Controller of Examinations
SAMBALPUR UNIVERSITY
[redacted]TI VIHAR, BURLA
Sambalpur (Odisha), PIN- 768 019

PHONE and Fax:0663-2430806
e-mail: coesuniv@gmail.com

Urgent **(Both by post and by e- mail)**

No. 8414 **/ Acd.-I** **Dated:** 04-11-16

To

The Principals,
Government College,
Sundargarh

Sub: M.Sc. Botany syllabus effective **from the Academic Session *2016-17.***

Ref :- This office letter No 5735(4) / Acd.-I (BOS) dated 30.7.16 .

Sir,

In continuation to the letters and the subject cited above, I am directed to intimate you that the Vice- Chancellor has been pleased to approve the syllabus for M.Sc. Botany Courses as per Course Credit Semester Examinations under 6 (15) of O.U. Act -1989 giving it effect from the Academic Session, 2016-17. The detail Courses of Studies is enclosed herewith for your reference and necessary action.

This may kindly be noted that it is the final syllabus for M.Sc. Botany Courses as per Course Credit Semester system from the Academic Session, 2016-17. It may be made available to teachers and students concerned. Further you are requested to ensure teaching of the courses in your colleges accordingly.

Any error and omission etc. may kindly be intimated to this office.

. Any queries on the matter may be made through e-mail: coesuniv@gmail.com.

Thanking you,

Yours faithfully,

Encl:- As above

Controller of Examinations

P.T.O.

Memo No. 8415 /Acd.-I(BOS), dtd. 04-11-16

Copy forwarded with enclosure for information and necessary action to:

1. The Chairman, Post Graduate Council, Sambalpur University.
2. The H.O.D. , School of Life Science , Sambalpur University, Jyoti Vihar .
3. The Director, College Development Council, Sambalpur University.
4. The Director, Directorate of Distance and Continuing Education, Sambalpur University.
5. The Co-ordinator, Private Examination Cell, Sambalpur University.
6. Asst. Registrar (Examination), Sambalpur University.
7. Programmer, University Computer Unit, Sambalpur University.
8. Asst. Controller of Examinations, Sambalpur University.
9. Section Officer / Assistant –in- Charge, ***e – Governance Cell,*** Sambalpur University with request to provide all the materials in the official web- site accordingly.
10. Section Officers, Computer Unit, E.G.-III , E.C.- III ,EC- VI Sections.
11. Five spare Copies for Academic-I Sections with enclosure.

03/11/16

Controller of Examinations

Memo No. 8416 /Acd.-I(BOS), dtd. 04-11-16

Copy forwarded without enclosure for information and necessary action to:

1. ***The Dy. Director, e – Governance Cell,*** Sambalpur University with request for needful to provide all the materials in the official web- site accordingly.
2. P.A. to the Vice- Chancellor, Sambalpur University.
3. P.A. to the Registrar, Sambalpur University.
4. P.A. to the Controller of Examinations, Sambalpur University.

03/11/16

Controller of Examinations

OUTLINE COURSE STRUCTURE

(M.SC BOTANY)

I-SEMESTER		
Paper-I	Biology & Biodiversity of Lower plants	5 CH
Paper-II	Cytology, Genetics & Biometry	5 CH
Paper-III	Instrumentation, Biodiversity & Evolution	5 CH
Paper-IV	Practical (Relevant to above papers)	3 CH
II-SEMESTER		
Paper-I	Gymnosperm & Taxonomy of Angiosperms	5 CH
Paper-II	Plant Physiology & Metabolism	5 CH
Paper-III	Biophysics & Biochemistry	5 CH
Paper-IV	Practical (Relevant to above papers)	3 CH
III-SEMESTER		
Paper-I	Plant Development and Reproduction	5 CH
Paper-II	Plant Ecology, Resource conservation & Economic Botany	5 CH
Paper-III	Tissue Culture, Biotechnology	5 CH
Paper-IV	Practical (Relevant to above papers)	3 CH
IV-SEMESTER		
Paper-I	Environmental Hazards and Protection measures	5 CH
	Elective Course	
Paper-II	Special Paper	5 CH
Paper-III	Special Paper	5 CH
Paper-IV	Practical (Relevant to above papers)	3 CH
	PROJECT	4 CH
	SEMINAR	4 CH
	TOTAL	**80 CH**

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – I

PAPER-I (Theory) Marks: 50 (10+40)

(BIOLOGY AND DIVERSITY OF LOWER PLANTS)

Unit-I (Microbiology):

Classification of Microbes, Structure, Nutrition, Reproduction and Economic Importance of Archaebacteria, Eubacteria, Cyanobacteria.

Virus: Characteristics and Ultra structure of Virus, Isolation, Purification, Replication and Transmission of virus.

Unit-II (Mycology):

General characters of Fungi, Classificatin, Fungal Cell wall Composition, Utrastructure of Cell, General characters, Structure and Reproduction of: Phycomycetes, Ascomycetes, Basidimycetes and Deuteromycetes. Reproduction in fungi (Vegetative, Asexual, and Sexual), Heterothallism, Degeneration of sex and Economic Importance of Fungi.

Unit-III (Phycology):

General characters of Algae, Classification, Thallus Organization, Cell Ultra-structure, Reproduction and Economic importance of Algae.

General characters, structur, pigmentation and Reproduction of : Cynophyta, chlorophyta, Phaephyta and hodophyta.

Unit-IV (Bryophytes):

General characters of Bryophytes, Origin and Classification. General account of: Marchantiales, Anthocerotales and Funaariales. Evolution of Sporophytes and Progressive sterilization of Sporogenous tissue. Economic Importance of Bryophyta.

Unit-V (Pteridophyta):

General characters, Origin and Classification of Pteridophytes, Evolution of stele structure, Reproduction and Phylogeny of the following order: Psilophytales, Isoetales, Calamitales and Polypodiales. Geterospory and Seed habit and its significance.

