

DEPARTMENT OF BIOSCIENCES
VEER NARMAD SOUTH GUJARAT UNIVERSITY
Outline of Syllabus for Semester System (2011-12)

M.Sc. Biosciences

III Semester (Plant Sciences)

Theory:

Paper	Subject	Credits
Bios -(P)-301	Phycology	4
Bios -(P)- 302	Mycology & Plant pathology	4
Bios -(P)-303	Bryology, Pterology and Gymnosperms	4
Bios -(P)-304	Medicinal Plants-I (Elective)	4

Practicals:

Bios -(P)- 305	Practicals Based on Bios-(P)-301 Bios-(P)-302 Bios-(P)-303 Bios-(P)-304	8
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IV Semester (Plant Sciences)

Theory:

Paper	Subject	Credits
Bios -(P)-401	Angiosperm taxonomy	4
Bios -(P)-402	Plant Anatomy	4
Bios -(P)-403	Embryology and Histo-chemical Techniques	4
Bios -(P)-404	Medicinal Plants-II (Elective)	4

Practicals:

Bios -(P)-405	Practicals Based on Bios -(P)-401 Bios -(P)-402 Bios -(P)-403 Bios -(P)-404	8
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M.Sc. Biosciences - III Semester (Plant Sciences)**Bios -(P)-301 - Phycology****No.of credits-4****Unit-1**

- General characters of algae
- Systems of Classification of algae
- Lifecycle patterns in algae

Unit-II

Taxonomy, salient features, phylogeny, interrelationships of the taxa

- Cyanophyta
- Chlorophyta
- Chrysophyta,
- Euglenophyta

Unit-III

Taxonomy, salient features, phylogeny, interrelationships of the taxa

- Phaeophyta
- Rhodophyta.
- Dinoflagellates.
- General account of Diatoms

Unit-IV

- Cyanobacterial toxins, extracellular products and antimicrobial substances of cyanobacteria.
- Physiology, Biochemistry and genetics of nitrogen fixation in heterocystous and non heterocystous forms.
- Economic importance of algae and the current trends and the researches carried out to exploit algal organisms
- Seaweed cultivation and their commercial industrial products
- Biotechnology of micro algae
- Algae as pollution indicators

References:

1. Bhatia, A. 1994. Treatise on Algae. S. Chand & Company, New Delhi.
2. Bold, H.C. & Wynne, M.J. 1985. Introduction to the Algae. Prentice Hall of India, New Delhi.
3. Chapman, V.J. Chapman, D.J. 1975. The Algae. Macmillan India Ltd., Delhi.
4. Fritsch, F.E. 1945. Structure and reproduction of Algae. Cambridge University Press.
5. Kumar, H.D. 1999. Introductory Physiology, Affiliated East West Press Pvt. Ltd. New Delhi.
6. Lewin, R.A. (Ed.). 1962. Physiology and Biochemistry of Algae. Academic Press.
7. Pandey, B.P. 1994. Algae. S.Chand & Company Ltd. New Delhi.
8. Round, F.E. 1984. The Ecology of Algae. Cambridge University Press.
9. Sharma, O.P. 1998 Text book of Algae. Tata McGraw Hill, New Delhi.
10. Sharma, P.D., A Text book of Botany-Lower Plants. Rastogi Publications, Meerut.
11. Vashishta, B.R. 1999. Algae. S.Chand & Company, New Delhi.]

M.Sc. Biosciences III Semester (Plant Sciences)
Bios -(P)-302- Mycology & Plant Pathology

No.of credits-4

Unit-1

- Principles and modern trends of classification of Fungi
- Contributions of Indian Mycologists.
- General account of Lichens.
- Heterothallism in fungi.
- Ultra structure of fungal cells
- Economic importance of fungi with special reference to secondary metabolites.

Unit-II

- Structure, reproduction and phylogeny of
 - Phycomycetes,
 - Ascomycetes,
 - Basidiomycete
 - Deuteromycetes.

Unit-III

- General principles and concepts of host-parasite interaction,
- Defense mechanisms
- Integrated management including biological control
- Fungicides and pesticides, sanitation, disease resistance
- Epidemiology and quarantine procedures.

