants in India. Prentice Hall India (Pvt.) Ltd., New Delhi
10. Singh, R.S. (1980). Plant Diseases. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
11. Subba Rao, N.S. (1977). Soil Microorganisms and Plant growth. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
12. Gardner E.J, Simmons M.J, Snustad D.P.(2010) Principle of Genetics (VIII Edition) , WSE India Pvt. Ltd , New Delhi
13. Gunasekaran,P.(1995).laboratory manual in Microbiology , New age (P)Ltd Publisher
14. Agrawal , A.K, Parihar ,P. (2006). Industrial microbiology , Student Edition , Jodhpur

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5 Credits / 6 hrs. /week / 90hrs./Sem

SECOND SEMESTER**CORE COURSE – VI. ANATOMY OF ANGIOSPERMS, PLANT MICRO TECHNIQUE AND EMBRYOLOGY OF ANGIOSPERMS****Unit - I****20hrs**

Meristems – general account . Vascular cambium – origin, types, structure and etiology. Secondary xylem – ontogeny , structure and function – wood – diffuse and porous – Sap and heart wood – compression and tension wood- Arrangement vessels in secondary xylem, Secondary phloem – structure and function and ontogeny.

Unit - II**20hrs.**

Anomalous secondary thickening (*Aristolochia*, *Boerhaavia*, *Bignonia*, *Achyranthes*, *Nyctanthes* and *Dracaena*. Periderm formation –Lenticels. Secondary structure and vascular differentiation of root , Shoot and root transition – Ontogeny of Dorsiventral and Isobilateral leaf. Nodal anatomy.

Unit - III**15hrs**

Light microscopy –optical principle, resolution, magnification, aberration. Phase contrast microscopy – Dark field illumination. Electron microscope (TEM &SEM) – Principle and preparation techniques. Special techniques– Maceration, Squashes, Smears, Whole mount and clearing techniques.

Unit - IV**10hrs**

Micro technique steps –Fixation and fixatives, dehydration, clearing, infiltration, embedding, block making and sectioning. Microtome's – types –Principles and operating mechanisms, Stains and staining techniques, Camera Lucida – types, Principles and their uses. Micrometry

Unit V**25hrs**

Development of anther, physiology and etiology of anther, tapetum and development of ovule , Pollen– pollen morphology – pistil interaction, concept of Fertilization, Sexual incompatibility– genetics basis, barrier to fertilization, physiology and Biochemistry of Incompatibility. Structure and development of different types of Endosperm. Embryo development and nutrition of embryo. Polyembryogeny - causes –classification – practical value. Apomixis: agamospermy and apospory , parthenocarpy - types

Text books

1. Pandey, B.P. (1978). Plant Anatomy, S. Chand & Co., New Delhi.
2. Singh, V. Pande, P.C. & Jain D.K. (1987) – Anatomy of seed plants – Rastogi Publications, Meerut.
3. Pijushroy,(2010).plant Anatomy, New central Book Agency ,Pvt Lit, New delhi

Reference books

1. Cutter, E.G. (1970). Plant Anatomy: Experimental and interpretation. Edward,Arnold Pub. Ltd., London.
2. Cutter, E.G. (1971). Plant Anatomy, Edward Arnold Pub. Ltd., London.
3. Cutter, E.G. (1978). Plant Anatomy, Experimental and Interpretation. Edward Arnold Pub.Ltd., London
4. Esau, K.(1960). Plant Anatomy, Wiley Eastern Private Ltd., New Delhi.
5. Esau, K.(1977). Anatomy of seed plants. Wiley Eastern Publication, New Delhi.
6. Fahn, A.(1989). Plant Anatomy. Macmillan Publication (P) Ltd, Singapore.

Embryology**Text Books**

1. Bhojwani, S.S. and Bhatnagar, S.P. (1981). The Embryology of Angiosperms. Vikas, Publishing House Pvt. Ltd., New Delhi.
2. Maheswari, P. (1976). An introduction to the Embryology of Angiosperms. TATA McGraw-Hill Publishing Co., Ltd., New Delhi.

Reference books.

1. Johri, B.M. (1984). Experimental Embryology of Vascular plants
2. Davis, G.L. (1966). Systematic Embryology of the Angiosperms.
3. Dwivedi, J.N. (1988). Embryology of Angiosperms. Rastogi & Co., Meerut.
4. Rahavan, V. (1976). Experimental Embryogenesis in Vascular plants, Academic Press,London
5. Sporne, K.R. (1972). The Evolution of pollen types in Dicotyledons. New Phytol. 71: 181-185

Micro techniques**Text Book**

1. Patki L.R, Bhalchandra B.L, Jeevaji I.H.(1987). An introduction to Microtechnique, S.Chand and company (Pvt)ltd, New Delhi

Reference Books

1. Johansen, D.A. (1940). Plant Microtechnique, TATA McGraw Hill Book Co., Ins., New delhi.
2. Peter Gray, (1964). Hand book of Basic Microtechnique. McGraw hill publication ,new york
3. Steven Ruzin, (2005).Plant Microtechnique and Microscopy. oxford university press,london

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5 Credits / 6 hrs. /week / 90hrs. / Sem

SECOND SEMESTER
CORE COURSE- VII. CELL AND MOLECULAR GENETICS

Unit I **10hrs**

Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, structure & function of cytoskeleton and its role in motility .

Unit-II **20hrs.**

Structure and organization of membranes; Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport. Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

Unit-III **25hrs**

The central dogma and structure of DNA & RNA; topology of nucleic acids; chromosome structure in prokaryotes & eukaryotes; nucleosome organization ; palindrome sequence C-value paradox; DNA denaturation kinetics – Replication- unit of replication, Types , enzymes involved in replication. DNA damage and repair mechanisms. Mutation: spontaneous and induced mutation; molecular basis of mutations; mutation by radiation, chemicals. Population genetic , Hardy –Weinberg law.

Unit -IV

Transcription : Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport. Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational inhibitors, post- translational modification of proteins

Unit-V **15hrs.**

Organization of gene – regulation of gene; Operon concept, Gene regulation of Lac, Ara & Trp, regulation of gene expression in lambda phage, eukaryotes- heat shock genes, RuBP carboxylase gene in plants, RNAs in gene regulation – RNAi, SiRNAs & MiRNAs.

Text books

1. Ajoy paul (2009). Text book of Cell and molecular biology , books and Allied (p)Ltd Kolkata
2. Gupta, P.K (2009). Genetics, Rastogi publications , Meerut , NewDelhi
3. David Freifelder. (1985). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
4. Kumar, H.D. (1999). Molecular Biology. Vikas Publishing House Pvt. Ltd. New Delhi
5. Satyesh Chandra Roy and Kalyan Kumar De. (1999). Cell Biology. New Central Book Agency (P) Ltd. Calcutta.
6. Freifelder, D. (1995). Microbial Genetics. Narosa Publication, New Delhi
7. Walker J.M and Rapley,R (2006). Molecular biology and biotechnology(4th ed) Panima publishing corporation , New Delhi

References Books

1. Grierson, D. and Covey, S.N. (1984). Plant Molecular Biology. Blackie and sons, London
2. David. E. Sadava. (1993). Cell Biology. Jones and Bartlett Publishers, Boston.
3. De Robertis and De Robertis. (1998).Cell and Molecular Biology. B.I. Waverly Pvt. Ltd. New Delhi.
4. Geoffrey M. Cooper .(1997). The Cell – A Molecular approach. ASM Press , Washington.
5. William D. Stansfield *et al.*, (1996). Schaun’s outline of theory and problems of Molecular and Cell biology. McGraw Hill, New York.
6. Lodish, *et al.* (2000). Molecular and Cell Biology. W.H. Freeman & Co. New York.
7. Lewin, B. (2000). Genes VII. Oxford University Press. New York.
8. Karp.G. (2008) Cell and Molecular Biology.5th edn. John Wiley & sons. London
9. Lewin (2007). Gene IX. Jones and Barlett Pub. ISBN. 0 7637 5222 3
10. Old, R.N. and Primrose, S.B. (1989). Principle of gene manipulation – An Introduction to Genetic Engineering. Blackwell Scientific Publicaiton, Oxford. London
11. Brown,T.A.(2006). Genomes 3, Garland science , New yark
12. Strickberger, M.W.(2010) . Genetics (3rd edition) PHI Learning Pvt. ltd

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4 Credits /6hrs/week/90hrs/Sem

CORE COURSE -VIII
Practical -II (Covering the core course III &V)
(TAXONOMY OF ANGIOSPERMS & PLANT PATHOLOGY AND MICROBIAL TECHNOLOGY)

Taxonomy**45hrs**

Identification of Specimen at family, generic and specific level belonging to the following families

Magnoliaceae, Menispermaceae. Polygalaceae, Caryophyllaceae. Portulacaceae, Oxalidaceae, Tiliaceae. Combretaceae. Onagraceae, Lythraceae, Aizoaceae, Oleaceae, Gentianaceae, Scrophulariaceae, Bignoniaceae, Pedaliaceae, Nyctaginaceae, Casurinaceae, Commelinaceae, Typhaceae, cyperaceae, Orchidaceae,

- Economic importance of families mentioned above
- Familiarity with the use of Flora
- Preparation of Dichotomous artificial key using locally available plants
- A field trip of not less than four days to a place of luxuriant vegetation to study
- The flora and to study the different types of vegetation.
- Submission of a tour report and 25 herbarium sheets (Specimens collected from Tour collection / locally available plants during the Internal practical Examination.
- Certified record work done in the laboratory during practical classes

Microbial technology**45 hrs.**

1. Grams staining of bacteria found in Milk, curd, root nodule
2. Isolation and identification of bacteria and fungi from spoiled food
3. Testing quality of Milk by methylene blue reductase and phosphatase Test

Demonstration

1. Preparation of Spawn for cultivation of edible Mushroom
2. Media preparation and Culturing of Blue green algae
3. Isolation and Seed preparation of *Rhizobium*, Arbuscular mycorrhiza
4. Culturing of phosphate solubilizing bacteria or *Azospirillum*
5. Production of citric acid using *Aspergillus niger* – Solid state fermentation and Submerged fermentation.
6. Bio composting using *Trichoderma*

Note: Visits to other leading laboratories.

PLANT PATHOLOGY

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).