SUGGESTED READING (PAPER-I)

1. Alexopolus, C.J. Introductory Mycology, John Willy & Sons Inc.
2. Pelczar, Reid and Chan, Microbiology, Tata Mc-Hill Publication.
3. Dubey, R.C. : A Text Book of Microbiology, S. Chand
4. Fritsch, F.E. Algae
5. Alexopolus, A.J. Introductory Mycology.
6. Kumar H.D. 1988, Introductory Phycology, Affiliated East West Press, New Delhi.
7. Maudahar C.L. 1978 Introduction to Plan Viruses, Chand & Co, New Dehli
8. Mehrotra R.S. and Anja R.S. 1998: An Introduction to Mycology, New Age Intro. Press.
9. Morris, 1986, An Introductin of Algae, Cambridge University Press, UK
10. Parihar N.S. 1991, Bryophyta, Central Book Depot, Allahabad.
11. Puri, P. 1980, Bryophytes, Atma Ram & Sons Delhi.
12. Rangaswami, G. Mahadevan A. 1999, Disease of Crop Plants in India (4^{th} Edn.)Prentice Hall of Inida, Pvt. Ltd.
13. Stewart W.N. & Rathwell G.W. 1993, Paleobotany and Evolution in Plants.
14. Sprone K.K., 1991, The Morphology of Pteridophytes, B.I. Publishing Pvt. Ltd., Bombay.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – I

PAPER-II (Theory) Marks: 50 (10+40)

(CELL AND MOLECULAR BIOLOGY OF PLANT, CYTOLOGY, GENETICS AND BIOMETRY)

Unit-I (Cytology):

Proten sorting, Targeting of protein to organelles, Chromosomes Structure, Euhromatin and Heterochromatin, Karyotype evaluation. Types of Chromosomes (Polytene and Lampbrush Chromosomes).

Unit-II (Gene structure and Genetic recombination):

DNA Structure , A,D &Z form, DNA Damage and Repair, RNA Splicing, Molecular Mechanism of Genetic Recombination, Transposable Elements.

Unit-III (Mutation):

Molecular basis of Gene Mutation, Application of Mutation for Crop Improvement, Chromosal aberration, Meiotic behaviours of Deletion, Duplication, Iversion and Translocation, Aneuploids and Euploids, Role of Polyploidy in Evolution and its practical significance in Crop improvement.

Unit-II (Molecular Cytogenetics and Plant breeding):

Nuclear DNA content (C-value paradox), Cot curve and its significance. Hybridization concept and techniques. Role of hybridization in Crop improvement. Genetics basis of inbreeding heterosis and hybrid vigor.

Unit-II (Biometry):

Measurement of Central tendency-Mean, Median and Mode, Measurement OF Dispersion (Mean and Absolute deviation, Range of Variance, Standard Deviation, Standard Error of Mean, Co-efficient of Variation). Hypothesis testing, Significance of means of large and small samples, t-Test, f-Test, Chisquare test, Simple Linear co-relation, Simple linear regression.

SUGGESTED READING (PAPER-II)

1. Lewin. B.2000, Genes VII, Oxford Univ Press, New York.
2. Alberts B. Bray D, Lewis J. Raff M. Roberts K. Watson J.D. 1999 Molecular Biology of the cell.
3. Wolfe S.L. 1993, Molecular and Cellular Biology, Wadsworth Pub. Co. California, USA.
4. Cucharaw BB Gruissem W. Jones R.L. 2000 Biochemistry and Molecular Biology of Plant, American Society of Plant Physiologists.
5. Kleinsmith L.J. and Kish VM 1995, Principles of cell and Molecular Biology, harp and Collins College Pub. New York, USA
6. Lodish H. Berk A. Zipursky S.L. Matsudaira P. Baltimoru D. and Darnell J.2000, Molecular Biology, W.H. Freeman & Co.
7. Alberts B. Bray D. Lewis J. Raff M. Roberts K. & Watson J.D. 1989 Molecular Biology of Cell, Garland Pub. Inc. New York.
8. Khush G.S. 1973 Cutogenetics of Aneuploids, Acadenmic Press New York.
9. Karp G. 1999, Cells and Molecular Biology, Concepts and experiments, Joh Wily & Sons Inc. USA.
10. Lewin B.2000 Genus VII, Oxford University Press New York, USA.
11. Russel P.J. 1998 Genetics, The Benjamin Cummings Pub. Co. USA.
12. Snustad DP and Simmons M.J. 2000 Principles of Genetics, John Wily and Sons Inc. USA.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – I

PAPER-III (Theory) Marks: 50 (10+40)

(INSTRUMENTATION, BIODIVERSITY & EVOLUTION)

Unit-I:

Principles of Electron Microscopy, Centrifugation: General principles, types of centrifuges, differential & density gradient centrifugation.

Unit-II:

Chromatography: Principle, Paper chromatography ion exchange chromatography, thin layer and gas chromatography. Electrophoresis principles & methods of gel electrophoresis.

Unit-III:

Spectrophotometer, Laws of light absorption colorimeters, UV visible spectrophotometers, General idea on tracer technique, Autoradiography.

Unit-IV:

Biodiversity: Concept, significance & its measurement, Role of biodiversity in environmental stability & sustainability. Biodiversity as a resource base, Biodiversity hot spots in tropical countries.

Unit-V:

Origin of life, General idea of organic evolution. Evidences and theories of evolution with special reference to Darwinism and Lamrkism.