Unit-IV

- Viral, fungal and bacterial diseases of
 - Rice
 - Sugarcane
 - Mango
 - Banana

References:

1. Ainsworth, G.C., Sparrow. K.E. and Sussman. The Fungi. Academic Press, New York.
2. Alexopoulos, C.J., Mims, C.W. Blackwell, M. 1996. Introductory mycology. John Wiley & Sons., New York.
3. Bilgarmi, K.S. and Verma, R.N. 1994. Physiology of Fungi. Vikas Publishing House Pvt. Ltd. New Delhi.
4. Dube, H.C. An Introduction to Fungi. Vikas Publishing House, New Delhi.
5. Inderjeet Kaur S, and Surinder Kaur 2011, Textbook of Fungi & their allies, Macmillan
6. Hale, M.E. 1983. Biology of Lichens. Edward Arnold.
7. Sharma, O.P. Text book of Fungi. Tata McGraw Hill Publishing Co.Ltd. New Delhi.
8. George N. Agrios. 1997. Plant Pathology. Academic press, London.
9. Manners, J.G.1982. Principles of Plant Pathology. Cambridge University Press.
10. Marshall, H. 1999. Diseases of Plants. Anmol Publications Pvt. Ltd. New Delhi.
11. Mehrotra, R.S.2000. Plant Pathology, Tata McGraw Hill Publishing Co. New Delhi.
12. Mundkur, 1982. Text book of Plant Diseases. Macmillan India, New Delhi.
13. Rangaswamy, G. 1992. Diseases of Crop Plants in India. Prentice Hall of India, New Delhi.
14. Singh, R.S. 1991. Plant Diseases. Oxford IBH, New Delhi.
15. Singh, R.S. 1994. Introduction to the Principles of Plant Pathology. Oxford IBH. New Delhi.
16. Swarup et al., 1999. Plant Diseases. Anmol Publications Pvt. Ltd., New Delhi.
17. Vashishta, P.C. and Gill, P.C. 1998. Plant Pathology. Pradeep Publications, Jalandhar.

M.Sc. Biosciences III Semester (Plant Sciences)
Bios -(P)-303-Bryology, Pterology and Gymnosperms

No.of credits-4

Unit-I

- Classification, Salient features of the taxa
 - Hepaticopsida,
 - Anthocerotopsoda
 - Bryopsida.
 - Phylogeny and interrelationships in bryophyte and affinities of bryophyta with other groups of plants
 - Origin and evolution in Bryophyta

Unit-II

- General characters, classification (current trends) of pteridophytes.
- Structure and evolutionary trends with reference to stele and spores. Telome concept in Pteridophytes.
- Apospory, apogamy and parthenogenesis.
- Origin and development of Heterospory. Origin of Seed habit
- Processes of fossilization and types of fossils. Concept of organ genera on palaeobotany
- Fossil Pteridophytes-
 - *Rhynia*,
 - *Lepidocarpon*,
 - *Sphaenophyllum*,
 - *Zygopteris*

Unit-III

- Comparative morphology, structure, ecology and phylogeny of the following groups.
 - Psilopsida,
 - Lycopsida,
 - Sphenopsida,
 - Pteropsida.

Unit-IV

- General characters, distribution, phylogeny, classification and economic importance of Gymnosperms.
- Structure of vegetative and reproductive parts of a representative taxon from each of the following groups, their phylogeny and interrelationships.
 - *Cycadofilicales*
 - *Caytoniales*

- *Bennettitales*
- *Pentoxylales*
- *Cycadales*
- *Ginkgoales*
- *Coniferales*
- *Gnetales*.

