GONDWANA UNIVERSITY

GADCHIROLI

SYLLABUS

BOTANY

M. Sc. Part-I and II

(Semester with credit based Pattern)

(w.e.f. session 2012-13)

APPENDIX – 1

Scheme of teaching under credit based semester system for M. Sc. Program in BOTANY.

M.Sc. I

Sr. No.	Semester	Course code / Paper	Course / paper	Title of course/ paper	Teaching Scheme		
					Theory (Hrs.)	Practical (Hrs.)	No. of Credits
1	I	BOT T I	I	Microbiology Algae & Fungi	4	--	4
2		BOT T II	II	Bryophytes & Pteridophytes	4	--	4
3		BOT T III	III	Gymnosperms and Paleobotany	4	--	4
4		BOT T IV	IV	Cytology & Genetics	4	--	4
6		BOT P I	PRACT.I	Algae, Fungi, Bryophytes	--	8	4
7		BOT P II	PRACT.II	Pterido, Gymno-Paleo, Cytology, Genetics	--	8	4
8		Seminar –I			2	--	1
8	II	BOT T V	I	Plant Physiology and Biochemistry	4	--	4
9		BOT T VI	II	Plant Development and Reproduction	4	--	4
10		BOT T VII	IIII	Cell & Molecular Biology- I	4	--	4
11		BOT T VIII	IV	Angiosperms - I	4	--	4
13		BOT P III	PRACT. III	Plant Physiology , Biochemistry, and Growth & Dev.	--	8	4
14		BOT P IV	PRACT. IV	Cell & Mol. Bio. I and Angio- I	--	8	4
		Seminar –II			2	--	1

Scheme of teaching under credit based semester system for M. Sc. Program in BOTANY.
M.Sc. II

Sr. No.	Semester	Course code / Paper	Course / paper	Title of course/ paper	Teaching Scheme		
					Theory (Hrs.)	Practical (Hrs.)	No. of Credits
15	III	BOT T IX	I	Plant Ecology	4	--	4
16		BOT T X	II	Cell and Molecular Biology - II	4	--	4
17		BOT T XI	III	Plant Biotechnology	4	--	4
18		BOT T XII	IV	Angiosperms - II	4	--	4
20		BOT P V	PRACT. V	Ecology, Cell & Mol. Biology-II	--	8	4
21		BOT P VI	PRACT. VI	Plant biotechnology & Taxonomy - II	--	8	4
		Seminar - III			2	--	1
22	IV	BOT T XIII	I	Plant Conservation, IPR & Ethnobotany	4	--	4
23		BOT T XIV	II	PRU, Biosafety, Bioethics, Biostat. & Pl. Breed.	4	--	4
24		BOT T XV	III	Special paper-I	4	--	4
25		BOT T XVI	IV	Special paper -II	4	--	4
27		BOT P VII	PRACT. VII	On Special Paper I & II	--	8	4
28		BOT P VIII	PRACT. VIII	Project	--	8	4
		Seminar IV			2	--	1

1. In each semester student will have to give seminar on any topic relevant to the syllabus encompassing the recent trends and development in that field. The topic of the seminar will be decided at the beginning of each semester in consultation with supervising teachers. The students have to deliver the seminar on the hour duration which will be followed by discussion. The seminar will be open to all the teachers of the department invitees and students.
2. The students will have to carry out the research based project work in lieu of practical in the **fourth semester** in the department or depending on the avaibility of placement, he/she will be attached to any of the national/ regional/ private research institute / organization for the duration of the fourth semester. The student will be randomly allotted the priority number for the selection of the supervisor at the begining of the third semester. The student in consultation with supervisor will finalize the topic of the project work at the third semester.
3. These course can be taught by person having post graduate qualification in relevant / equivalent subjects/ or having teaching / research experience in that particular area.

APPENDIX – 2

Scheme of the examination under credit based semester system for M. Sc. Program in BOTANY.