SUGGESTED READING (PAPER-III)

1. Instrumental Analysis for Science & Technology. W. Ferren, Agro Botanical Publication.
2. Biophysical Chemistry-Upadhyay & Nath.
3. Useful techniques for plant scientists by Dhopte.
4. Methods of soil physics by S.K. Jalota, R. Khera & B.S. Ghuman.
5. An Introduction to plant Taxonomy- C. Jeffrey
6. An Introduction of Systematic Botany & Ecology- J.N. Mishra
7. Ecology & Environment – P.D. Sharma, Rastogi Pub.
8. Plant Ecology- W.D. Bellings.
9. Fundamentals of Ecology – Wever & Clements.
10. Fundamental of Ecology – E.P. Odum.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – I

(PRACTICAL-IV)

HOURS: 06

Marks: 100

(PRACTICAL RELATED TO THEORY PAPERS)

1. Collection, Identification and Preservation of common infected plants of the locality.
2. Symptomology study of diseased specimens.
3. Collection of algae from various habitat of locality, either separation, preparation temporary and permanent mounts and identification.
4. Microbiological Method: Measuement of length, breadth and diameter of algal/fungal cells and spores using ocular and stage micrometer.
5. Preparation and sterilization of media for the culture of Bacteria and Fungi.
6. Gram staining of Bacteria.
7. Identification of fungal cultures- Rhizopus, Mucor, Aspergillus, Pencillium, Fusarium.
8. Temporary and permanent preparation of slides of important genera belonging to all important classes of fungi.
9. Study of morphology, anatomy and reproductive structures of representative members of Bryophytes and Pteridophytes.
10. Study of Mitosis and Meiosis by squashing technique. Drawing the chromosomes and different stages of Mitosis and Meiosis by using camera Lucida.
11. Biometry
12. Viva-Voce
13. Practical record duly certified by the concerned teacher.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – II

PAPER-I (Theory) Marks: 50 (10+40)

(GYMNOSPERMS AND TAXONOMY OF ANGOSPERMS)

Unit-I (Gymnosperms):

General characters, Origin and Evolutin of Gymnosperms. Classification of Gymnosperms structure, reproduction and phylogeny of Cycadopsida, Coniferopsida and Gnetopsida.

Unit-II (Fossil and Fossilization):

Geological Time Scale, Process of fossilization, structure & Phylogeny of Pteridospermales (Lyginopteridaceae, Meddullosaceae), Cycadeoidales & Cordaitales.

Unit-III (Angiosperms):

(Taxonic concepts and nomenclatures)- Taxonomic hierarchy, species, genus, family and other categories, Salient features of the International code of Botanical Nomenclature (ICBN), Herbarium Methodology.

Unit-IV (System of Classification):

Merits and demerits of major system of classification, Bentham and Hookers's system, Hutchinson and Takhatjan system, Phytography and Phyllogency of Ranales, Mavales, Umbellales, Rubiales, Tubiflorae, Campnulales, Liliflorae, Sitamineae, Glumiflorae and Microspermae.

Unit-IV (Taxonomic Evidence):

Taxonomy as synthetic discipline: Embryology in relation to plant taxonomy., Cytotaxonomy, Numerical taxonomy, Phtochemical analysis in relation to taxonomy.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – II

PAPER-I (Theory) Marks: 50 (10+40)

(GYMNOSPERMS AND TAXONOMY OF ANGOSPERMS)

Unit-I (Gymnosperms):

General characters, Origin and Evolutin of Gymnosperms. Classification of Gymnosperms structure, reproduction and phylogeny of Cycadopsida, Coniferopsida and Gnetopsida.

Unit-II (Fossil and Fossilization):

Geological Time Scale, Process of fossilization, structure & Phylogeny of Pteridospermales (Lyginopteridaceae, Meddullosaceae), Cycadeoidales & Cordaitales.

Unit-III (Angiosperms):

(Taxonic concepts and nomenclatures)- Taxonomic hierarchy, species, genus, family and other categories, Salient features of the International code of Botanical Nomenclature (ICBN), Herbarium Methodology.

Unit-IV (System of Classification):

Merits and demerits of major system of classification, Bentham and Hookers's system, Hutchinson and Takhatjan system, Phytography and Phyllogency of Ranales, Mavales, Umbellales, Rubiales, Tubiflorae, Campnulales, Liliflorae, Sitamineae, Glumiflorae and Microspermae.

Unit-IV (Taxonomic Evidence):

Taxonomy as synthetic discipline: Embryology in relation to plant taxonomy., Cytotaxonomy, Numerical taxonomy, Phtochemical analysis in relation to taxonomy.

SUGGESTED READING (PAPER-I)

1. Cote, A.J. 1669 Numerical Taxonomy Academic Press London
2. Davis P.H. and Hey Wood, V.H. 1973 Principles of Angiosperms Taxonomy Robert E. Kreiger Pub. Co. New York
3. Grant V 1971 Plant Speciation Columbia Univ. Press New York
4. Harrison HJ 1971 New Concepts in flowering plant taxonomy Heiman Educational Books Ltd. London
5. Heslop-Harrison J.1967 Plant Taxonomy English language Book Soc. And Edward Arnould Publ Ltd. U.K.
6. Heywood V.H. and Moore D.M. 1984 Current Concepts in Plant Taxonomy, Academic Press London.
7. Jones A.D. and Wibins AD 1971 Variations and Adaptations in Plant species Hieman & Co , Educational Books , London.
8. Jone SB Jr. and Luchsier A.E. 1986 Plant Systematic (2^{nd} Edn) Mc Graw Hill Books Co. New York
9. Nroden Stam, B.EI Gazaly G, and Kassan M. 2000 Plant Systermatics for first 21^{st} Century, Portlan Press Ltd, London
10. Radfird AE 1986 Fundamental of Plant Systematics, Harper and Row Pub. USA.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – II

PAPER-II (Theory) Marks: 50 (10+40)

(PLANT PHYSIOLOGY, METABOLISM)

Unit-I (Enzymes):

Nonmenclature and classification of enzymes, regulatory sites and activity sites, mechanism of enzyme action, Kinetics of enzymatic catalysis, Michaelis-Menton equation and its significance, Line Wever-Burke and Eddy Hoftsee plots. Enzyme inhibition, regulation of enzymatic activity, factors affecting enzyme catalysis.