References:

1. Cavers, F. 1976. The Inter relationship of the Bryophyta. S.R. Technic (Book House), Ashok Rajpath, Patna.
2. Dyer, A.F. and Duickett, J.G. (Ed.). 1984. The experimental Biology of Bryophytes. Academic Press.
3. Parihar. N.S.1980. An Introduction to Embryophyta Vol. I. Bryophyta. Central Book Depot.
4. Prem Puri, 1981. Bryophytes: Morphology, Growth and differentiation. Atma Ram and Sons, New Delhi.
5. Vashishta, P.C. 1999. Bryophyta. S. Chand & Co. New Delhi.
6. Eames, E.J. 1983. Morphology of vascular plants. Standard University Press.
7. Rashid, A. 1999. Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
8. Sharma, O.P. 1990. Textbook of Pteridophyta. Macmillan India Ltd. Delhi.
9. Sporne, K.R. 1986. The morphology of Pteridophytes. Hutchinson University Press.
10. Sundara Rajan, S. 1999. Introduction to Pteridophyta. New Age International Publishers, New Delhi.
11. Biswas, C. and Johri, B.M. 1999. The Gymnosperms. Narosa Publishing House, New Delhi.
12. Chamberlain, C.J. 1955. Gymnosperms. Structure and Evolution.
13. Chamberlain, C.J. 2000. Gymnosperms. C B S Publishers and Distributors, New Delhi.
14. Sporne, K.R.1986. Morphology of Gymnosperms. Hutchinson University Press.
15. Vashishta, P.C. 1999. Gymnosperms, S. Chand & Company Ltd. New Delhi.

M.Sc. Biosciences III Semester (Plant Sciences)
Bios -(P)-304 -Medicinal Plants-I (Elective)

No.of credits-4

Unit-I

- History and development of herbal science in India and abroad
 - Sushrut
 - Theophrastus (370 – 285 BC)
 - Parashar (250 – 120 BC)
 - Charak (1 AD)
 - Dioscorides (1 AD)
- Introduction to the literature on medicinal plants
 - Charak Samhita
 - Rajnighantu
 - Bhavprakash Nighantu
 - Sharangdhar Samhita
 - Nighantu Adarsh : Bapalal Vaidya
 - Indian Medicinal Plants : Kirtikar and Basu
 - Contemporary literature:

Unit-II

- Identification, distribution and importance of following medicinal plants
- Undergroundparts: roots, tubers, suckers
 - *Asparagus racemosus*
 - *Asparagus adscendens*
 - *Chlorophytum tuberosum*
 - *Chlorophytum borivillianum*
 - *Dashmool (Ideal vs. Reality)*
 - *Shemal musli: bombax malabarica*
 - *Boerhavia diffusa*
 - *Tephrosia purpurea*
 - *Withania somnifera*
- Bark:
 - *Terminalia arjuna*
 - *Tecomella undulata*
 - *Moringa oleifera*
- Leaves:
 - *Justicia adhatoda*
 - *Centella asiatica*
 - *Ocimum sanctum*
 - *Vitex negundo*
 - *Cassia angustifolia*
 - *Abrus precatorius*

Unit-III

- Flowers:
 - *Madhuca indica*
 - *Careya arborea*
 - *Hibiscus rosasinensis*

- Seeds & fruits:
 - *Emblica officinale*
 - *Embelia tsjerum cottam*
 - *Semecarpus anacardium*
 - *Terminalia chebula*
 - *Terminalia bellirica*
 - *Gmelina arborea*
 - *Cassia tora*
 - *Cassia sophera*

- Exudates & Gums:
 - *Sterculia urens*
 - *Acacia nilotica*
 - *Anogeissus latifolia*
 - *Bombax malabarica*
 - *Commiphora wightiana*
 - *Boswellia serrata*

Unit-IV**Phormocognosy:**

- Morphological examination
- Microscopic evaluation
- Development of Standardization parameters
 - b. Solvent extractive values
 - c. Ash values
 - d. Crude fiber
 - e. Moisture content
 - f. Microbial infestation (Bioload)
 - g. Bitter value
 - h. Foaming index
 - i. Swelling index
 - j. Heavy metals
 - k. Contaminations & Aflatoxins

References:

1. Ambasta S. P. (1986): The Useful Plants of India. Publication & Directorate, CSIR, New Delhi.
2. Anjaria J., Parabia M.H. and Dwivedi S. (2002): Ethnovet Heritage- Indian Ethnoveterinary Medicine: An Overview. Pathik Enterprise, Ahmedabad.
3. Anonymous (1998): Quality Control Methods for Medicinal Plants Materials. World Health Organization, Geneva.
4. Anonymous (1999): Indian Herbal Pharmacopoeia (Volume I – II). Joint Publication of Regional Research Laboratory (CSIR), Jammu and Indian Drug Manufacturers' Association.