M.Sc. I (Sem – I & II)

SN	Semester	Course / Paper	Title of paper	Duration of paper / hrs.		Maximum marks		Total marks	Credits
				T	P	Ex	In		
1	I	I	Microbiology, Algae and Fungi	3		80	20	100	4
2		II	Bryophytes and Pteridophytes	3		80	20	100	4
3		III	Gymnosperms and Paleobotany	3		80	20	100	4
4		IV	Cytology and Genetics	3		80	20	100	4
5		Pract. I	Microbiology, Algae and Fungi and Bryophytes		6	80	20	100	4
6		Pract. II	Pteridophytes, Gymnosperms, Paleobotany, Cytology and Genetics		6	80	20	100	4
7			**Seminar**					25	1
8	II	V	Plant physiology and Biochemistry	3		80	20	100	4
9		VI	Plant Development and Reproduction	3		80	20	100	4
10		VII	Cell and Molecular Biology- I	3		80	20	100	4
11		VIII	Angiosperms- I	3		80	20	100	4
12		Prac. III	Plant physiology, Biochemistry, Plant Development and Reproduction		6	80	20	100	4
13		Prac. IV	Cell and Molecular Biology- I and Angiosperms- I		6	80	20	100	4
14			**Seminar**					25	1

Scheme of the examination under credit based semester system for M. Sc. Program in BOTANY.

M.Sc. II (Sem –III & IV)

SN	Semester	Course / Paper	Title of paper	Duration of paper / hrs.		Maximum marks		Total marks	Credits
				T	P	Ex	In		
15	III	IX	Plant Ecology	3		80	20	100	4
16		X	Cell and Molecular Biology- II	3		80	20	100	4
17		XI	Plant Biotechnology	3		80	20	100	4
18		XII	Angiosperms- II	3		80	20	100	4
19		Pract. V	Plant ecology, Cell and Molecular Biology- II		6	80	20	100	4
20		Pract. VI	Plant Biotechnology and Angiosperms- II		6	80	20	100	4
21			**Seminar**					25	1
22	IV	XIII	Plant conservation, IPR and Ethnobotany	3		80	20	100	4
23		XIV	Pl. Res. Uti., Bioethics, Biosafety, Pl. Breed. & Biostat.	3		80	20	100	4
24		XV	Special Paper I	3		80	20	100	4
25		XVI	Special Paper II	3		80	20	100	4
26		Pract. VII	On Special Paper I & II		6	80	20	100	4
27		Pract. VIII	Project		6	80	20	100	4
28			**Seminar**					25	1

1. In each semester student will have to give seminar on any topic relevant to the syllabus encompassing the recent trends and development in that field. The topic of the seminar will be decided at the beginning of each semester in consultation with supervising teachers. The students have to deliver the seminar on the hour duration which will be followed by discussion. The seminar will be open to all the teachers of the department, invitees and students.
2. The students will have to carry out the research based project work in lieu of practical in the fourth semester in the department or depending on the avaibility of placement; he/she will be attached to any of the national/ regional/ private research institute / organization for the duration of the fourth semester. The student will be randomly allotted the priority number for the selection of the supervisor at the end of the third semester. The student in consultation with supervisor will finalize the topic of the project work at the third semester.
3. The regular full time teacher of the department / contributory teacher approved by University / scientist of Government / private research laboratory appointed by University as a contributory teacher and having M.Phil. or Ph. D. degree can supervise the project work of the student .

APPENDIX – 3

Rules and Regulations for the Credit and Semester system in Post Graduate Teaching Department Botany of University.

I . GENERAL ADMINISTRATION OF THE CREDIT AND SEMESTER SYSTEM.

1. There shall be a Coordinator committee for Credit and Semester system, with Head of the Department as its chairperson, consisting of not less than three teachers of the department. The committee will be nominated by Vice Chancellor. This committee will take appropriate decisions, from time to time. This committee will forward these recommendation to appropriate authority, in case such approvals are essential.
2. Any issue not covered by this set of Rules and Regulations , but covered by the Rules previously existing shall be governed by the rules existing before the commencement of these Rules .
3. Any issue arising out of the implementation of the Credit and Semester system which are of the specific nature , which dose not need the approval of any authority and Vice Chancellor shall be resolved by the departmental coordination committee.
4. The coordination committee shall from time to time consider suggestion received from Faculty , Student and Examination Section and wherever the matter pertains to the overall functioning of the Credit and Semester system, shall recommended new rules , modification in existing rules or clarification there of .