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4 Credits /6hrs/week/90hrs/Sem

SECOND SEMSTER**CORE COURSE - IX. Practical-III****(ANATOMY OF ANGIOSPERMS, PLANT MICRO TECHNIQUE AND EMBRYOLOGY OF ANGIOSPERMS, CELL AND MOLECULAR GENETICS)****ANATOMY, EMBRYOLOGY AND MICRO TECHNIQUES****30hrs**

Preparation of hand sections, maceration and clearing

1. Temporary and permanent mounting of whole specimens and Sections using different types of mountants.
2. Calibration of microscope and micrometry
3. Microtomy and microtome sectioning
4. Examination of different cell and tissue types with help of techniques
5. Structure of (primary and or secondary) leaf , root , stem and floral parts (including fruits)
6. Examination of vascular cambium and study of its activity
7. Examination of Structural and identification of Wood of some common Indian Timbers such as *Prunus* , *Mangifera indica* , *Terminalia* , *Tectona grandis*, *Swietenia Mahagoni* , *Azadirachta indica* *Lagerstroemia* and *Pterocarpus*

EMBRYOLOGY**15hrs**

1. Organization of anthers and pollens, pollen wall patterns, pollen germination and Pollen tube growth.
2. Study on ovary, ovules and their modification.
3. Isolation of plant embryos and embryonic tissues

Note

- i) A minimum of 10 double stained permanent sections
- ii) Record and observation note book.
- iii) Wax blocks and slides mounted with wax ribbons.
- iv) Group report on ontogenetic change in selected plant.

CELL AND MOLECULAR GENETICS

45hrs

1. Cell Biology: Squash and smear techniques –Onion root tip (mitosis) Rheo flower bud (Meiosis)
2. Microscopic view of cell organelles in plant cells – viewing Cystolith & Raphides, Chloroplast (Hydrila leaf)
3. Isolation of plant organelles by centrifugation techniques.
4. Separation of giant chromosome
5. Evaluation of Genetic concept by solving problem of Mendelian hypothesis, Epistasis, complementary, supplementary, duplicate factor, Interaction of genes Multiple alleles and Hardy-Weinberg law
6. Regulation of gene expression (With help of models /Charts /Book diagram
7. Three point test cross –chromosome map
8. Isolation of spontaneous mutations in bacteria by gradient plate technique.
9. Isolation of auxotrophs by UV mutagenesis.
10. Colorimetric estimation of DNA & RNA

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THIRD SEMESTER
CORE COURSE -X. PLANT PHYSIOLOGY AND BIOPHYSICS

Unit - I**20hrs**

Water relations of plants: Water potential, osmotic potential and pressure potential - their relationships. Stomatal physiology, transpiration flux, antitranspirants. Source - sink relationships in translocation of solutes. Mineral nutrition: Hydroponics – prospects and problems, nutrient solutions, chelating agents. Mineral ion uptake - passive and active uptake and transport, Nernst equation, Donnan's potential, role of H⁺ ATPase as a carrier, co transport (symport), counter transport (antiport) ionophores - Na⁺, K⁺, ATPase pump.

Unit - II**20hrs.**

Photosynthesis: recent concepts in photosynthetic electron transport, redox systems of chloroplast, cyclic, non-cyclic and pseudocyclic photophosphorylation. Oxygen Evolving Complex (OEC) Kok's model, photosynthetic carbon reduction cycles (PCR cycles): C₃, C₄ and CAM pathway, Classification of C₄ plants and their significance, CO₂ concentration mechanisms, light activation of photosynthetic enzymes. Photorespiration (PCO cycle) and its regulation. Respiration- RQ, factor affecting respiration.

Unit - III**25hrs**

Nitrogen fixation: Types, Nitrogenase, nif gene, Assimilation of nitrate and ammonium ion -NR, NIR, GDH and GS/GOGAT pathways, Transamination and other methods. Integration of nitrogen and carbohydrate metabolisms. Applications of auxins, gibberellins, cytokinins in agriculture and horticulture, Physiology of growth retardants - ethylene and abscisic acid, phytochrome mediated processes. Physiology of flowering & fruit ripening. dormancy of seeds, causes and methods of breaking dormancy. Ageing and senescence - types, physiological and biochemical changes. Physiology of seed germination.

Unit - IV**10hrs.**

Stress Physiology: definition, types and resistance mechanisms of water, drought, salt, ionizing and non ionizing radiation stresses. Secondary metabolites: Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

Unit -V**15hrs**

Bioenergetics: Concepts of free energy, entropy, high-energy compounds, bioenergetics of ATP. Aerobic and anaerobic respiration, Glycolysis, TCA cycle Pasteur effect, anaplerotic reactions, amphibolic nature of the citric acid cycle. Mitochondrial electron

transport and oxidative phosphorylation, mechanism of ATP-Synthesis, electron transport inhibitors and uncouplers, gluconeogenesis, glyoxylate cycle, cyanide resistant respiration, Pentose phosphate pathway

Text Books

1. Pandey, S.N and Sinha, B .K (2001). Plant Physiology. Third revised edition, Vikas publishing House Pvt. Ltd, New Delhi
2. Devlin, R.M., (1974), Plant Physiology, Affiliated East West Press Pvt. Ltd
3. Noggle, G.R. and Fritz, G.J., (1976). Introductory Plant Physiology, Prentice - Hall, India.
4. Jain ,V.K (2007).Fundamentals of plant physiology , S. Chand & Company ltd, New delhi.
5. Nobel, P.S (1970) Introduction to Biophysical Plant Physiology. W. H. Freeman and Company, San Francisco
6. Verma ,V.(2008).Text book of plant Physiology, Ane's student edition ,Newdelhi

Reference books

1. Beevers, L. (1976). Nitrogen metabolism in plants. William & Sons Ltd. London.
2. Bray, C.M. (1983). Nitrogen Metabolism in Plants, Longman.
3. Kramer, P.J,(1969).Plant and soil water relationship, A ModernSynthesis.
4. Salisbury, F, B and Ross, C.W (1986). Plant Physiology. Third edition, CBS Publishers and Distributors, New Delhi
5. Levitt, (1972). Responses of plants to environmental stress, Academic press, New York.
6. Bidwell RGS (1979). Plant Physiology, Mac Millan Publishing Company. New Delhi.
7. Taiz, L and Zeiger, E (1991) Plant physiology. The Benjamin/Cummings Publishing company, Inc., California, New York.

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4 Credits /6hrs/week/90hrs/Sem

THIRD SEMESTER**CORE COURSE - XI. ENVIRONMENTAL BIOLOGY****Unit-I** **25hrs.**

History and scope of ecology, Concept, structure and function of ecosystem. Synecology – Population ecology- characteristics of a population; population growth curves population regulations ; life history strategies (r and k selection); concept of metapopulation - demes and dispersal , interdemic extinctions, age structural populations. Modern concept of biotic community. Major and Minor communities. Methods of studying plant community: edges and ecotones .

Unit-II **20hrs.**

Ecological Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resources partitioning; character displacement. Ecological succession – types , mechanisms ; changes involved in succession , concept of climax- Biogeochemical cycling. Reserve and cycling pattern in tropical and temperate regions. Ecological indicators.

Unit-III **15hrs.**

Scope - Sources of air, water, soil, radiation and noise pollution – effects and control measures. Ozone depletion - Global warming and climate change – consequence – Rio de Janeiro summit (1992)- Kyoto protocol (2005) - El Nino, Disaster management - Floods, Earth quake, Cyclone, Tsunami and Landslides. Dams and their effect on forest and tribal Environmental impact assessment- biological monitoring programme, Environmental management and legislation (Broad outline)

Unit-IV **15hrs.**

Environmental education – Principles, Environmental education programmers. Environmental education in India. Environmental organization and agencies, Man and Biosphere programme (MAB), UNESCO, and UNEP. Map reading –types of maps political, geographical, revenue and forest , GPS and Geographic Information System (GIS). Grid and contour System latitudes, longitude and altitude. Principles and applications of Remote Sensing,

Unit-V **15hrs.**

Biodiversity and Wildlife of India and its conservation-Biogeography zones in India – Floristic region of India .Willis -Age and Area hypothesis, continues range, cosmopolitan circum polar, circum boreal and circum austral, Discontinues distribution Wager theory - continental drift hypothesis, endemism. Biodiversity – status, monitoring and documentation –Hot spots and biosphere reserves in India. Forest conservation through laws - the biological diversity Act (2002 in force) - world conservation strategy (WCS) and National biodiversity strategy and action plan (NBSAP). Principle and process of community based conservation.

Text books

1. Sharma, P.D. (2009). Ecology and Environmental, Rastogi Publishers, Meerut.
2. Ambasht, R.S. (1988). A text books of plant ecology. Students, Friends & Co., Varanasi
3. Pandey K, Shukla, J.P.(2009). Elements of toxicology , Wisdom press, New Delhi
4. Kumar, H.D.(1997) .General ecology , Vikas Publication company ,New Delhi

References books

1. Edward J. Kormondy, (1996). Concept of Ecology, Prentice Hill of India Pvt, Ltd. New Delhi.
2. Emil T. Charlett. Environmental Protection Tata Mc Graw Hill New Delhi.
3. George L. Clarke (1954). Elements of Ecology. John Wiley & sons. Inc., New York.
4. Misra K.C. (1980). Manual of plant ecology (second edition) Oxford and IBH Publishing Co., New Delhi.
5. Odum E.P. (1971). Fundamentals of ecology, W.B. Saunders Co., Philadelphia, London.
6. Perkins H.C. (1974). Air pollution, Mc Graw Hill Kongotusta Ltd, Tokyo.
7. Robert Smith, (1977). Elements of ecology and field biology, Harper and Raw Publishers, New York, London.
8. Michael. P. (1984). Ecological methods for field and laboratory investigations, Tata McGraw Hill publishing company Ltd., New Delhi.
9. Misra, R. (1986). Ecology work book, Oxford and IBH publishing company, New Delhi.
10. Russell, P.J Wolfe, S.L, Hertz P.E Starr, C McMillan, B. (2008). Ecology , Brooks and Cole cengage learning, U.S.
11. Jadhar, H.V, Purohit, S.H. (2008).Global pollution and environment monitoring , Himalaya Publishing house ,New Delhi
12. Myers A.A, Giller ,P.S (1988).Analytical biogeography, Chapman & Hall, London.
13. Gangopadhyay ,A.(2007). Plant diversity , Gene-tech book ,New delhi
14. Gupta ,P.K (2009). Soil, plant , water and fertilizer analysis . Agrobios (India), Jodhpur