5. Anonymous (2002): WHO Monographs on selected Medicinal Plants (Volume I-II). World Health Organization, Geneva
6. Chauhan M. : Microscopic profile of powdered drug used in Indian System of Medicine (Volume I).
7. Chopra R.N., Nayar S.L. and Chopra I.C. (1969): Glossary of Indian Medicinal Plants. Publication and Information Directorate, CSIR, New Delhi
8. Evans W.C. (2002): Pharmacognosy (15th Edn.). Saunders Publications.
9. Edwin F.George, Michael Hall and Geert-Jan De Klerk (2007) Plant Propagation by Tissue culture Vol.1.
10. Handa S.S. and Kaul M.K. (edt. by) (1997): Supplement to Cultivation and Utilization of Medicinal Plants. Regional Research Laboratory, CSIR, Jammu-Tawi, J&K, India
11. Kirtikar K.R. and Basu B.D. (1998): Indian Medicinal Plants (I to VIII Volumes) (2nd edn.) (4th Reprint) BishenSingh Mahendrapal Singh, Dehradun
12. Rangunathan K. and Mitra R. (comp. & edt. by) (1999): Pharmacognosy of Indigenous Drugs (Volumes I – II) (Reprint). Central Council for Research in Ayurveda and Siddha, New Delhi, India.
13. RaviKumar K. and Ved D.K. (2000): 100 Re-Listed Medicinal Plants for Conservation Concern in Southern India (1st Edn.) Foundation for Revitalization of Local Health Traditions, Bangalore.
14. Sadasivam S. and Manickam A (1996): Biochemical Methods (2nd. Edn.).New Age International Publishers, Tamilnadu Agriculture University, Coimbtore.
15. Sumy, Ved D.K. and Krishnan (2000): Tropical Indian Medicinal Plants Propagation Methods (1st Edn.) Foundation for Revitalization of Local Health Traditions, Bangalore.

M.Sc. Biosciences IV Semester (Plant Sciences)

Bios -(P)-401- Angiosperms taxonomy

No.of credits-4

Unit-I

- Definition and importance of taxonomy.
- Pre Darwinian and post Darwinian theories of biological classification:
 - Essentialism, Nominalism, and Empiricism, evolutionary systematics and phylogenetic systematics.
- Study of Bentham and Hooker's system of classification.
- Comparative study of the systems of classification by Engler & Prantle, Bessey Hutchinson and Takhtajan including a critical evaluation of their basic tenets.

Unit-II

- Plant Nomenclature: Understanding of ICBN (International Code of Botanical Nomenclature) – Principles of ICBN – Effective and valid publications. Law of priority and Author citation – Type Concept, nomenclatorial types– Type specimens(Holotype, lectotype, syntype, isotype, Neotype), Publication of names -Nomina Conservanda et rejicienda and types of names: Autonym, Synonym, Homonym, Basionym, Tautonym and Nomen nudum.
- Construction of taxonomic keys (indented and bracketed) and their utilization.

Unit-III

- Floristic studies of India
 - Botanical Survey of India.
 - Overview of flora of Gujarat
- Critical study of the current ideas on the origin of angiosperms with special reference to their ancestral stocks and their distribution in time and place

Unit-IV

- Modern concepts and trends in Plant taxonomy: Elementary treatment of
 - i. Cytotaxonomy
 - ii. Chemotaxonomy
 - iii. Numerical Taxonomy (Taximetrics)
 - iv. Molecular Taxonomy
 - v. Cladistics.
- Problems in evolutionary taxonomy: the concepts of primitive and advanced, monophyly and polyphyly, parallelism and convergence, homology and analogy.