II. ADMISSION AND CONDUCTION OF THE CREDIT SYSTEM .

1. The M. Sc. Degree of Botany will be awarded who complete the total of 100 credits (sciences) in the minimum of two years .
2. Each credit will be equivalent to (i.e. 15 hrs.).
3. The department can announce the seminar course to introduce student to research done by the faculty. Seminar credits are to be conducted through discussion and presentation by the students and the personal guidance of the teacher . Seminar shall not exceed a maximum 2 credits. These credits will be evaluated as internal assessment .
4. The Departmental Coordination Committee-
    a. Will nominate the faculty of each course to be taught in the department .
    b. Will approve a plan for evaluation prepared by the faculty for the credits concern as a internal continuous assessment of 50 % from among the 12 given in the III below. Ordinarily the teacher may opt for an internal assessment procedure other than the written exams.
    c. Will evolve the norms of evaluating oral examination whenever necessary in relation to term paper assignment ;
    d. Will take appropriate decisions in the cases of readmissions of student during the transition from old to revised syllabus by deciding which credit from the revised syllabus was equivalent to credit from the old syllabus;

e. Will revise the syllabus at least five years.

5. There will be no mid-way change to over to credit system to noncredit or external examination or vice versa.

III. EXAMINATION RULES

1. Each course will have
   a. 50 % of marks as a semester and examination of three hours.
   b. 50 % marks for internal (i.e. in- semester) assessment.
2. The student has to obtain 40% marks in the combined examination of in- Semester assessment and semester – end assessment with a minimum passing of 30 % in both these separately .
3. To pass, a student shall have to get minimum aggregate 40% marks (E and above on grade point scale) in each course.
4. If a student misses an internal assessment examination he/ she will have a second chance with the permission of the teacher concerned. Such a second chance with the permission of the teacher concerned. Such a second chance shall not be the right of the student; it will be the discretion of the teacher concerned to give or not to give second chance to a student to appear for internal assessment.
5. Students who have failed semester-end exam may reappear for the semester-end exam only twice in subsequent period. The student will be finally declared as failed if he/she does not pass in all credits within a total period of four years. After that such students will have to seek fresh admission as per admission rules prevailing at that time.
6. A student can‘t register for the third semester, if he/ she fails to complete all credits of the total credits expected to be ordinarily completed within two semesters.
7. Internal marks will not change. A student can not repeat internal assessment.
8. There shall be revaluation of the answer script of semester end theory examination only as per the existing ordinance in force. There shall not be revaluation of the internal assessment papers and practical examination.
9. While marks will be given for all examination, they will be converted into grades. The semester end and final grade sheets and transcripts will have only grades and grade point average.
10. The project will consist of not more than ten percent of the total credits for the degree course.
11. Each credit will have an internal (continuous) assessment of 50% of marks and a teacher must select a variety of procedures for examination such as:
    i. Written test and / or Mid term test (not more than one for each course);
    ii. Term paper ;
    iii. Journal / lecture / library notes ;
    iv. Seminar presentation ;
    v. Short quizzes ;
    vi. Assignments ;
    vii. Extension work;

viii. Research projects by individual student or group of students;

ix. An open book test (with the concern teacher deciding what books are to be allowed for this purpose).

12. The system for evaluation will be as follows: Each assignment will be evaluated in terms of grades. The grades for separate assignments and the final semester end examination will be added together and then converted into grade and later a grade point average. Results will be declared for each semester and final examination will give grade and grade point average.

Marks (out of 100)	**Grade**	**Grade point**
100 to 75	O: Out standing	06
74 to 65	A: Very Good	05
64 to 55	B: Good	04
54 to 50	C: Average	03
49 to 45	D: Satisfactory	02
44 to 40	E: Pass	01
39 to 00	F: Fail	00

13. Final Grade Points

Grade Points	**Final Grades**
5.0 TO 6.0	O
4.50 TO 4.99	A
3.50 TO 4.49	B
2.50 TO 3.49	C
1.50 TO 2. 49	D
0.50 TO 1.49	E
0.00 TO 0.49	F