Unit-II (Transport and Translocation of water & solutes):

Mechanism of water transport through xylem, Phloem loading and unloading, Active and Passive transport of solutes.

Unit-III (Signal transduction, photochemistry and photosynthesis):

Signal transduction: Overview, receptors and G-proteins. Phosphlipid signaling. Role of cyclic nucleotides, two component system in bacteria. Photochemistry and Photosynthesis: Photosynthesis pigments, light harvesting complexes, photo oxidation of water. Mechanism of Electron and proton transfer. Carbon assimilation, Calvin cycle, photorespiration and its significance, C_4 cycle and CAM pathway.

Unit-IV (Respiration, Lipid Metabolism, Nitrogen Fixation, Nitrogen and Sulphur metabolism)- Respiration):

Glycolysis TCA Cycle, Electron Transport and ATP synthesis, Pentose phosphate pathway, Alternate oxidase system.

Lipid Metabolism: Structure and function of Lipid, Synthesis of membrane lipid (structural lipids) and storage lipids and their catabolism, Glyoxalate cycle.

Nitrogen and Sulphur metabolism: Biological N_2 Fixation, Nodule formation and nod factors, Mechanism of nitrate uptake and reduction, ammonium assimilation, Slfate assimilation.

Unit-V (Plant growth regulators and Vernalization):

Physiological effects and mechanism of action of Auxin, Gibberellins, Cytokinis, Ethylene, Abscisic acid, Photoperiod and its significance, Endogenous clock and its regulation, Role of vernalization.

SUGGESTED READING (PAPER-II)

1. Pietro, San – Harvesting the Sun
2. Nutaman, P.S. – Di Nitrogen Fixation
3. Devlin & Baker – Photosynthesis
4. Bonner, J& Verner, J-Plant Biochemistry, Academic Press, New York
5. Bhatia & Parasar- Plant Physiology
6. Devlin, R.M. – Plant Physiology- East West Press, Chennai
7. Robinowitch – Plant Physiology
8. Steward, F.C.- Plant Physiology
9. Glasten, A.C. (1989) Life Processes in Plants, Scientific American Library
10. Hookaas, P.J.J., Hall, M.A. & Libbenga, K.R. (eds) (1999)-Biochemistry & molecular Biology of Plant Hormones, Elsevier, Amsterdam, The Netherlands.
11. Hopkins, W.G. (1995) Introduction to Plant Physiology , John Wiley & sons Inc, New York.
12. Moore T.C. (1989) Biochemistry & Physiology (4^{th} Edn) Wordsworth Publishing Co. Californis, USA
13. Salisbury, F.B. & Ross, C.W.(1992) Plant Physiology (4^{th} Edn) Wordsworth Publishing Co. Callifornis USA
14. Taiz, L & Zeiger, E (1998) Plant Physiology (2^{nd} Edn) Sinauer Associates Inc. Publishers, Massachusetts, USA
15. Devlin R.M.- Plant Physiology, The East Weat Press, Chennai
16. Leopold, A.C. & Kriedmann- Plant Growth & Development-Tata Mc Graw Hill
17. Conn, E.E. & Stumpf, P.K.- outline of Biochemistry, Wiley Eastern Publishers, India
18. Wilkins, M.B.- Advanced Plant Physiology
19. Verma, V- Plant Physiology
20. Shrivastav - Plant Physiology

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – II

(PRACTICAL-IV)

HOURS: 06 Marks: 100

(PRACTICAL RELATED TO THEORY PAPERS)

1. Collection , Description and identification of locally available angiospermic taxa.
2. Study of anatomical features of living gymnosperm
3. Study of anatomical features of fossil gymnosperm
4. Determination of O.P/S.P.
5. Effect of various concentration of solutes on the rate of imbibitions of sees (starchy, oily, proteinaeus)
6. Estimation of chla and b of leaves of different ages.
7. Impact of wavelength of light on photosynthesis.
8. Pigment separation by paper chromatography
9. Determination of cuticular transpiration
10. Effect of CO_2 concentration on the rate of photosynthesis
11. Determination of chl a and chl b in C_3 and C_4 plants.
12. Any other practical related to the theory papers.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – II

PAPER-III (Theory) Marks: 50 (10+40)

(BIOPHYSICS & BIOCHEMISTRY)

Unit-I

Elementary thermodynamics:- Concepts of steady state in an open sytem, enthalpy, entropy & free energy changes, calculation of free energy changes, calculation of free energy from equilibrium constants & redox potentials.

Unit-II

Intermolecular forces (hydrogen bonds, electrostatic bonds electrophobic interaction, Vanderwall's forces) Electromagnetic and ionizing radiations, Laws of light absorption.

Unit-III

Proteins: Primary structure, Determination of amino acid sequences, chemical, methods of analysis, Identification N & C terminal residues, secondary tertiary & quarternary structures, Forces influencing protein structure (hydrogen bond, hydrophobic interactions, electrostatic interaction & vanderwals' forces) purification methods (ammonium sulphate solubilization through SDS gel electrophoresis & gen filteration)

Unit-IV

Carbohydrates: Nomenclature, structure & properties of monosaccharides, glycosidic bonds & glycosides: disaccharides, oligosaccharides, structural & storage polysaccharides.

Unit-V

Lipids: Classification of lipids , structure & properties of fatty acids & lipid peroxidaition, phorphoglyceride backbone structure, conformation & properties, sphingolipids, glycolipids, cholesterol & related steroids, Lipid aggregates.