References:

1. Cronquist, A. 1981. An Integrated System of Classification of Flowering Plants.
2. Davis, P. H. and Heywood. 1963. Principles of Angiosperm Taxonomy, New York
3. Gibbs, R.D. Chemo taxonomy and Flowering Plants.
4. Greuter et al., 1988. International Code for Botanical Nomenclature, Koningsteen.
5. Henry, A.N. and Chandrabose, M. 1980. An Aid to the International code of Botanical Nomenclature.
6. Heywood, V.H. and Moore, D,H. 1984. Current concepts in Plant Taxonomy, London.
7. Hooker, J.D. 1879. Flora of Brtish India. Reeve & Co. London.
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9. Lawrence, G.H.M. 1955. An Introduction to Plant Taxonomy. Central Book Depot, Allahabad.
10. Lawrence, G.H M. 1964. Taxonomy of Vascular Plants. New Delhi.
11. Naik, V.N. 1984. Taxonomy of Angiosperms. New Delhi.
12. Priti Shukla and Shital P. Misra. 1997. An Introduction to Taxonomy of Angiosperms. Vikas Publishing House Pvt. Ltd. New Delhi.
13. Rendle. A.B. 1967. Classification of Flowering Plants. Cambridge.
14. Sivarajan, V.V. 1999. Principles of Plant Taxonomy Oxford & IBH Publishing Co. Pvt Ltd. New Delhi.
15. Subrahmanyam, N.S. 1999. Modern Plant Taxonomy. Vikas Publishing House Pvt. Ltd. New Delhi.
16. Willis, J.C. 1960. A Dictionary of Flowering Plants and Ferns. Cambridge.

M.Sc. Biosciences IV Semester (Plant Sciences)

Bios -(P)-402-Plant Anatomy

No.of credits-4

Unit-I

- Apical organization in vascular plants : Root and shoot meristem
- Cellular manifestation and factors affecting development,
- Shoot apex of Pteridophyta, Gymnosperms and Angiosperms,
- lateral roots, root hairs
- Epidermis, stomata, trichomes, types, role
- Secretory Ducts and Laticifers, types, development, function.

Unit-II

- Vascular Cambium
- Xylem
- Phloem
- Nodal anatomy

Unit-III

- Structure of wood- wood development and environmental factors.
- Softwood- hardwood. heart wood and Sap wood,
- Heart wood and role of extractives in wood quality.

Unit-IV

- Physiological Plant-Anatomy:
 - Dermal tissue system
 - Absorbing tissue system
 - Storage tissue system.
 - Secretary or glandular system

References:

1. Cutler, D. F. 1978. Applied Plant Anatomy. Orient Longman Publishers, New Delhi.
2. Easu, 1987. The Anatomy of seed plants. Wiley Eastern Ltd. New Delhi.
3. Fahn, A. 1989. Plant Anatomy, Peragamon Press, Oxford, New York.
4. Gahan, P.B. 1984. Plant Histochemistry and Cytochemistry, Academic Press, London.
5. Carlquist T.S. Comparative plant anatomy

M.Sc. Biosciences IV Semester (Plant Sciences)**Bios -(P)- 403-Embryology and Histochemical Techniques****No.of credits-4****Unit-I****Gametophyte Development**

- Structure and development of microsporangium. Microsporogenesis, development of male gametophyte.
- Structure and development of megasporangium. Megasporogenesis, development of female gametophyte.
- Different types of embryo sacs, ultra structure of embryo sac, Nutrition.

Unit-II**Fertilization**

- Pollination, Pollen pistil interaction, Pollen viability, storage, germination, Fertilization, sexual incompatibility
- Embryo development, Types of embryogeny, Polyembryony, Nutrition, endosperm, seed development
- Palynology — morphographic, aeropalynology, Mellitopalynology, Paleopalynology, forensic palynology.

Unit-IV

- Scope of histochemistry and cytochemistry in Biology.
- Buffers and reagents, Chemistry of fixation
- Tissue processing techniques for light microscope, hand and serial sections, squashes smears and maceration.
- Types of microtomes-Rotary, Sledge, Freezing Cryostat and Ultratomes.
- Classification and chemistry of biological stains. General and specific vital stains and fluorochromes.

Unit-IV

- Tissue processing techniques for electron microscopy (SEM and TEM).
- Detection and localization of primary metabolites- Carbohydrates (PARS reaction), Proteins (Coomassie brilliant blue staining), Lipids (Sudan Black method). Introduction to other methods.
- Enzyme histochemistry (General design and applications).