14. Calculation of average grade points and cumulative grade points average **(CGPA)** :

Grade Point Average = Total Grade Point Earned X Credits hrs. for each course

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Total Credit Hours

Cumulative Grade Point Average

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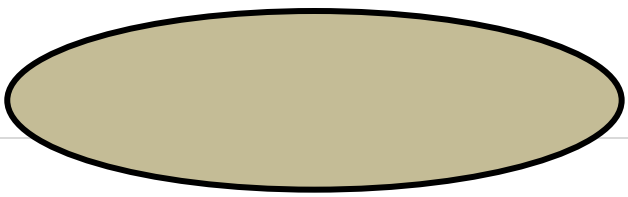
SYLLABUS

BOTANY

M.Sc. Part-II



M. Sc. Botany Syllabus

Semester III

Course code/name: PAPER –IX : Plant Ecology

Module I:

Vegetation organization: Concepts of community and continuum, analysis of communities (analytical ad synthetic characters): interspecific associations, concept of ecological niche.

Vegetation development: Temporal changes (cyclic and non-cyclic); mechanism of ecological succession (relay floristics and initial floristic composition; facilitation, tolerance and inhibition models); changes in ecosystem properties during succession, Autecology.

Module II:

Ecosystem organization: Structure and functions; primary production (methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization, energy flow pathways, ecological effeciencies); litter fall and decomposition (mechanism, substrate quality and climatic factors); global biogeochemical cycles of C, N, P, and S; mineral cycles (pathways, processes, budgets) in terrestrial and aquatic ecosystems.

Module III:

Air, Water and Soil pollution: Kinds; sources; quality parameters; effects on plant and ecosystems.

Climate change: Greenhouse gases (CO_2, CH_4, N_2O, CFCs; sources, trends and role); ozone layer and ozone hole; consequences of climate change (Global warming, sea level rise, UV radiation).

Module IV:

Ecosystem stability: Concept (resistance and resilence); Ecological perturbations (natural and anthropogenic) and their impact on plants and ecosystems; ecology of plant invasion; environmental impact assessment; ecosystem restoration.

Ecological management: Concepts; sustainable development; sustainability indicators.

Practicals:

1. A trip to the grass land/ forest/ water body to get acquainted with their plant species.
2. Distribution pattern of different plant species determined by Quadrat/ Transat/ Point centered Quarter methods.
3. Qualitative parameters of distribution of plant species, Frequency, Density, Basal cover, dominance, Abundance and IVI.
4. Analysis of soils of two different areas i.e. Cropland and forest/ grassland for certain nutrients, CO_3, NO_3, Base deficiency.
5. Analysis of water quality for physical properties like colour, BOD, COD, O_2, CO_2 contents etc.

6 Study of adaptations in plants of Hydrophytic, Xerophytic and Halophytic zones.

Suggested Readings:

1. Ambasht R.S. 1968. Freshwater ecosystem- Manual of Ecology 123-137 (See Misra KC et al 1968)
2. Ambasht R.S. 1966 Conservation Ecology, Abs Proc School on Plant Ecol (Full paper in press Oxford and IBH Calcutta).
3. Ambasht R.S. 1995 A text book of plant ecology Student and co. Varanasi-5
4. Anderson JM Ecology for environmental sciences: biosphere ecosystems and man
5. Billings WB 1964 Plants and the ecosystem Macmillan & co, London.
6. Clements FE 1916 Plant succession, An analysis of the development of vegetation. Carnegie Institute of Washington.
7. Cragg JB 1968 The theory and practice of conservation, IUCN Publ, New Series No. 12, 25-35.
8. Dash MC 1993 Fundamentals of Ecology WB Saunders and co. Philadelphia USA.
9. Deangelis DL Energy flow, nutrient cycling and ecosystem resilience. Ecology 56, 238-43.
10. Dwivedi Rama Shankar 1968. The decomposer system manual of ecology See Misra KC et al 1970)
11. Frankel OH, Soule ME, 1981, Conservation and Evolution, Cambridge Univ Press.
12. Grace J 1983, Plant atmosphere relationships. Champman & Hall.
13. Greig Smith P 1983, Quantitative plant ecology, Univ California Press, California.
14. Hutchings MJ (ed) 1988, Plant population biology, Blackwell.
15. Hutchinson GE 1978, An introduction to population ecology. Yale Univ. Press.
16. Kochhar PL 1986 Plant Ecology Ratan prakashan, Mandi, Agra.
17. Krebs GJ 1972 Ecology Harper and Row Publ, New York.
18. Kumar HD 1994 Modern concepts of ecology. Vikas publishing house pvt ltd, New Delhi.
19. May RM (ed) 1981 Theoretical Ecology, Blackwell.
20. Odum EP 1963 Ecology Holt Reinhart and Winston Inc.
21. Odum EP 1983 Basic Ecology, Saunders Publ Philadelphia.
22. Reynolds CS 1984 The ecology of phytoplankton, Cambridge Univ Press
23. Silverton JW 1982 Introduction to plant population ecology, Longman.
24. Southwick CH 1983 (ed) Global Ecology Sinauer.
25. Whittaker RH 1975 Communities and Ecosystems (2nd ed) MacMillan, New York.