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4 Credits /6hrs/week/90hrs/Sem

CORE COURSE - XII. Practical -IV**(PLANT PHYSIOLOGY, BIOPHYSICS AND ENVIRONMENTAL BIOLOGY)****PLANT PHYSIOLOGY****45hrs**

1. Determination of water potential (Shardakov's method)
2. Determination of solute potential
3. Chlorophyll estimation
4. Isolation of chloroplast and estimation of Photosystem II activity
5. Estimation of total acidity in CAM plants
6. Apparent photosynthesis
7. Estimation of Leg- hemoglobin content
8. Estimation of starch by perchloric method.
10. Estimation of nitrogen by Nessler's method
11. Estimation of proline and phenols in plant tissues under different environmental and physiological conditions

DEMONSTRATION

1. *In vivo* assay of NR, NiR.
2. Estimation of IAA
3. C₃ and C₄ anatomy, C₄ subtypes

ENVIRONMENTAL BIOLOGY PRACTICALS**45hrs.**

1. Analysis of vegetation – by using quadrat / line transect to find out frequency and Interpret the vegetation's in terms of Raunkiaer's frequency formula.
2. Estimation of Species diversity, frequency, density abundance, dominance, FICC, and Dominance biodiversity indices by using quadrat frame
3. Estimation of total biomass and herbage yield by harvest method.
4. Description of Zonation in a pond and stratification in a forest
5. Soil and water
 - i) Garden soil experiment to make texture.
 - ii) Capillary water.
 - iii) Field capacity.

- iv) Wilting coefficient.
 - v) pH of the soil/water
 - vi) Chemistry of the soil (NO_3 PO_4 & SO_3)
 - vii) Water analysis for dissolved oxygen and carbon-di-oxide.
 - viii) Analysis of BOD
6. Estimation of primary production in the given water sample by the Light-Dark bottle Method.
 7. Estimation of carbonate, bicarbonate and chloride content in water samples.
 8. Estimation of the quantity of planktons present in the given water sample

PHYTOGEOGRAPHY

A study of plant distribution maps – continuous, discontinuous, circum polar, circum tropical, endemic distribution

Note

- 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

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4 Credits /6hrs/week /90hrs/sem

THIRD SEMESTER**ELECTIVE COURSE – II. HERBAL TECHNOLOGY****Unit –I** 15hrs.

History of Medicinal plants. Traditional Medicinal systems: Ayurvedha, Siddha, Unani and Naturopathy. Definition of Drug - Classification of natural drugs, (Alphabetical, Morphological, Pharmacological, Chemical and Chemo taxonomical). Traditional and Folklore medicines - Native medicine.

Unit –II 15hrs

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 20hrs.

Cultivation, collection and preparation of natural drugs - Macroscopic characters (Physical and Organoleptic characters), therapeutical and pharmaceutical uses of the following medicinal plants: *Adathoda vasica*, *Aloe vera*, *Centella asiatica*, *Syzygium aramoticum*, *Datura metel*, *Piper nigrum*, *Allium sativum*, *Azadiracta indica*, *Ocimum sanctum* and *Vinca rosea*.

Unit –IV 20hrs.

Cultivation and utilization of selected medicinal plants - *Bacopa monnieri*, *Cassia senna*, *Gloriosa superba*, *Phyllanthus amarus* and *Rauwolfia serpentina*. Commercial value (Economically feasible or cost effective), women entrepreneurship development, marketing cultivated medicinal plants -National Medicinal Plants Board of India.

Unit –V 20hrs

Ethnobotany – definition-Major tribes of South India and their ethno botanical and ethno-biological heritage. Ethno Medicines. Ethnobotany and conservation of plants with special reference to India – mythology and conservation of ecosystems, conservation of selected plant species: sacred groves, forestry and unique ecosystems and their ethnobiological values, plants and animals in art, tradition and ethnography: Ethnobotanical field methods.

Text books

1. John Jothi Prakash, E. (2003). Medicinal Botany and Pharmacognosy.

- JPRPublication, Vallioor, Tirunelveli.
2. Gokhale, S.B., Kokate, C.K. and Purohit, A.P. (2003). Pharmacognosy. Nirali Prakashan, Pune.
 3. Prajapathi, Purohit, Sharma and Kumar. (2003). A Hand book of Medicinal plants. Agrobios Publications, Jodhpur.
 4. Kumar ,N.C (1993). An Introduction to Medical Botany and Pharmacognosy

Reference Books

1. Anonymous, (1999). Pharmacognosy of Indigenous Drugs (Vol. I-III). Central Council for Research in Ayurvedha and Siddha, New Delhi.
2. Anonymou, (2004). Cultivation of Selected Medicinal Plants. National Medicinal Plants Board, Govt. of India, 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. Chaudhuri, A.B. (2007). Endangered Medicinal Plants. Daya Publishing House, New Delhi.
6. Chopra, R.N. (1980). Glossary of Indian Medicinal plants. CSIR, New Delhi.
7. Handa, 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.
9. Jaibala, S. and Balakrishnan, G. (1975). A Hand book of common remedies based On Siddha system of Indian medicines. St. Louis Institute Press, Chennai.
10. Natkarni, K.M. (1998). Indian Materia Medica (Vol. I-III). Popular Prakasam, New Delhi.
11. Raychaudri, S.P. (1991). Recent advances in Medicinal, Aromatic and Spice crops (Vol. I). Today & Tomorrow publication, New Delhi.
12. Johnson,T (1999). CRC Ethnobotany desk Reference , CRC press ,New York

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4 Credits /6hrs/week /90hrs/sem

THIRD SEMESTER**ELECTIVE COURSE – III. PLANT BIOTECHNOLOGY****Unit –I**

20hrs

Biotechnology - scope and potentialities. Genetic engineering - enzymes - nucleases, polymerases, ligases, alkaline phosphatase, Reverse transcriptase – S1 nucleases - vectors - use of plasmids, cosmids, phagmids. Amplification of genes by PCR. cDNA and construction of cDNA libraries. Blotting techniques (Southern, northern and western blotting) – non radioactive probe – DNA diagnostics (RFLP, AFLP and RAPD) – DNA sequencing – restriction mapping.

Unit –II

20hrs.

Recombinant DNA technology - gene transfer in plants - aims, strategies for development of transgenic plants - specific and non-specific methods of gene transfer - organization of Ti plasmid in *Agrobacterium tumifaciens* - Ti plasmid mediated gene transfer. DNA transfer by particle bombardment, micro and macro injection methods -lipofection - electroporation. Gene knockouts and homologous recombination (holliday model).

Unit –III

15hrs.

Genes of agronomic interest and transgenic crops: Plants and genes of improved nutritional quality(Golden rice), Insect resistance (Bt cotton and Bt brinjal),terminator seed technology- antisense RNA(flavr savr) and RNAi technology – disease resistance, herbicide resistance, salt and stress tolerance, enhancement of shelf life of flowers and fruits.

Unit –IV

20hrs

Plant tissue culture - concept of totipotency - organization of tissue culture laboratory. Sterilization methods - callus induction, subculture and maintenance. Organogenesis - anther culture and production of haploids - somatic embryogenesis - isolation, culture and fusion of protoplasts - cybrids - micro-propagation – encapsulated seeds. Germplasm storage - Cryopreservation.

UNIT- V

15hrs.

Bioethics and Commercial concerns: Local and global trade projections; Species of interest; Cost saving, commercialization and Business opportunities; Leading companies and their business output; Intellectual Property Rights, implications for India,

WTO,WIPO,GATT,TRIPS,PBR and Farmer's rights. Patenting, procedures and applications for patent and granting of a patent, compulsory licences, patent search, PCT. Patent of living organisms. Social and ethical issues of Genetically Modified Crops; Food safety legislation, governmental role, International guidelines and regulations; Environmental hazards and health risks.

Text books

1. Dubey, R.C., (2001). A text book of biotechnology. S. Chand & Co., New Delhi.
2. Gupta, P.K. (1994). Elements of Biotechnology. Rastogi Publications, Meerut.
3. Ignacimuthu, S.J.(2003). Plant Biotechnology. Oxford & IBH Publishing, New Delhi.
4. John Jothi Prakash, E. (2005). Outlines of Plant Biotechnology. Emkay Publishers, New Delhi.
5. Kalyankumar De,(2008). Plant tissue culture. New Central Book Agency, Calcutta.
6. Kumar H.D. (1993). Molecular Biology and Biotechnology. Vikas Publishers, New Delhi.
7. Sathyanarayana BN and Vergheese DB (200). Plant tissue culture- Practices and new experimental protocols, ILK Publ. New Delhi

Reference Books

1. Bhojwani, S.S. & Razdan, M.K. (2004). Plant Tissue Culture, Read Elsevier India Pvt. Ltd.
2. Purohit S.S.(2010). Plant tissue culture , Student edition, jodhpur
3. Dix, P.J. (1990). Plant cell line and selection. VCH Publ.
4. Islam, A.S. (1996). Plant tissue culture. Oxford & IBH Publ.
5. Glick, B.R. & J.J. Pasternak. (2009). Molecular biotechnology, Panima Pub. Co.
6. Hammond, J.C. McGarvey and V. Yusibov, (2009). Plant Biotechnology, Springer Verlag. New york
7. Sambrook J and Russel DW, (2001). Molecular Cloning- A laboratory Manual., Cold Spring Harbour Publ.

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4 Credits /6hrs/week /90hrs/sem

FOURTH SEMESTER
CORE COURSE - XIII. BIOCHEMISTRY & NANOBIO TECHNOLOGY

Unit -I 10hrs.

Basics of chemistry

Structure of atoms, molecules and chemical bonds – Types- ionic bond, covalent bond, metallic bond, - weak interaction - hydrogen bond, hydrogen bond in biological system - hydrophobic bond- vander waals interaction water – structure, properties, ionization of water. Acid and bases. pH concept – buffer , Molarity, Molality and Normality.

Unit- II 20hrs.

Carbohydrate

Structure, classification, and properties . Carbohydrate metabolism - Glycolysis, pyruvate metabolism, pentose phosphate pathway, Gluconeogenesis and Glycogen metabolism, TCA Cycle – Metabolic role and its regulation. Nucleic acids: Nomenclature, Biosynthesis, Regulation of Biosynthesis and breakdown.