References:

1. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms, Vikas Publishing House Pvt. Ltd. New Delhi.
2. Johri, B.M. 1984. Embryology of Angiosperms. Springer Verlag. Berlin.
3. Maheswari, P. 1980. Recent Advances in the Embryology of Angiosperms.
4. Pandey, A.K. 1997. Introduction to Embryology of Angiosperms. CBS Publishers and Distributors, New Delhi.
5. Pandey, S.N. and Chadha, A. 2000. Embryology. Vikas Publishing House Pvt. Ltd. New Delhi.
6. Gary, P. 1964. Hand Book of basic microtechnique, John Wiley & Sons, New York.
7. Harris, Electron microscopy in Biology
8. Johanson, W.A. 1984. Plant Microtechnique. Mc Graw Hill.
9. Johanson, W.A. 1982. Botanical Histochemistry-Principles and Practice. Freeman & Co.
10. Kierman, J.A. 1999. Histological and Histochemical Methods. Butterworth Publications, London
11. Poarse, histochemistry, Vol. I and Vol.II.
12. Ruzin, Z.E. 1999. Plant Microtechnique and Microscopy. Oxford University Press, New York.

M.Sc. Biosciences IV Semester (Plant Sciences)
Bios – (P) -404- Medicinal Plants-II (Elective)

No.of credits-4

Unit-I

Phytochemistry:

- Glycosides: anthraquinones, isothiocyanates, Flavonols, Lactones phenols Saponins and cardiac glycosides
- Alkaloids: indoles, isoquinolines, tropanes, pyridine and piperidine, steroidal alkaloids.
- Phenols and tannins

Unit-II

Pharmacological screening of herbal drugs:

- Need for phyto-pharmacological evaluation
- Evaluation of anti diabetic agents
- Evaluation of anti microbial agents
- Evaluation of anti diarrhoeal agents

Unit-III

Conservation of medicinal plants

- Non destructive and sustainable exploitation
- Cultivation of medicinal plants
 - *Withania somnifera*
 - *Chlorophytum tuberosum*
 - *Andrographis paniculata*
 - *Cassia angustifolia*
 - *Justicia adhatoda*
 - *Cissus quadrangularis*
 - *Costus speciosus*
- Micropropagation of medicinal plants
 - Methods
 - Development of tissue culture protocol for medicinal plants
 - Possible methods of improving yield
 - Selection of strains
 - Biotechnological methods (GMOs etc.)
 - Cell culture and production of secondary metabolites

Unit-IV

- Methods of isolation
 - a. Solvent extraction
 - b. Thin layer chromatography

- c. HPTLC
- d. Column Chromatography
- e. HPLC
- Intellectual property rights and Patent laws

References:

1. Bhat S.V., Nagsampampagi B.A. and Sivakumar M. (2005) Chemistry of Natural Products, Narosa Publishing house, New Delhi
2. Bolliger H.R., Brenner M., Ganshirt H., Mangold H.K., Seiler H., Stahl E. and Waldi D. (1965): Thin Layer Chromatography – A Laboratory Handbook. Springer-Verlag Academic Press Inc. New York, London
3. DerMarderosian A. and Beutler J.A. (Co ed. by) (2002): The Review of Natural Products (Volume I- II) (2nd edn.). Facts and Comparisons, Missouri, USA.
4. Harborne J. B. (1973): Phytochemical Methods. Chapman and Hall, London.
5. Mukherjee P.K.(2002): Quality Control of Herbal Drugs- An Approach to Evaluation of Botanicals (1st Edn.). Business Horizons Pharmaceutical Publishers, New Delhi, India
6. Raman N. (2005): Phytochemical Techniques and Plant Tissue Culture. Department of Botany, University of Madras, Chennai.
7. Rastogi R.P. and Mehrotra B.N. (1993): Compendium of Indian Medicinal Plants (Volumes I – VI). CSIR, Lucknow and Publication & Information Directorate, New Delhi.
8. Wagner H. and Bladt S. (1996): Plant drug Analysis- A Thin layer Chromatography Atlas (2nd Edn.). Springer Publications