M. Sc. Botany Syllabus

Semester III

Course code/name: Paper- X : Cell and Molecular Biology- II

Module I:

Ribosomes: Structure and function

Transcription & Translation: Transcription in prokaryotic and eukaryotic cells, plant promoters, transcription factors, types of RNA and their function, splicing, mRNA transport, rRNA biosynthesis; translation in prokaryotic and eukaryotic cells, structural levels of proteins, post-translational modification; structure and role of tRNA.

Module II:

Gene structure and expression: Fine structure of gene, Cis-trans test; fine structure analysis in eukaryotes; introns and their significance, RNA splicing; regulation of gene expression in pro- and eukaryotes.

Protein sorting: Machinery involved, vesicles, coat proteins; protein targeting to plastids, mitochondria, peroxisomes, nucleus, vacuoles; modification during transport.

Module III:

Genome organization in prokaryotes and eukaryotic organelles: Phage genome, genetic recombination in phage and mapping phage genes; mapping of bacterial genes through transformation, conjugation and transduction; genetics of mitochondria and chloroplast.

Genetic recombination and genetic mapping: Recombination, independent assortment and crossing over; molecular mechanism of recombination, role of RecA and RecBCD enzymes; site-specific recombination; chromosome mapping, linkage group, genetic markers, construction of molecular maps, correlation of genetic and physical maps; Somatic cell genetics - an alternative approach to gene mapping.

Module IV:

Cell cycle and apoptosis: Control mechanisms, role of cyclins and cyclin dependent kinases; retinoblastoma and E2F proteins; cytokinesis and cell plate formation; programmed cell death in plants; regulation in plant growth and development.

Signal transduction: Overview, receptors and G- proteins, phospholipid signaling, role of cyclic nucleotides, calcium-calmodulin cascades, diversity in protein kinases and phosphatases.

Techniques in cell biology: Electrophoresis, immunotechniques, FISH, GISH, confocal microscopy

Practicals:

1. Isolation of nuclei and identification of histones by SDS-PAGE.
2. Isolation of chloroplast and demonstration of two subunits of RUBISCO by SDS PAGE
3. Restriction digestion of plant DNA, its separation by agarose gel electrophoresis, visualization by ethidium bromide staining.
4. To study in vitro transcription.
5. To study in vitro translation.
6. To study conjugation in bacterial cells.
7. To detect the presence of specific antigen by ELISA
8. Isolation of RNA and quantification by spectrophotometric method.

References: Online journals available on UGC V-SAT programme

Suggested readings:

1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D. 1999. Molecular Biology of Cell, Garland Publishing, Inc., New York.
2. Buchanan, B.B., Gruissem, W. and Jones, R. L. 2000 Biochemistry and Molecular Biology of Plants. American Soc. Of Plant Physiologists, Maryland, USA.
3. De Robertis, E.D.P. and De Robertis, E.M.F. Cell and Molecular Biology 8th Ed. B. I. Waverly Pvt. Ltd., New Delhi.
4. Karp, G. 1999 Cells and Molecular Biology; Concepts and Experiments. John Wiley & Sons, Inc., USA.
5. Khush, G.s. 1973 Cytogenetics of Aneuploids, Academic Press, New York, London
6. Kleinsmith, L.J. and Kish, V.M. 1995 Principles of Cell and Molecular Biology (2nd Edi.) Harper Collins Coll. Publisher, New York, USA.
7. Lewin, B. 2000 Gene VII Oxford Univ. press, New York.
8. Lodish, H., Berk, A. Zipursky, S. L. Matsudaira, P., Baltimore, D. and Darnell, J. 2000 Molecular Cell Biology Edi. W.H. Freeman and Co., New York, USA.
9. Malacinski, G. M. and Freifelder, D. 1998 Essentials of Molecular Biology (3rd Edi.) Jones and Bartiet Pub. Inc., London.
10. Russel, P. J. 1998 Genetics (5th Edi.) The Banjamin/ Cummings Publishing Com. Inc., USA
11. Sunstad, D. P. and Simmons, M. J. 2000 Principles of Genetics (2nd Edi.) John Wiley & Sons Inc., USA.
12. Tamarin, R. H. 2001 Principles of Genetics 7th Edi. The McGraw−Hill Companies.