Unit- III 25hrs.

Amino acid, Protein and Enzyme Metabolism

Amino acids– classification and peptide bonds, Ramachandran Plot, properties of Amino acid - Amino acid metabolism, Urea cycle, one carbon reaction, non protein amino acids, amines and their role in cell function. Proteins: classification, structure – primary , secondary, tertiary and quaternary, properties of protein. Enzymes-Classification , Enzyme catalysis, specificity of enzyme action - Factors affecting enzymes activities, feedback and allosteric inhibition, reversible and irreversible inhibition, bi substrate reaction - Chemical kinetics and order of reactions, Michaelis and Menten equation, V_{max} and Michaelis constant – coenzymes

Unit - IV 20hrs.

Lipid and Secondary metabolism

Lipids and fatty acid metabolism - Lipids - Structure, classification, and properties, Biosynthesis of membrane lipids – Steroids – Steroid metabolism. Biosynthesis of major fatty acids, Fatty acid oxidation and energy production. Secondary metabolism in plants: polyamines, phenols – Isoprenoids – Cyanogen glycosides and Glucocyanulades -

Alkaloids terpenoids ,Flavonoids , Tannins – Outline of their biosynthesis and biochemical importance.

Unit - V

15hrs.

Nanobiotechnology

Introduction to Nano biotechnology - Applications of Nanobiotechnology in medicine and food-Bionanomaterials – Synthetic and Natural bionanomaterials -Implications of Nanoscience and nanotechnology on Society, Issues- Biosensors and their Applications, Nanoarrays, DNA double Nanowire, Biological Nanostructures – Applications of bionanoscience to materials research.

Text Books

1. Rastogi , S.C (2003). Outlines of Biochemistry , CBS Publishers & Distributors , New Delhi
2. Mahadevan ,A and Sridhar R.(1986) Methods in Physiological plant Pathology , Sivakami Publications, Madras
3. Stryer, L., (1988). Biochemistry, WH Freeman & Co., NY.
4. Jain J.L. *et al.*,(2008). Fundamentals of Biochemistry, Chand ,New Delhi
5. Conn E.E, Stumpf , Bruening G, Doi RH.(2005) . Outlines of Biochemistry 5/Ed, Wiley & Sons Pvt .ltd
6. Satyanaryana U, Chakrapani U, (2006). Biochemistry, Books and Allied (P)Ltd.

Reference Book

1. Apps *et al.*, (1992). Biochemistry, ELBS.
2. Caret *et al.*, (1993). Inorganic, Organic and Biological Chemistry, WMC Brown Pub. USA.
3. Nelson D.L, Cox M.M.(2005). Lehninger Principle of Biochemistry, W.H. freeman and Company, New York
4. Rawn, D. (1989).Biochemistry, Neil Patterson.
5. Zuley G.L., (1998).Biochemistry, Wm.C .Brown Publishers USA.

Nano biotechnology

Text Books

1. Pradeep T. (2007). NANO : The Essentials – Understanding Nanoscience and Nanotechnology, TATA McGraw – Hill Education.

Reference Book

1. Charles PP and Frank JO, (2006). Introduction to Nanotechnology, Wiley India Ed.
2. Abdelhamid Elaissari, (2008). Colloidal Nanoparticles in Biotechnology, John Wiley

- & Sons, Inc., Hoboken, New Jersey.
3. Brechignac C, Houdy P and Lahmani M, (2007). Nanomaterials and Nanochemistry
 4. Springer, New York.
 5. Kewal K. Jain MD, (2008) .The Handbook of Nanomedicine, Humana Press, USA

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4 Credits /6hrs/week /90hrs/sem

FOURTH SEMESTER**CORE COURSE XIV - BIOINSTRUMENTATION, BIOSTATISTICS AND BIOINFORMATICS****Unit- I** 20hrs.**Analytical techniques based on optical principles**

Photomicrography: Camera as the remote sensing device – types – shutter speed – aperture – depth of field – photographic techniques – printing (photographic emulsion, enlarger, developer and fixer) – Spectroscopy: Principles, components and working mechanism – Colorimetric, UV visible and Infra Red (IR), nuclear magnetic resonance (NMR), electron paramagnetic resonance (EPR), atomic absorption spectroscopy (AAS).

Unit- II 20hrs**Quantitative procedures based on physical principles**

Centrifugation: Principles, components, mechanism and application of clinical, refrigerated and ultra centrifuges – separation of organelles and macromolecules. Chromatography: Principles (absorption – partition – ion exchange – affinity), components, methodology and applications of the different types of chromatography – thin layer, GC, HPLC, qualitative and quantitative analysis of biomolecules. Radiometry: Isotopes, radioactivity, measurement of radioactivity- radioactive counters (scintillation counter), applications of radioisotopes, autoradiogram.

Unit- III 15hrs.**Methods targeting the electrolytic behavior:**

pH metry- pH concept, electrodes, standardization and buffers – acetate-phosphate-Tris Glycine, titration curve, pKa value. Electrophoresis: Principles, equipment, methodology and applications - PAGE, AGE, SDS- PAGE, 2 D electrophoresis , iso electrofocusing

Unit- IV 15hrs.**Research methodology**

Choosing the problem for research –literature collection – Primary, secondary and tertiary sources – Bibliography – indexing and abstracting – Reporting the results of research in conferences – Oral and Poster presentation . Thesis writing – Research

journals – National and International – monographs – reprints – proof correction – Full paper – Short Communication – Review paper.

Unit- V

20hrs.

Biostatistics and Bioinformatics

Biostatistics – Scope – Collection – classification, Tabulation and presentation of data – mean – median and mode. Standard deviation – Standard error – probability analysis – test of significance - 't' test – Chi-square test – permutation and combination – Skewness and kurtosis - correlation and Regression analysis- ANOVA. *In silico* methods: Computing in biology (statistical analysis, pictorial presentations and 3D simulation), online monitoring- introduction to bioinformatics - analysis of proteins and nucleic acids and data bases.

Text Books

1. Marimuthu, R. (2008). Microscopy and Microtechnique. MJP Publishers, Chennai
2. Wilson K, Walker, J. (1994). Principle and techniques of practical biochemistry, 4th ed) Cambridge university press, Cambridge
3. Attwood T K and Parry Smith D J, (1999). Introduction to Bioinformatics Addison Wesley Longman Limited, England
4. Khan, I.A., and Khannum, A., (1994). Fundamentals of Biostatistics, Vikas Pub., Hyderabad
5. Sree Ramulu, V.S., (1988). Thesis Writing, Oxford & IBH Pub., New Delhi.

References Books

1. Cooper. T.G. (1991). The Tools of Bio-chemistry, John Wiley & sons, London
2. Dey P.M. and Harborne, J.B (2000). Plant Biochemistry Harcourt Asia Pvt. Ltd.
3. Plummer D.T (2003). An introduction to practical Biochemistry. 3rd Edn. Tata McGraw Hill Publishing Company Ltd. New Delhi
4. Theil T., Bissen S. and Lysons E.M. (2002). Biotechnology DNA to protein. A Laboratory project in molecular biology, Tata McGraw Hill publishing company, New York.
5. Bryan Bergeron, M.D. (2006). Bioinformatics Computing, Prentice – Hall of India. New Delhi.
6. Stephen Misener and Stephen A. Krawetz. (2000). Bioinformatics-Methods and Protocols. Humana Press, Totowa, New Jersey.
7. Kothari, C.R., (1991). Research Methodology – Methods and Techniques, Wiley Eastern Ltd., New Delhi
8. Zar, J.H. (1984). Biostatistics Analysis, Prentice Hall International, England Cliffs, New Jersey,.
9. Harisha S (2007). Fundamentals of Bioinformatics. IK International Publishing house Pvt. Ltd. New Delhi.

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4 Credits /6hrs/week /90hrs/sem

FOURTH SEMESTER**CORE COURSE XV - PRACTICAL -V****BIOCHEMISTRY, NANO BIOTECHNOLOGY, BIOINSTRUMENTATION, BIOSTATISTICS AND BIOINFORMATICS****BIOCHEMISTRY**

45hrs.

1. Preparation of Phosphate and citrate buffers
2. Estimation of reducing sugars by Nelson - Somogyi method
3. Estimation of Total soluble sugars by Anthrone Method
4. Estimation of Total free amino acids by Moore and Stein method (1948)
5. Estimation of proteins by Lowry's method
6. *Peroxidase* assay from plant source
7. Catalase assay from plant source
8. Estimation of free fatty acid by titration

Demonstration

1. Determination of K_m -value, V_{max} , Michaelis constant for amylase or phosphorylase
2. Estimation of oil in oil seed by Soxhlet extraction
3. Preparation of Silver nanoparticles

BIOINSTRUMENTATION

30hrs.

1. Verification of Beer's law using $CuSO_4$ / $K_2Cr_2O_7$ Solution
2. Separation of photosynthetic pigments by TLC.
3. Separation of sugar/Amino acid by paper chromatography
4. Measurement of pH of the fruit juice.

Demonstration

1. Separation of plant pigments by Column chromatography
2. Electrophoretic separation of Nucleic acid /protein

BIOSTATISTICS

15hrs

1. Collection and tabulation of data (Continuous and discrete)
2. Construction of Histogram, Frequency polygon, Frequency curve,
3. Construction of Bar diagrams, Pie charts.

4. Calculation of Measures of central tendency for Discrete and continuous series (Mean, Median and Mode)
5. Calculation of measures of Dispersion for Discrete and continuous series (Standard Deviation and standard error).
6. Calculation of Skewness and kurtosis
7. Calculation of correlation and regression
8. Calculation of permutation and combination
9. Calculation of student's 't' test
10. Calculation of Chi - square test.
11. Calculation of One way and two way ANOVA.

BIOINFORMATICS

1. Exploring NCBI database system, querying the PUBMED and GenBank databases ,EBI server and searching the EMBL Nucleotide database, Exploring & querying SWISSPROT & UniProtKB

Reference Books

1. Sadasivam S, and Manicam A.(2008).Biochemical Methods , New Age International Publishers, New Delhi
2. Jeyaraman.J.(1998).Laboratory Manual in Biochemistry, New Age International Publishers Ltd
2. Palanivelu, P. (2009). Analytical biochemistry and separation techniques – A Laboratory manual for B.Sc and M.Sc students, 21st century Publications. Madurai

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4 Credits /6hrs/week /90hrs/sem

**FOURTH SEMSTER
ELECTIVE COURSE IV – HORTICULTURE AND FORESTRY**

Horticulture 15hrs.