SUGGESTED READING (PAPER-III)

1. Biochemistry – Garre & Grisham, 1995
2. Basic Biophysics for Biologists- M. Daniel, Agro Botanica, Bikaner
3. Outlives of Biochemistry-Cohn & Stumph, Willey Eastern India, Edn
4. Principles of Biochemistry- A.L. Lehninger, Kalyani Pub.
5. Biological Chemistry- Mehler & Cordes, Harper & Row
6. Principles of Bioenergentics – A.L. Lehninger
7. Plant Biochemistry – J. Bonner & J. Vamer 1996 Academic Press
8. Botanical Metabolism (3rd Edn) 1996. Gottschalk, Springer verlag, Germany
9. Principles of Physical Biochemistry, K.E. Van Holde, W.C. Johnson & O. Shing Ho. Prentice Hall of India, Pvt. Ltd., New Delhi.
10. Biochemistry (2nd Edn) Lubert Stryer, Freeman & SBS, 1995

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – III

PAPER-I (Theory) Marks: 50 (10+40)

(PLANT DEVELOPMENT AND REPRODUCTION)

Unit-I (Seed Germination):

Early events during germination, Morphological and bio-chemical changes, Inhibition of germination.

Unit-II (Shoot, leaf and root development):

Organization of Shoot Apical Meristem (SAM) and Root Apical Meristem (RAM), Tissue differentiation like xylem and phloem, Secretory duct and laticfers, Formation of lateral roots, shoot and leaf.

Unit-III (Reproduction, Pollination and Fertilization):

Flower development, microsporogenesis, pollen germination, sperm dimorphism, pollen-stigma interaction, self incompatibility (Physiological-Biochemical and Genetical aspects), ovule development of embryo in monocots and dicots, Polyembryony, apomixes.

Unit-IV (Seed Development and Fruit Growth):

Endosperm development, types of endosperm, cellularization of endosperm, Ultra structure and nuclear cytology storage proteins of endosperm, development of embryo in monocots and dicots, Polyembryony, apomixes

Unit-V (Dormancy, Senescene and Programmed cell death):

Types of dormancy, Seed dormancy, Bud dormancy, over corning seed dormancy, Senescene-basic concept, PCD in life cycles of plant, Metabolic changes, Influence of hormones on senescene and genetic control of senescene.

SUGGESTED READING (PAPER-I)

1. An introduction of Embryology of Angiosperms – P. Maheswari. T.M.H. Publication
2. Recent advances in Embyology of Angiosperms - P. Maheswari. T.M.H. Publication
3. The Embryology of Angiosperms – S.S. Bhojwani and S.P. Bhatnagar, Vikash Publishing House Pvt. Ltd.
4. Introductory Embryology – G.P. Dawar and S.K. Sharma
5. Plant Physiology – Noggle and Fritz
6. Plant Growth and Development – Leopold
7. Plant growth and development – Leopold and Kriedman
8. An Introduction to Plant Anatomy – A.J. Eames and L.H. Mc. Daniels
9. Plant Anatomy – K. Esau
10. Plant Anatomy – B.P. Pandey
11. Plant Anatomy – P.C. Vasistha

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – III

PAPER-II (Theory) Marks: 50 (10+40)

(PLANT ECOLOGY AND PLANT RESOURCE CONSERVATION, ECONOMIC BOTANY)

Unit-I (Community Ecology):

Concept of community, Characteristics feature of community, composition, structure, species diversity, stratification, growth form, Quantitative analysis of community (Frequency, density, dominance and diversity index). Community dynamics-causes of succession trends of succession, basic types of succession. General process of succession, Hyddosere and Xerosere.

Unit-II(Structure and Function of Ecosystem):

Structure and function of ecosystem, food chain, food wed, ecological pyramids, energy flow concept, Thermodynamics Laws, Trophic organization, Linderman's energy flow model and Y-Shaped energy flow model, ecological efficiencies. Biogeochemical cycle like carbon, Nitrogen, Phosphorus and Sulphur.

Unit-III (Climate change and Pollution):

Acid rain, Photochemical smog, Green-house gases (CO_2 CH_4 N_2O CFC_S) and its effect. Ozone hole, consequences of climate change, global warming, U.V. radiation, sea level rise.

Unit-IV (Phytogeography & Plant Resource conservation):

Major vegetation, Biological diversity, IUCN categories of threat, Ho spots inventory. In-situ conservation. Protected areas in India (sanctuaries, national parks). Ex-situ conservation, (botanical gardens, cryobanks) Gene banks & seed bank for conservation.

Unit-V (Economic Botany):

Cultivation and uses of following-cereals-Oryza, Triticum, Pulses-Bigna radiate, Beverages-Camelia sinensis, Coffea Arabica, Timber-Shorea, Tectona. Medicinal-Rauwolfia, Vinca, Narcotics-Nicotiana, Cannabis.

SUGGESTED READING (PAPER-II)

1. Ambasht, R.S. (1988) A text book of plant Ecology students friends Co.Varanasi
2. Botkin, D.B. & Keller, E.A. (2000)- Environmental Planet (2nd Edn)- John Wiley & Sons Inc. New York
3. Chapman, J.L. & Reiss , M.J. (1995)- Ecology-Principles & Application, Cambridge Univ. Press
4. Cunningham, W.P. & Saigo, S.W. (1997)-Environmental Science-A global Concern WCB Tata Mc Graw Hill
5. Dash, M.C. (1993)- Fundamental of Ecology Tata Mc Graw Hill Publishing Co. Ltd. New Delhi
6. Daubenmire, R.F. (1974) Plants & Environment, A Text Book of Plant Ecology (3rd Edn)- John Wiley & Sons, New York
7. Kendeigh, S.C. (1980) Ecology with special reference to Animals & Man Prentice Hall of India Pvt. Ltd. New Delhi
8. Kumar, H.D.(1997)-General Ecology Vikash Publishing House Pvt. Ltd. Delhi
9. Kormondy, E.J. (1996) Concepts of Ecolog-Prentice Hall of India Pvt. Ltd.,
10. Pickering, K.T. and Owan, L.A. (1997)- An introduction to Global Environmental Issues (Indedn) Butter & Tanner Ltd. U.K.
11. Smith, L.R. & Smith, T.M. (1998)- Elements of Ecology (4th Edn) An Imprint of Addison Wesley, Longman Inc. California, USA
12. Tyler, M.G.Jr (1997)-Environmental Science Working with Earth (6th Edn) Wordsworth Publishing Co.
13. Weacer, J.E. & Clements, S.E. (1966)- Plant Ecology Tata Mc Graw Hill Publishing Co. Ltd., New Delhi
14. Sharma, P.D.- Elementary Ecology, Rastogi Publishers, Meerut
15. Kochar, P.L.- Plant Ecology- S. Nagin & Co.
16. Verma, V.- A text book of Ecology, Emkay publication, New Delhi
17. Pandey, B.P- Economic Botany
18. Kochar- Economic Botany
19. Samba Murthy, A.V.S. & Subramanium, N.S. (1989)- A text book of Economic Botany, Wiley Eastern Pvt. Ltd., New Delhi
20. Sharma, O.P. (1996)- Hill's Economic Botany- Tata Mc Graw Hill Publ. co.

SUGGESTED READING (PAPER-II)

1. Ambasht, R.S. (1988) A text book of plant Ecology students friends Co.Varanasi
2. Botkin, D.B. & Keller, E.A. (2000)- Environmental Planet (2nd Edn)- John Wiley & Sons Inc. New York
3. Chapman, J.L. & Reiss , M.J. (1995)- Ecology-Principles & Application, Cambridge Univ. Press
4. Cunningham, W.P. & Saigo, S.W. (1997)-Environmental Science-A global Concern WCB Tata Mc Graw Hill
5. Dash, M.C. (1993)- Fundamental of Ecology Tata Mc Graw Hill Publishing Co. Ltd. New Delhi
6. Daubenmire, R.F. (1974) Plants & Environment, A Text Book of Plant Ecology (3rd Edn)- John Wiley & Sons, New York
7. Kendeigh, S.C. (1980) Ecology with special reference to Animals & Man Prentice Hall of India Pvt. Ltd. New Delhi
8. Kumar, H.D.(1997)-General Ecology Vikash Publishing House Pvt. Ltd. Delhi
9. Kormondy, E.J. (1996) Concepts of Ecolog-Prentice Hall of India Pvt. Ltd.,
10. Pickering, K.T. and Owan, L.A. (1997)- An introduction to Global Environmental Issues (Indedn) Butter & Tanner Ltd. U.K.
11. Smith, L.R. & Smith, T.M. (1998)- Elements of Ecology (4th Edn) An Imprint of Addison Wesley, Longman Inc. California, USA
12. Tyler, M.G.Jr (1997)-Environmental Science Working with Earth (6th Edn) Wordsworth Publishing Co.
13. Weacer, J.E. & Clements, S.E. (1966)- Plant Ecology Tata Mc Graw Hill Publishing Co. Ltd., New Delhi
14. Sharma, P.D.- Elementary Ecology, Rastogi Publishers, Meerut
15. Kochar, P.L.- Plant Ecology- S. Nagin & Co.
16. Verma, V.- A text book of Ecology, Emkay publication, New Delhi
17. Pandey, B.P- Economic Botany
18. Kochar- Economic Botany
19. Samba Murthy, A.V.S. & Subramanium, N.S. (1989)- A text book of Economic Botany, Wiley Eastern Pvt. Ltd., New Delhi
20. Sharma, O.P. (1996)- Hill's Economic Botany- Tata Mc Graw Hill Publ. co.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – III

PAPER-III (Theory) Marks: 50 (10+40)

(BIOTECHNOLOGY & GENETIC ENGINEERING OF PLANTS AND MICROBES)

Unit-I (Plant Cell and Tissue Culture)

Basic concepts, Principles and Scopes of Biotechnology, Concepts of Cellular differentiation, Totipotency, Aspects of Morphogenesis, Somatic embryogenesis and androgenesis, Mechanisms, Techniques and Utility

Unit-II (Somatic Hybridization)

Protplast Isolation, Fusion and Culture, Hybrid selection, regeneration, possibilities and achievements in Protoplast research.

Unit-III (Recombinant DNA technology)

Gene cloning, Restriction Endonuclease, Construction of genomic and DNA libraries. Choice of vectors (Plasmid, Bacteriophage and Cosmid), DNA synthesis (Phosphite trimester approach/Phosphoramidite method), DNA sequencing (Maxam & Gilbert's chemical method and Sanger's enzymatic method) Bacterial transformation, selection of Recombinants. PCR technology.

Unit-IV (Genetic Engineering of Plants and Genomics)

Transgenic Plant, application of Transgenic Plants. Agrobacterium mediated gene transfer, Ti-plasmid, T-DNA transfer, Ti-plasmid derved vectors, direct method of Gene transfer (particle gun method, microinjection) Chloroplast transformation and its application, Southern, Northern and Western blotting technique. DNA Finger printing.

Unit-V (Application of plant Tissue Culture)

Micro-propagation, Somaclonal variation, Production of secondary metabolites, Cryopreservation and gemplasm storage, Microarrays.

SUGGESTED READING (PAPER-II)

1. Biotechnology- B.D. Singh
2. A Text Book of Biotechnology – H.D. Kumar
3. A Text Book of Biotechnology – R.C. Dubey
4. Elements of Biotechnology – P.K. Gupta
5. Plant Biotechnology – P.K. Gupta
6. Biotechnology and Tissue Culture – Chopra, Narosa Publishing House.
7. Plant Cell Tissue and Organ Culture- Gamborg
8. Tissue Culture- Dodds
9. Principle of Gene manipulation – Primrose Old
10. Collins, H.A. and Edward, S. 1998. Plant cell Culture Bios scientific Publishers, Oxford, U.K.
11. Vasil, IK and Thorpe, T.A. 1994 Plant cell and tissue culture. Klwer Academic, Publishers, The Netherlands
12. Biotechnolgy Vol-3 H.J. Rhem and reed. Verlag chemic.