Unit - I

Brief History of Horticulture – Divisions of Horticulture – Plant growth environment – soil and its preparations – organic manures and substrate – Farmyard manure, compost, Leaf mould, oil cake, Meat meals, Blood meal, Horn and Hoof meal - Liquid Manure, Peat Moss. Biofertilizers and Plant growth regulators in root initiation, flowering, fruit setting and development. Irrigation Types- Sprinkler Irrigation, Trickle Irrigation- Surface, Furrow, Surge, Pitcher.

Unit- II 15hrs

Plant Propagation - Seed propagation; Vegetative propagation- Cutting, Budding, Grafting and Layering. Nursery techniques – Preparation of soil bed – method of digging – bed size, types, spacing, rotation. Green house, Glass house, Poly house - construction and related equipments

Unit- III 20hrs.

Gardens types – formal, informal and kitchen – principle and design, landscaping. Aftercare of plants: weeding, Pruning, Top dressing and Topiary. Lawn making, Floriculture - cut flower, harvesting and marketing. Terrarium culture, Vegetable and fruit gardens, Hedge Plants, Hydroponics, Bonsai and Bonsai techniques. Flower Arrangement - Containers and requirements for flower arrangements Free style, Shallow and Mass arrangement - Japanese – Ikebana - Bouquet and garland making - Dry flower arrangement.

FORESTRY

Unit- IV 20hrs.

Forest types and their components – Alpine, Rain, Coniferous, Deciduous, Evergreen, Thorn and Scrubs jungles, Sholas, Grasslands, Estuaries and Mangrove. Forest Topography and stratification - top canopy, mid section, ground flora and fauna. Vegetation of western and Eastern ghats and Eastern Himalayas . Agro and Social forestry. Silviculture - concept, scope and practices..

Unit- V

Deforestation causes : natural calamities, human interference, denudation, invasion of Alien species , tree felling, cattle grazing and exploitation of forest products, quarrying and mining - effects and control measures –Do's and Don'ts inside forest area. Man and animal conflicts.

Afforestation and Reforestation. Forest Mensuration: definition, direct measurements, direct and indirect estimate, and prediction. Measurement of diameter – rules and methods, measurement of height – different rules, methods, instruments, total height and merchantable length.

Text Books

1. Prasad, S. and Kumar, U. (2010). Principles of Horticulture. Agrobios (India). Jodhpur.
2. Edmond Senn, Arews , Halfacre. (1987). Fundamentals of Horticulture, Tata McGraw Hill book Co., Ltd. New Delhi
3. Manibhushan Rao K 1991, Text Book of Horticulture, Macmillan Publications, Hyderabad
4. Kumar.N (1977) Introduction to Horticulture, Rajalakshmi Publications, Nagercoil, India.
5. Negi, S.S., (1994). India's Forests, Forestry and Wildlife, Indus publishing Co., New Delhi.
6. Khanna, I.S. (1984) Principles and practices of silviculture. Khanna Bhandu, Dehra Dun
7. Lal, J.B., (1989) India's Forests Myth & Reality. Nataraj Publishers, Dehra Dun
8. Ramprakash. (1986). Forest management. IBD Publishers, Debra Dun.
9. Dwivedi, A.P. (1992) Agroforestry – Principle and practices. Oxford and IBH Publishing Co., New Delhi.

Reference books

1. Arora J.S. (1990). Introductory Ornamental Horticulture, Kalyani Publications
2. Bailey L.H. (1901). The Standard Cyclopaedia of Horticulture Volume 1,2 and 3, Macmillan Publications
3. Chauhan V.S, Vegetable Production in India, RamPrasad & Sons
4. Shujnronto, (1982), The Essentials of Bonsai, David & Charles
5. Bose, T.K. and Mukherjee, D (1972). Gardening in India, Oxford & IBH Publishing Co., Kolkatta, Mumbai, New Delhi.
6. Pratibha, P. Trivedi . (1987). Home gardening, ICAR Publication, New Delhi.
7. Randhawa (1997). Ornamental Horticulture in India, Today & Tomorrow Publishers, New Delhi
8. Frederick S. Backer, (1950). Principles of silviculture, Mc Graw Hill Book Co. NY
9. Donald Bruce and Grancis X. Schumacher. (1950). Forest menturation, , Mc Graw Hill Book Co. NY
10. Bor,N.L (2010). A Manual of Indian Forest Botany,(Second Edition) Asiatic pub., New Delhi

11. Benu Singh, (2010). A Modern Book on Forestry and Horticulture, Vista International Pub. New Delhi
12. Stebbing E.P.(1982) .the forest of India ,A.J. Reprints agency, New Delhi.

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4 Credits /6hrs/week /90hrs/sem

FOURTH SEMESTER

CORE COURSE XVI - PROJECT AND DISSERTATION WORK

Project is a component of the active learning module that teaches approach and research techniques. Students would have a 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.

BROAD RESEARCH AREAS

- Plant diversity and Systematic
- Plant physiology and Biochemistry
- Plant Molecular Biology and Biotechnology
- Microbiology and Plant pathology
- Environmental biology

Allocation

- Student may select their broad research area during the end of the third 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 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 papers and be subjected to peer review.

Evaluation

Internal Assessment mark based on (40marks)

- | | |
|----------------------------------------------------------------------------------------------|-----------------|
| 1. Literature collection | 10 marks |
| 2. Data collection | 10 marks |
| 3. Methodology | 10marks |
| 4. Presentation of result –Statistical analysis/ tabulation/Thesis writing /Reference Citing | 10 marks |
| 5. External marks | 60 marks |
| i) Dissertation | 40marks |
| ii) Viva voce | 20marks |

Dissertation format

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

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4 Credits /4hrs/week /60hrs/sem

SECOND SEMESTER**EXTRA DISCIPLINARY COURSE – PAPER-I. HORTICULTURE****10hrs****Unit- I**

Importance of scope of horticulture – Divisions of horticulture – Climate, soil and nutritional- Nursery techniques.

Needs – Water irrigation – Plant propagation method – Cutting, layering, grafting, budding,

Stock – Scion relationship, micro propagation, induction of rooting.

Unit –II**15 hrs**

Types of garden- formal, informal and kitchen , Indoor gardening – House plants – flower garden (outdoor) hedges, edges, fences, trees, climbers, Rockeries, Arches, terrace garden – Lawn making and maintenance – Water garden , cultivation of water plants. Aftercare of plants: weeding, Pruning, Top dressing and Topiary.

Unit –III**10hrs**

Classification of vegetables, cultivation of important crops – Tomato, Brinjal, Bhendi, *Dolichos lablab*, Snake guard. Storage, transport and Marketing of vegetables.

Unit –IV**15hrs**

Fruit crops – Induction of flowering, flower thinning, fruit setting, and fruit development. Cultivation of important fruit crops – Mango, Banana, Lime, Sapota, Guava. Storage and preservation of fruit

Unit –V**10hrs**

Floriculture – Flower decoration – Dry and wet decoration – cultivation of commercial flower– Rose, Jasmine, Chrysanthemum, marketing. Hydroponics, Bonsai and Bonsai techniques.

Text books

1. Chadha, (2001). Hand Book of Horticulture. ICAR Publications, New Delhi.
2. Chauhan, V.S. Vegetable Production in India, Ramprasad Publications, Agra.
3. Edment Senn Andrews, (1994). Fundamentals of Horticulture. TATA McGraw Hill Publishing Co., Ltd., New Delhi.
4. Manibhushan Rao, K. Text book of Horticulture. Macmillan India Ltd.

Reference books

1. Randhava, G.S. (1973). Ornamental horticulture in India. Today and Tomorrow Printers and Publishers, New Delhi.
2. Williams, C.N., Uzo, J.O. and Peregrine, W.T.H. (1991). Vegetable production in Tropics. Longman Scientific & Technical, Essex (UK).
3. Yawalkar, K.S. (1961). Vegetable crops of India. Agri-Horticultural Publishing House, Dharmapath, Nagpur

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4 Credits /4hrs/week /60hrs/sem

SECOND SEMESTER**EXTRA DISCIPLINARY COURSE – PAPER- II. HERBAL BOTANY****Unit –I** **10hrs**

History of Medicinal plants - Historical account of Medicinal plants in India - Establishment of medicinal plant gardens - Traditional Medicinal systems: Ayurvedha, Siddha, Unani and Naturopathy.

Unit –II **10hrs**

Cultivation, therapeutical and pharmaceutical uses of the selected medicinal plants: Adadhoda, Aloe, Allium, Ocimum, and Vinca - National Medicinal Plants Board of India.

Unit –III **15hrs**

Definition of Drug - Classification of natural drugs: Alphabetical, Morphological, Pharmacological and Chemical Traditional and Folklore medicine- Native medicine

Unit –IV **10hrs**

Drugs from leaves (Eucalyptus), Flower (Eugenia), Fruits and seeds (Coriander) Roots (Rauwolfia), Bark (Cinchona) and Wood (Ephedra)

Unit –V **10hrs**

Pharmacognosy - Definition and scope. Drug adulteration, Drug evaluation, Chemical evaluation and Biological evaluation of drugs, Phytochemical investigations - Quality control of herbal drugs.

Reference books

1. Amruth, The Medicinal plants Magazine (All volumes) Medplant Conservatory Society, Bangalore.
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MODEL QUESTION PAPER

M. SC., BOTANY DEGREE EXAMINATION
(For Students Admitted from the academic year 2012 – 2013 onwards)

Semester- I

**CORE COURSE -I. BIODIVERSITY OF PLANTS - I
(ALGAE, FUNGI, LICHEN, BACTERIA AND VIRUSES)**

Time: 3 Hrs.

Max. Marks: 75

Part A

10X2=20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Coneobium .
2. Phycoerythrin
3. Dolipore septum
4. Mycobiont
5. Sordeia
6. Apothecium
7. Bergey classification
8. Endspore
9. Cauliflower mosaic viruses
10. Viroids

Part B

5 x 5 = 25

**Answer all questions; all questions carry equal marks,(either a or b)
Draw diagrams wherever necessary, each answer should not exceed 200 words.**

11. a) Classify the plastids based on number of thylakoids
Or
b) List out the characteristic features of Chlorophyceae
12. a) Briefly list out the general characters of Deuteromycetes
Or
b) Describe the range of reproductive structure in Basidiomycetes .