SUGGESTED READING (PAPER-II)

1. Biotechnology- B.D. Singh
2. A Text Book of Biotechnology – H.D. Kumar
3. A Text Book of Biotechnology – R.C. Dubey
4. Elements of Biotechnology – P.K. Gupta
5. Plant Biotechnology – P.K. Gupta
6. Biotechnology and Tissue Culture – Chopra, Narosa Publishing House.
7. Plant Cell Tissue and Organ Culture- Gamborg
8. Tissue Culture- Dodds
9. Principle of Gene manipulation – Primrose Old
10. Collins, H.A. and Edward, S. 1998. Plant cell Culture Bios scientific Publishers, Oxford, U.K.
11. Vasil, IK and Thorpe, T.A. 1994 Plant cell and tissue culture. Klwer Academic, Publishers, The Netherlands
12. Biotechnolgy Vol-3 H.J. Rhem and reed. Verlag chemic.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – III

(PRACTICAL-IV)

HOURS: 06 Marks: 100

(PRACTICAL RELATED TO THEORY PAPERS)

1. Determination of minimum size of quadrates
2. Determination of frequency, density of species of grassland community
3. Estimation of IVI of species in a community
4. To determine soil moisture content, porosity of soils collected from varying depths at different localities.
5. To determine the water holding capacity of soils collected from different localities.
6. To estimate dissolved oxygen content in eutrophic and oligotrophic water sample.
7. Identification and comments on plants/plant products with reference to their economic importance.
8. Moprhological, anatomical study of white fibres (cotton, jute)
9. Study the cytohistological zonation in the shoot apical meristem (SAM) by preparing L.S. of colcus shoot apex and making permanent with double stained procedure
10. Examination of shoot apices to study the origin and arrangement of leaf primodia of monocotyledon taking L.S. and preparing a permanent slide.
11. Study of different types of ovules/embryos in permanent preparation.
12. Any other practical.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

PAPER-I (Theory) Marks: 50 (10+40)

(ENVIRONMENTAL HAZARDS & PROTECTION MEASURES)

Unit-I

Global warming green house effect, global warning & Climate change, effect of global warming, Ozone depletion, world summit on sustainable development (WSSD)

Unit-II

Radiation & Chemical toxicology: Units of radioactivity, sources of radiation exposure, biological effect of radiation.

Unit-III

Chemical toxicants: Industrial & agricultural wastes, biological effect of chemical toxicants. Ecological changes & diseases; contaminated water and diseases, index organisms of faecal contamination.

Unit-IV

Environmental laws: Constitutional provision of water & Air act, Responsibility of an Industry, Water cess Act, 1981, The Water (Prevention & control of pollution) act 1974, The Environment Protection Act. 1986.

Unit-V

Environmental Protection: Function & Responsibility of state pollution control Board, participation of people in environmental protection, Role of NGOs, Environmental movement in Odisha & India.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

PAPER-II (Theory) Marks: 50 (10+40)

(ENVIRONMENTAL BIOLOGY)

Elective Paper

(SYSTEM ECOLOGY)

Unit-I

(System concept) : Holistic view of the organism, Environmental complex, system approach to the organism. Environmental complex variables, interactions & flow process in the system, various types Ecosystems & their characteristics & significance.

Unit-II

(Functional aspects of ecosystem): Energy flow, efficiency of energy transfer, trophic-dynamic concept, food chain, food web, Ecological pyramids, energy flow in terrestrial & aquatic ecosystem with specific examples-forest, grassland & marine ecosystems.

Unit-III

(Functional aspects of ecosystem): Nutrient cycling (Sedimentary & gaseous) carbon, Nitrogen & Phosphorus cycles & organism involved in these cycles, Role of decomposers in these cycles.

Unit-IV

(Primary Production): Measurement in aquatic & terrestrial ecosystem, its linkage with secondary production, factors affecting primary production, Bemoans for over in different ecosystems & patterns of primary production in the biosphere.

Unit-V

(Biogeochemical cycles in nature): Carbon, Nitrogen and Phosphorus cycle, organisms involved in these cycles, Role of decomposers in the cycle.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

PAPER-III (Theory) Marks: 50 (10+40)

(ENVIRONMENTAL BIOLOGY)

Elective Paper

(RESOURCES AND CONSERVATION)

Unit-I (Forest Resources):

Concept of conservation in relation to resource conservation of Biological diversity. Social forestry, agro forestry, forest-conservation through laws, World Conservation Strategy (WCS). National Conservation Strategy (NCS), Conservation Agencies – IUCN, UNEP

Unit-II (Water Resource)

Water demand, Sources of Water, Hot spots of surface water, water management, river ralley projects.

Unit-III (Soil Resources)

Soil composition, Soil erosion, Principles of soil conservation, Land use planning, Waterland development, Voluntary agencies & NGOs.

Unit-IV(Energy Resources)

Conventional & non-conventional energy resources. Conventional-Nuclear, thermal, Oil, Hydro, Non-conventional Biogas, Petro Plant & Renewable resources.

Unit-V (Conservation Biology)

Biological diversity, Conservation of Biodiversity, Megadiversity, Hot spots, Bioethics & Conservation, causes of extinction, Endangered species, IUCN, Read Data Book, Man & Biosphere Programme (MAB).