13. a).lichens as indicators of pollution justify the statements
Or
b) Describe the Asexual reproduction of lichen
14. a) Write a short note on organization of bacterial cell wall
Or
b) Distinguish the gram positive from gram negative bacteria
15. a) Describe the morphology and structure of viruses .
Or
b) Describe the structure of double stranded DNA viruses that you studies

Part C

5x 10 =30

Answer all questions; all questions carry equal marks,(either a or b) Draw diagrams wherever necessary, each answer Should not exceed 500 words.

16. a) Give an account on Fritsch Classification of Algae.
Or
b) a) Explain in detail about the range of degeneration of sex in fungi
17. a) Describe the morphology and internal structure of fruticose of lichens
Or
b) . Explain the classification of bacteria by Bergey
- 18 a) Give an account on structure and chemical composition of DNA viruses
Or
b) Write an essay on isolation and purification of plant viruses

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MODEL QUESTION PAPER

M. Sc., Botany Degree Examination
(For Students Admitted from the academic year 2012 – 2013 onwards)

Semester I

CORE COURSE - II. BIODIVERSITY OF PLANTS – II
(BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY)

Time: 3hrs.

Max. Marks: 75

Part A

10X2=20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Elaters
2. Gemma
3. Apogamy
4. Vallecular canal
5. Siphnostele
6. Eusporangiate
7. Living fossil
8. Female gametophyte of Gnetum
9. Rhynia
10. Birbal sahni

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b)
Draw diagrams wherever necessary, each answer should not exceed 200 words.

11. a) Economic importance of Bryophytes
Or
b) List out the characteristic features of Marchantiales
12. a) Describe the cone of the Equisetaceae.
Or
b) Give the anatomical character feature of *Gleichenia* stem
13. a) Write notes Sorus evolution
Or

- b) Compare the Pteridophyte with Bryophytes
14. a) "Ginkgo is a living fossil". Discuss.
Or
b) Give an account of phylogeny of Cycadales.
- 15) a. Describe the method of fossilization
Or
b) With diagrams describe *Lygionptersis oldhamia*

Part C

3 x 10 = 30

**Answer all questions; all questions carry equal marks, (either a or b)
Draw diagrams wherever necessary, each answer should not exceed 500 words.**

16. a) With suitable diagrams, describe the range of sporophyte structure in Bryophytes.
Or
b) Why Anthoceros called as Synthetic group? Justify
17. a) Give the classification of Pteridophytes
Or
b) Write an essay on heterospory and Seed habit in Pteridophytes with Suitable Examples.
18. a) Give general characters of Arucariaceae
Or
b) Write an essay on fossil bryophytes with suitable example

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MODEL QUESTION PAPER

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Semester -I

CORE COURSE- III. TAXONOMY OF ANGIOSPERMS

Time: 3hrs.

Max. Marks: 75

Part A

10X2=20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Binomial nomenclature
2. Holotypes
3. Flower of polygala
4. Willowherb family
5. Anthocarp
6. Systematic position of *Sesamum indicum*
7. Monograph
8. Kew botanical gardens
9. Serotaxonomy
10. OTU

Part B

5 x 5 = 25

**Answer all questions; all questions carry equal marks, (either a or b)
Draw diagrams wherever necessary, each answer should not exceed 200 words.**

11. a) Discuss the Linnaean principle of Classification
Or
b) Give a short account on Author citation
12. a) Evaluate the characters of Menispermaceae in the light of the of its
Phylogeny
Or
b) Give an account of floral characters of Portulacaceae

13. a) Describe the flowers in Cyperaceae.
Or
b) Comment on embryological Character of *Trapa*
14. a) Briefly discuss the DNA barcoding and their application in Plant taxonomy
Or
b) Give a short account on classification of plants based on Anatomy
15. a) 'Phenotypic plasticity' - Discuss
Or
b) Briefly explain species concept

Part C

5 x 10 = 50

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Give an account of Bentham and Hookers system of classification and add a note on its merits.
Or
b) Write an essay on principle and Priority of botanical nomenclature
17. a) Explain the feature of taxonomic interest in Aizoaceae and example its Systematic position
Or
b) Explain the floral feature of Oleaceae with its economic importance
Or
18. a) Give a detail account on Chemotaxonomy.
Or
b) Critically examine the classical experiments of Turreson

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MODEL QUESTION PAPER

M.Sc., Botany Degree Examination
(For Students Admitted from the academic year 2012 – 2013 onwards)

Semester I

ELECTIVE I-PLANT RESOURCES AND UTILIZATION

Time: 3Hrs.

Max. Marks: 75

Part A

10X2=20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Acclimatization
2. Secondary center
3. Binomial of Rice
4. Natural fibres
5. Colchicum
6. Asafoetida
7. Biodiesel
8. Name any dye yielding plants
9. In situ conservation
10. Wetlands

Part B

5 x 5 = 25

**Answer all questions; all questions carry equal marks (either a or b)
Draw diagrams wherever necessary, each answer should not exceed 200 words.**

- 11.a) Discuss the biodiversity status in India
Or
b) Give short account on economic importance of lichens
12. a) Write short notes on Pulse and their importance
Or
b) Give a brief account fodder crops
13. a) Write the Chemo-taxonomical classification of crude drug.
Or

- b) Explain the physical evaluation of drug.
14. a) Give brief an account on minor forest product
Or
b) Write a brief note on vegetable oil and their fat content
15. a) Give an account on mangroves and their importance.
Or
b) Give a brief account on ex situ conservation.

Part C

3 x 10 = 30

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Write an essay on plant introduction
Or
b) Discuss the nutritional value and industrial application of certain widely Exploited marine Algae
17. a) Give an account of underground vegetables.
Or
b) Write about the botanical description, cultivation and medicinal properties of *Dioscorea and Adathoda*
Or
18. a) Give a detailed account of the structure, types, chemical composition, Properties and uses of Wood
Or
b) Write about the role of International Union for Conservation of Nature.

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MODEL QUESTION PAPER

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Semester II

CORE COURSE V - PLANT PATHOLOGY AND MICROBIAL TECHNOLOGY

Time: 3Hrs.

Max. Marks: 75

Part A

10 x 2 = 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Phyto alexin
2. SAR
3. Axenic culture
4. Turbidostate
5. Hfr strain
6. Proteomics
7. Xenobiotic
8. Bio absorption
9. Spawn
10. Bio preservative

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b). Draw diagrams wherever necessary, each answer should not exceed 200 words.

- 11.a) Write briefly on plant disease forecasting
Or
b) Explain modes of infection and dissemination of plant pathogens.
- 12.a) Write a short notes on Scope of Microbiology
Or
b) Explain the gram staining method
- 13.a) Give a brief account on transposons.

Or

b) Explain the bacterial conjugation.

14.a) Narrate how biological water treatment is carried out

Or

b) Explain how bioremediation of Oil spills can be done

15. a) Give a brief account on Food born pathogen

Or

b) Explain Single cell protein and their application

Part C

3 x 10 = 30

Answer all questions; All questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Write an essay on defense mechanisms in plants.

Or

b) Diagrammatically explain the specialized transduction in bacteria

17. a) Write an essay on biogas production and application

Or

b). Explain mass cultivations of Rhizobium in detail.

18. a) Give a detail account on Solid state fermentation and their product

Or

b) Give an account of steps in production of any industrial enzyme

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MODEL QUESTION PAPER

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Semester II

**CORE COURSE VI- ANATOMY OF ANGIOSPERMS, PLANT MICRO TECHNIQUE AND
EMBRYOLOGY OF ANGIOSPERMS.**

Time: 3Hrs.

Max. Marks: 75

Part A

2 x10= 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. diffuse porous wood
2. Tension wood
3. Lenticels
4. Unilacunar node
5. Numerical apertures
6. Smears
7. Simple stain
8. FAA
9. Endothelium
10. Polyembryony

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 200 words.

11. a) Write the types and its functions of cambium.
Or
b) Differentiate the Sap wood from Heart wood.
12. a) Give a detailed account of periderm formation.
Or
b) Diagrammatically describe Anomalous structure of Aristalochia stem
13. a) Write an principle and organization of light microscope
Or
b) Write notes on clearing techniques.

14. a) Give an account on fixation and fixatives.
Or
b) Give an account on micrometry.
15. a) Describe the various types of haustoria associated with cellular Endosperms
Or
b) Discuss the development of pollen wall in angiosperms plant

Part C

3 x 10 = 30

Answer all questions; All questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Give a detailed account on types of meristems
Or
b) Write the structure and development of secondary phloem
17. a) Discuss the root and shoot transition
Or
b) Explain principle and functions of TEM.
18. a) Give a detailed account on Sexual incompatibility.
(Or)
b) Describe the development of dicot embryo

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MODEL QUESTION PAPER
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Semester II

CORE COURSE VII - CELL AND MOLECULAR GENETICS

Time: 3 Hrs.

Max. Marks: 75

Part A

2 x10= 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Peroxisomes
2. Leucoplast
3. Cyclins
4. Integral protein
5. nc RNA
6. Holoenzyme
7. Leading strand
8. Degenerate code
9. Promoter gene
10. Attenuator

Part B

5 x 5 = 25

**Answer all questions; all questions carry equal marks, (either a or b)
Draw diagrams wherever necessary, each answer should not exceed 200 words.**

- 11 a) Describe the organization of Plant cell wall
Or
b) Give a short account mitochondria structure and function
12. a) Describe the mechanisms of intercellular transport.
Or
b) Write a sort notes on Synaptonemal complex and its significance in meiosis
- 13 a) Write notes on C-value paradox

Or

- b) Discusses Hardy –Weinberg law, using a hypothetical example of two alleles Locus

14.a) Give a brief account on post transcriptional modification

Or

- b) What is genetic code? Describe general properties of the genetic code.

15 a) Describe Structure of RUBP carboxylase

Or

- b) How does the regulation of gene expression in bacteriophage differ from that in Prokaryotes

Part C

3 x 10 = 30

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 Words.

16. a) Write an essay on structure, and functions of Endoplasmic reticulum

Or

- b) How is phosphorylation and De phosphorylation involved in cell cycles? Which enzymes are involved in these biochemical events? Discuss

17. a) Write an essay on mutation

Or

- b) Discuss the mechanisms of DNA replication

18. a) Explain the post translation modification of protein

Or

- b) Write in detail account on Lac operon in E.coil.

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MODEL QUESTION PAPER

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(For Students Admitted from the academic year 2012 – 2013 onwards)
Semester III
CORE COURSE -X .PLANT PHYSIOLOGY AND BIOPHYSICS

Time: 3 hrs.

Max. Marks: 75

Part A

10 x 2 = 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Define osmotic potential
2. Anti Transpirants
3. Emerson enhancement effect
4. Kranz type of anatomy
5. Nitrogenase
6. ABA
7. Terpenes
8. Proline
9. Entrophy
10. Oxidation

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 200 words.

11. a) Distinguish between active and passive absorptions.
Or
b) Describe the biological significance of Water
12. a) Describe the outline of CAM pathway
Or
b) Write short notes on respiratory quotient

13. a) Highlight the role of leghaemoglobin in nitrogen fixation.

Or

b) Brief account on phytochrome in flowering.

14. a) Explain the drought tolerant mechanisms of higher Plant

Or

b) Write short notes on UV stress

15. a) Explain the laws of thermodynamics.

Or

b). what are high energy compounds

Part C

3 x 10 = 30

Answer all questions; All questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Explain the possible mechanisms of solutes and assimilates

Or

b) Explain the regulatory mechanisms of stomatal behavior

17. a) Give an account on of Photorespiration and its significance

Or

b). Explain the Z scheme of photosynthesis.

18. a) Explain causes and methods of breaking of dormancy.

Or

b) Brief account on biosynthesis of phenols and their roles.

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MODEL QUESTION PAPER

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Semester III
CORE COURSE -XI . ENVIRONMENTAL BIOLOGY

Time: 3 Hrs.

Max. Marks: 75

Part A

10 x 2 = 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Synecology
2. Ecotones
3. Ecological niche
4. Poly climax theory
5. Tsunami
6. Greenhouse gas
7. GPS
8. Latitudes
9. Hotspots
10. NCS

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 200 words.

11. a) Write a brief account on the aim and scope of ecology.
Or
b) Discuss in brief the various factor that regulate the population growth
12. a) Explain ecological indicators
Or
b).Give an account of the sequential stages of a typical hydrosere
13. a) Brief account on noise pollution.
Or
b) Write short on Rio de janeiro summit.
14. a) Explain the principle and application of remote sensing

Or

b) Discuss about environmental education programme

15. a) Explain the age and area hypothesis

Or

b) Give a brief account on forest and wildlife act in India

Part C

3 x 10 = 30

Answer All questions; all questions carry equal marks, (either a or b)

Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Describe the various method of study of communities .point out merits and Demerits of each method

Or

b) Define ecosystem. Give an account of the structure and function of an ecosystem

17. a) Define ecological niche. How this phenomenon is involved in completion between the organisms

Or

b). Write about the causes, effect and control measures of air pollution.

18. a) Write a short account of role of any five well known endian NGOs in environment Managements

Or

b) Describe the floristic regions of India

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MODEL QUESTION PAPER

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Semester III
ELECTIVE COURSE –II. HERBAL TECHNOLOGY

Time: 3Hrs.

Max. Marks: 75

Part A

10 x 2 = 20

Answer all questions; all questions carry equal marks. Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Materia Medica
2. Ayurveda
3. Pharmacognosy
4. Organoleptic evaluation
5. Vasicine
6. Nimbizidine
7. Uses of Senna
8. Serpentine
9. Sacred grooves
10. Narcotics

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 200 words.

11. a) Give a Brief account on Ayurveda.

Or

b) Write a short notes on Unani.

12. a) Classify Drug adulterants

Or

b) Give an account on biological evaluation of drug.

13. a) Brief account on therapeutic uses of *Aloe vera*.
Or
b) Give an account of pharmaceutical importance of *Vinca rosea*.
14. a) Give brief account on the utility value of *Bacopa monnieri*
Or
b) Give an account on phytochemistry of *Phyllanthus amarus*.
15. a) Give an account on mythology in ethnobotany.
Or
b) Discuss ethnobiological values

Part C

3 x 10 = 30

**Answer all questions; all questions carry equal marks, (One question from each unit)
Draw diagrams wherever necessary, each answer should not exceed 500 words.**

16. a). Define the term drug and give an account on the classification of natural drugs.
Or
b). elaborately explain Phytochemical investigations of herbal drugs.
17. a). Write down the cultivation, collection and natural drug preparation of *Rauwolfia serpentina*
Or
b). Write down the cultivation and utilization of *Gloriosa superba*.
18. a) Give brief account on major tribes of south India
Or
b) Explain the activities of National Medicinal Plants Board of India.

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Semester III

ELECTIVE COURSE- III. PLANT BIO-TECHNOLOGY

Time: 3 Hrs.

Max. Marks: 75

Part A

10 x 2 = 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Cosmids
2. AFLP
3. T-DNA
4. rDNA
5. Nutritional value of Golden rice
6. Flavr savr
7. Totipotency
8. Cybrids
9. WTO
10. TRIPS

Parts B

5x5 = 25

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 200 words

11. a) Give a brief account on scope of Biotechnology
Or
b) Describe western blotting
12. a) Highlight the significance of recombinant DNA technology
Or
b). Explain Electroporation

13. a). Discuss the terminator seed technology.

Or

b). Discuss a methodology to enhance the shelf life of fruits.

14. a). Describe encapsulation.

Or

b). Explain the genetic and epigenetic basis of somaclonal variation.

15. a). Brief an account on the current scenario of IPR in India.

Or

b). Write about Plant Breeder's Right (PBR).

Part C

3x10=30

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 500 words.

16.a) Give an account of cDNA and construction of cDNA library.

Or

b) Give a detailed account on Holliday model.

17. a) Explain about organization of Ti plasmid in *Agrobacterium tumifaciens*.

Or

b) Discuss the Glyphosate resistance in Soybean

18. a) Write in detail about somatic embryogenesis

Or

b) Discuss the ethical and social issues related to GMOs.

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MODEL QUESTION PAPER

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Semester IV
CORE COURSE- XII. BIOCHEMISTRY AND NANOBIO TECHNOLOGY

Time: 3 Hrs.

Max.Marks: 75

Part A 2 x10= 20

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words

1. Vander waals force
2. Covalent bond
3. PPP
4. Gluconeogenesis
5. Iminoacids
6. Allosteric inhibition
7. Isoprenoids
8. Flavonoids
9. Nanowire
10. Biosensors

Parts B

5x5 = 25

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 200 words

11. a) Write the importance of pH in biological system
Or
b) Write notes on Molarity, molality and normality of solutions.
- 12.a) Classify carbohydrates.
Or
b) Explain the components of nucleic acids.
- 13.a) Write about the properties of amino acids.
Or

b) Explain Ramachandran Plot.

14. a) Classify lipids.

Or

b) Write short notes on phenols.

15. a) Briefly explain application of nanobiotechnology in medicine.

Or

b) Discuss the social issues of nanobiotechnology.

Part C

3x10=30

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 500 words.

16 a) Explain the structure, properties and ionization of water.

Or

b) How a four carbon compound is converted into a six carbon compound?

17. a) Give an account on the structural confirmations of proteins.

Or

b) Discuss Michaelis- Menton equation.

18. a) Describe the β oxidation of fatty acids.

Or

b) Explain synthetic and natural bionanomaterials and their applications.

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Semester IV

CORE COURSE- XIII .BIOINSTRUMENTATION, BIostatISTICS AND BIOINFORMATICS

Time: 3 Hrs.

Max.Marks:75

Part A

2 x10= 20

Answer all questions; all questions carry equal marks,

Draw diagrams wherever necessary, each answer should not exceed 50 words

1. Numerical Aperture
2. Explain Beer-Lambert's law
3. Define partition chromatography
4. Isotopes
5. pH
6. SDS-PAGE
7. Autoradiogram
8. Define bibliography
9. Define Probability
10. PUBMED

Parts B

5x5 = 25

Answer all questions; all questions carry equal marks(either a or b), each answer should not exceed 200 words.

11. a) Write short note on principle of Spectroscopy.
Or
b) Camera is a remote sensing device - justify.
- 12.a) Write short note on types of rotors in centrifuge.
Or
b) Give the principles of Gas chromatography
13. a) Write short note on buffers.

Or

b) Explain Isoelectro focusing.

14. a) Briefly explain types of literature collection.

Or

b) Write notes on indexing and abstracting

15. a). Describe the measures of Central tendency

Or

b). Explain pictorial presentation of data.

Part C

3x10=30

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 500 words.

16. a) Explain principle and mechanisms of UV visible spectrometer.

Or

b) Describe the technique of HPLC and its application.

17. a) Define Electrophoresis. How DNA can be electrophoratically separated?

Or

b) Write notes on i) Scientific journal ii) Monograph iii) Short communication
iv) Review paper

18. a) Discuss the different types of correlation

Or

b) What are Structure and Sequence databases?

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MODEL QUESTION PAPER

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Semester IV
ELECTIVE COURSE- IV. HORTICULTURE AND FORESTRY

Time: 3 Hrs.

Max.Marks:75

Part A

2 x10= 20

Answer all questions; all questions carry equal marks,Draw diagrams wherever necessary, each answer should not exceed 50 words

1. IIHR
2. Pomology
3. Nursery Stock
4. Types of layering
5. Kitchen garden
6. Hoagland's Plant Growth Solution
7. Estuaries
8. Social forestry
9. Denudation
10. Species invasion

Parts B

5x5 = 25

Answer all questions; all questions carry equal marks(either a or b) each answer should not exceed 200 words.

11. a) Write the divisions of horticulture
Or

b) Explain the different organic substrates

12 a) Write about types of Budding
Or

b) Explain nursery soil bed preparation

13. a) Write notes on Top dressing and Topiary
Or
b) Explain Ikebana
14. a) Discuss the characteristic features and components of Thorn and Scrub Jungle
Or
b) Write the scope and practices of silviculture
15. a) Describe the effects of deforestation
Or
b) Man- animal conflict- Discuss

Part C

3x10=30

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 500 words.