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

HOURS: 06 Marks: 100

PRACTICAL

SPECIAL PAPER

1. Comparative analysis of moisture content of different soil samples.
2. Measurement of water quality based on dissolved Oxygen content of water sample.
3. Estimation of Carbonate content of soil samples.
4. Estimation of soil respiration rate by alkali absorption method.
5. Measurement of Pollution status of water samples by algal index method.
6. Measurement of water holding capacity of different soil samples.
7. Estimation of Carbon content of soil samples.
8. Estimation of Nitrogen content of soil samples.
9. Comparison of resistance to water loss by different categories of leaves.
10. Estimation of Primary Production of the water samples.
11. Any other Practicals.

SUGGESTED READING

SEMESTER-IV

PAPER-I AND SPECIAL PAPER (ENVIRONMENTAL BIOLOGY)

1. Forest Ecology, Vol.I & II, G.S. Puri, R.K. Gupta. V.H. Meher Homji & S. Puri
2. Fundamental of Ecology – E.P. Odum
3. Ecology & Environment – P.D. Sharma, Rastogi Pub.
4. Nature & Properties of Soil – Buckman & C. Brady
5. Plant & Environment – F.F. Dubenmire
6. Dynamics of Vegetation – F.E. Clements
7. Fundamentals of Ecology – Weaver & Clements
8. Plant Ecology – W.D. Bellings
9. Methods of Soil Physics – S.K. Jalota, R. Khera, B.S. Ghuman
10. A text Book of Plant Ecology – R.S. Ambasht
11. Men & Environment – M.C. Dash & P.C. Mishra
12. Fundamentals of Ecology – M.C. Dash

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

ELECTIVE COURSE

(BIOCHEMISTRY) SPECIAL PAPER-II

Unit-I

Chloroplast biogenesis-Morphology of chloroplast. Ultra structure of thylakoid membrance & localization of membrance complexes, Energy transduction in chloroplast membranes, composition, structure of PS I & PS II.

Unit-II

Structure and composition of Oxygen evolving complex (OEC) and chloroplast coupling factor, Electron transport in thylakoid membrane, Mechanism of Photophosphorylation. Inhibitions & couplers, Photoregulation of Rubisco.

Unit-III

Ultra structure of Mitochondria, structure of mitochondrial membrane, structure of electron transport complexes, Topography and asymmetry in membrane structure, Mitochondrial compartmentation, shuttle transporters in mitochondrial membrane.

Unit-IV

Coupling of metabolite transport to electron transport, inhibitors of electron transport and oxidative phosphorylation, structure and function of coupling factor protein, mechanism and energetic of exidative phosphorylation.

Unit-V

Biosynthesis of carbonhydrates gluconeogenesis from acetyl CoA in plant and microorganisms, gluconeogenesis from TCA cycle intermediates and amino acids, Regulation of gluconeogenesis.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

ELECTIVE COURSE

SPECIAL PAPER-III

Marks : 50 (10+40)

Unit-I

Lipid Metabolism: Degradation of odd & even carbon fatty acids, Oxidation of mono & polygenic fatty acid. Minor pathways of fatty acid Osidation, energetic of L-Oxidation, the Glyoxylate cycle.

Unit-II

Biosynthesis of saturated and unsaturated fatty acids and triglycerides. Biosynthesis of phospholipids & cholesterol, Regulation of Cholestrol biosynthesis.

Unit-III

Nitrogen Metabolism: Mechanism of biological nitrogen fixation, Nitrogenase and hydrogenase enzyme systems, control of nitrogenous activities, Nitrate assimilation, incorpation of ammonia into organic compounds. Biosynthesis & degradation of protein, Biosynthesis of purines & pyrimidines.

Unit-IV

Metabolism of amino acids: Biosynthesis of essential, non-essential & aromatic amino acids, Oxidative degradation of amino acids leading to acetyl CoA L-Ketoglutarate pathway, succinic pathway, fumarate pathway and oxaloacetate pathway of amino acid Oxidation.

Unit-V

Regulation of metabolic processes: Enzymatic regulation of glycolysis, Role of uridine diphosphate sugar in sucrose and starch synthesis.

DETAILED SYLLABUS

M.SC BOTANY

SEMESTER – IV

SPECIAL PAPER

PRACTICAL-IV

Marks : 100

1. Determination of chl a and chl b content of leaves of two different ages and comparison of ratio of chla & chlb.
2. Determination of crude lipid content of oily seed.
3. To find out the saponification value of the oil.
4. Estimation of reducing sugar content of plant material.
5. Estimation of total free amino acid content in plant material.
6. Estimation of total protein content of a sample.
7. To find out the effect of substrate concentration on urease activity in the plant material to determine the km value by Line weaver Burke plot.
8. To find out the effect of enzyme concentration and incubation period in urease activity.
9. To determine the effect of incubation period and temperature on urease activity.
10. Any other practical.

SUGGESTED READING

SEMESTER-IV

SPECIAL PAPER (BIOCHEMISTRY)

1. Principles of Biochemistry- Lehninger, Nelson & Cox, 1993, CBS. Pub. New Delhi.
2. Biochemistry – Lubert Stryer (41Edn.) 1995, Freeman & CBS.
3. Biochemistry- Grat & Grisham, 1995.
4. Enzyme structure & Mechanism – Freshet & Freeman.
5. Enzyme structure & Function – W.B. Bernard
6. Understanding Enzymes – T. Palmer, Ellies Harwood,1985
7. Basic Principles of membrane transport – S.G. Schultz, 1980
8. Mechanism of Bioenergetics – E. Racker, AP
9. Membrances of Mitochondria & Chloroplasts – E. Racker, AP
10. Phosynthesis – Rabinowitch & Govindjee – Wiley Eastern, New Delhi
11. Bioenergetics Photosynthesis – Govindjee (Ed) 1984
12. Biochemistry – K. Trehan
13. Chloroplast Biogenesis – (Vol.5) Baker and Baker
14. Botanical Metabolism (3rd Edn) 1996. Goottschalk, Springer Verag, Germany.

****