16. a) Explain different types of Irrigation.
Or
b) Write about types of Grafting and its application
17. a) Define the designing of different types of gardens
Or
b) Elaborate the types of flower arrangements
18. a) Explain the components of Tropical and temperate forests.
Or
b) Discuss the drawbacks of Human interference in forest

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MODEL QUESTION PAPER

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(For Students Admitted from the academic year 2012 – 2013 onwards)

**CORE COURSE – IV. PRACTICAL - I (Covering the core courses I & II)
(ALGAE, FUNGI, LICHENS, BACTERIA, VIRUSES, BRYOPHYTES, PTERIDOPHYTES,
GYMNOSPERMS AND PALEOBOTANY)**

Practical: 50 marks

Record : 05 marks

Viva – voce: 05 marks

Marks: 60 marks

Time: 4 Hrs. Max.

1. Make suitable micro preparations of A, B, C, D and E. Draw labeled sketches. Identify and give the reasons. Submit the slides for valuation. (5 x 4 = 20 marks)
2. Make suitable micropreparations of F and G. Draw labelled sketches identify give the reasons. Submit the slides for valuation. (2 x 5 = 10 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. (2 x 2 = 4 marks)
5. Draw diagrams and notes of interest on K, L, M and N. (4 x 3 = 12 marks)

Key:

A, B, C, D & E - Materials one each from Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms.

F & G - Reproductive parts one each from Pteridophytes and Gymnosperms.

H - Mixture of three micro algae.

I & J - Macroscopic structure of Bryophytes and Gymnosperms. (Spotter)

K, L, M & N - Materials one each from Fungi, Lichens and Fossils, bacteria or Viruses

Note:

- Submission of 15 herbarium sheets from Algae / Fungi / Lichens / Bryophytes / Pteridophytes / Gymnosperms (during the internal practical examination).
- Field trip to a hill station and coastal area for a minimum period of five days for the Collection of specimens and to study the plants in their natural habitat.
- Certified record work done in the laboratory during practical classes

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**CORE COURSE -VIII. Practical - II (Covering the core courses III & V)
TAXONOMY OF ANGIOSPERMS, PLANT PATHOLOGY AND MICROBIAL TECHNOLOGY**

Time : 4hrs

Practical : 50

Record : 05

Viva-voce : 05

Max. Marks : 60

1. Find out the binomials of A and B. (3x2=6marks)
2. Refer specimens C and D to their respective families, give the reasons at each level of Hierarchy. (3x2=6marks)
3. Construct a key using E, F, G, H,I and J. 6 marks
4. Determine whether the given sample K is contaminated with bacteria or not. Leave Sample for valuation. 4 marks
5. Perform the gram staining to identify the given bacterial sample L - 5 marks
6. Name the causal organism, disease symptoms and control measures of the given Material. M 4marks
7. Mention the family, genus and species of N,O and P (3x3=9marks)
8. Write notes on Q, R and S. (3x2=6marks)
9. Write economic importance of T and U. (2x2=4marks)

Key:

A&B - Families prescribed in the syllabus

C&D - Flowering plants from families prescribed in the syllabus.

E, F, G, H, I & J - Flowering twigs.

K - Samples given in the practical's

L - Samples given in the practical's

M - Pathological material specified in the syllabus.

N, O and P - Plants given in practical syllabus

Q, R&S - Spotters from microbiology (Equipment's/Instruments/Chemicals/culture Media /stains/Photographs/Slides)

T&U - Economic importance of families.

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**CORE COURSE – IX. Major Practical III (Covering the core courses VI & VII)
(ANATOMY OF ANGIOSPERMS AND EMBRYOLOGY OF ANGIOSPERMS AND
PLANT MICRO TECHNIQUE, CELL AND MOLECULAR GENETICS)**

Time: 4hrs	Practical	: 50
	Record	: 05
	Viva-voce	: 05
	Max. Marks	: 60

- Cut transverse section of "A". Identify the anomaly by giving reasons. Draw diagrams and submit the slides for valuation. -6 marks
- Macerate and identified the elements in the "B". Measure the length or breadth using Micrometer. - 6 marks
- From the given material "C" dissect and mount any two stage of embryo. Draw diagrams. Submit the slides for valuation. - 6 marks
- With the flower bud given in "D", identify any 2 developmental stages of microsporogenesis. Draw diagrams. Submit the slides for valuation. - 6 marks
- Prepare a squash of "E". Display any 2 stages of cell divisions. Draw labeled sketches. - 4 marks
- Construct a chromosome map; calculate interference and coefficient of variation from a three point test cross data given in F. - 8 marks
- Solve the genetic problem "G" and "H". (2 x 3=6)
- 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 - Three point test cross 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.

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CORE COURSE – XII. Major Practical IV (Covering the core courses X & XI)

PLANT PHYSIOLOGY, BIOPHYSICS AND ENVIRONMENTAL BIOLOGY

Time : 4 hrs.

Practical : 50
Record : 05
Viva-voce : 05
Max. Marks : 60

1. Set up the experiment A assigned to you. Record your observation and interpret the Results. Leave the set up for valuation. 10 marks
2. Comment on the setup B. 5marks
3. Writes notes of physiological interest of C and D 3x2=6marks
4. Construct a meter quadrat F. studies the plant community by determining frequency,
5. Density and abundance of different species. Analyses the vegetation. Record your data and interpret the results. 10marks
6. Determine the content of the given sample G. (pH/ dissolve oxygen/ bicarbonate Content/Primary productivity - 7marks
7. Write notes of ecological interest of H,I,J and K 4x3=12marks

Key:

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

B -Plant physiology experiment

C & D - Charts/Figures/Graphs/tables/Instruments/Apparatus,
Chemicals/Models/photographs

F -Simple quadrat

G - Soil sample/water sample

H, I,J,&K - Ecological tools/Chemicals/Graphs/photographs/maps

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CORE COURSE – XV. Major Practical V – (Covering the core courses XIII & XIV)

BIOCHEMISTRY, NANOBIO TECHNOLOGY, BIOINSTRUMENTATION,

BIOSTATISTICS AND BIOINFORMATICS

Time: 4 hrs.

Practical: 50

Record : 05

Viva –voce: 05

Max. Marks: 60

marks

1. Conduct the experiment (**A**) assigned to you. Record your results. Leave the set up Valuation. 10 marks
2. For the given data (**B**) perform students “t” test and prove the statements - 7 marks
3. From the given material C find out mean and calculate the standard deviation with Reference to its length. Present your data in the form of a graph. - 5 marks
4. Verify Beers law using the given solution. (**D**)
Or
Determine the pH of given sample (**E**) by using pH meter and comment on it
- 7marks
5. Separate and identify the given sample (**F**) using either TLC or Paper Chromatography – 10 Marks
6. Write notes on G, H, I, J and K 5x2=10 marks

Key

- A. Biochemistry experiment from the syllabus (Selected by each students by lot)
- B. Statistical data and tables are to be provided
- C. Leaves or Seed sample (50numbers)
- D. CuSO_4 solution / $\text{K}_2\text{Cr}_2\text{O}_7$ solution
- E. Water sample or fruit juice
- F. Amino acid / Sugar/ pigments
- G. Biochemistry (Equipments/Apparatus/Chemicals/Photographs/Charts/Diagrams)
- H. Nanobiotechnology (Spotter)
- I. Bioinstrumentation
(Equipment's/Apparatus/Chemicals/Photographs/Charts/Diagrams)
- J. Bioinformatics
- K. Biostatistics

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EXTRA DISCIPLINARY COURSE – I. HORTICULTURE

Time: 3 Hours

Maximum: 75 Marks

Part A

10x 2

Answer all questions; all questions carry equal marks, Draw diagrams wherever necessary, each answer should not exceed 50 words

1. Divisions of Horticulture
2. Stock- Scion Relationship
3. Cutting
4. Rockeries
5. Weeding
6. Indoor gardening
7. Topiary
8. Olericulture
9. Enzymes used in induction of Flowering
10. Ikebana

Part B

5X 5=25

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 500 words.

11. a) Give a brief account on importance of soil and plants.
Or
b) Give an account on different methods of grafting.
12. a) Give short notes on the types of vegetable gardens.
Or
b) Explain the any four Hedge plants

13. a) Describe the cultivation of edible tubers.

Or

b) Explain the necessity for storage of vegetables

14. a) Discuss the technology used in delaying Fruit ripening

Or

b) Write the importance of fruit preservation in Horticulture

15. a) Elaborate the types of flower arrangements

Or

b) Define Hydroponics and explain the Plant Growth Solution

Part C

3x10=30

Answer all questions; all questions carry equal marks (either a or b), each answer should not exceed 500 words.

16. a) Discuss the types of Irrigation.

Or

b) Explain the designing pattern of different types of gardens

17. a) Write an essay on different types of lawn grasses. How do you prepare lawn?

Or

b) Write the cultivation process of Brinjal and Bhendi

18. Discuss the importance and cultivation process of Banana

Or

b) Explain the cultivation of the commercial flowers Jasmine and Chrysanthemum.

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EXTRA DISCIPLINARY COURSE – II. HERBAL BOTANY

Time: 3 Hours

Maximum: 75 Marks

Part A

2 x10= 20

Answer all questions; all questions carry equal marks. Draw diagrams wherever necessary, each answer should not exceed 50 words.

1. Ayurveda
2. Traditional medicine
3. Organoleptic evaluation
4. Drug
5. Nimbizidine
6. Pharmacognosy
7. Cinchona
8. Serpentine
9. Drug evaluation
10. Narcotics

Part B

5 x 5 = 25

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 200 words.

11. a) Give an brief account on Siddha
Or
b) Write the importance of Naturopathy
12. a) Explain the therapeutical use of *Ocimum*
Or

- b) List the activities of National Medicinal Plants board of India.
13. a) Explain Traditional Medicine
Or
b) Write the importance of Knowledge of Folklore medicine
14. a) Give an account of pharmaceutical importance of Coriander.
Or
b) Give an account on phytochemistry of *Ephedra*.
15. a) Discuss the causes of Drug adulteration.
Or
b) Give an account on quality control of herbal drug.

Part C

3 x 10 = 30

Answer all questions; all questions carry equal marks, (either a or b) Draw diagrams wherever necessary, each answer should not exceed 500 words.

16. a) Explain any one Traditional Medicinal System in detail
Or
b) Write down the cultivation, collection and natural drug preparation of Vinca.
17. a) Define the term drug and give an account on the classification of natural drugs.
Or
b) Elaborately explain Phytochemical investigations of herbal drugs.
18. a) Write down the cultivation and utilization of *Rauwolfia serpentina*.
Or
b) Explain the various methods of evaluating Drug