13. Wolf, S.L. 1993. Molecular and Cellular Biology, Wadsworth Publishing Co., California, USA.
14. Gerhard, Krauss, Wieley, VCH Third revised edition, Biochenmistry of Signal Transduction and Regulation.

M. Sc. Botany Syllabus

Semester III

Course code/name: Paper- XI : Plant Biotechnology

Module I:

Recombinant DNA technology: Gene cloning and principles and technique; vectors- types and their properties; construction of DNA libraries; splicing of insert into the vector; screening of DNA libraries and introduction of the recombinant DNA into the host cells.

Genetic engineering of plants: Aims, strategies for development of transgenics (with suitable examples); Agrobacterium- the natural genetic engineer; T-DNA and transposon mediated gene tagging.

Module II:

Microbial genetic manipulation: Bacterial transformation, selection of recombinants and transformants, genetic improvement of industrial microbes and nitrogen fixers, fermentation technology.

Genomics and proteomics: Molecular markers for introgression of useful traits; high throughput sequencing; functional genomics; Protein profiling and its significance**.**

DNA synthesis; DNA sequencing; polymerase chain reaction; DNA fingerprinting

Module III:

Plant tissue culture: Basic concepts; Principles and scope; tissue culture media; callus induction and cell suspension; aspects of morphogenesis; haploid and triploid production; production of somatic embryos; applications of plant tissue culture; protoplast isolation and culture; production of cybrids

Transgenic production: Methods to introduce gene in plants; selection of transformed plants/explants; salient achievements in crop bioteachnology.

Module IV:

Bioinformatics: Introduction, History, Definition and applications of bioinformatics.

Database: Types and classification of databases – Primary Databases (Nucleic acid sequence, protein sequence, protein structure), Secondary databases (Genomic, cDNA, Organellar, gene expression), special databases (Human, *Escherichia coli*, *Saccharomyces*

cerevesaie and *Arabidopsis thaliana*), Literature database (PubMed, OMIM), Information Retrieval system (Entrez). Other databases: GeneBank, KEGG, Taxonomy databases

Data analysis, prediction and submission tools and their uses: ORF finder**,** Blasts, FASTA, RASMOL, Prediction of pro- and eukaryotic genes and promoters (Genscan); protein structure (SWISS-Prot, pfam, PDB, PIR); **sequin**, webin, AutoDep tools.

Practicals:

1. Growth characteristics of *E.coli* using plating and turbidimetric methods.
2. Isolation of plasmid from *E.coli* and its quantification.
3. Restriction digestion of the plasmid and estimation of the size of various DNA fragments.
4. Cloning of a DNA fragment in a plasmid vector, transformation of the given bacterial population and selection of recombinants.
5. Co-cultivation of the plant material (e.g. leaf discs) with *Agrobacterium* and study GUS activity histochemically.
6. Preparation of media for plant tissue culture.
7. To surface sterilize the given seeds/explant for tissue cultural manipulation.
8. To isolate protoplast and determine its viability.
9. To fuse the protoplast for production somatic hybrid.
10. Demonstration of DNA sequencing by Sanger's dideoxy method.
11. To search literature of different organisms and genes from NCBI.
12. Use of various tools to retrieve information available from NCBI
13. To retrieve gene and protein sequences of various organisms from NCBI.
14. To locate gene(s) on chromosomes for a given disease/disorder.

Suggested Readings (for laboratory exrcises)

1. Baxevanis, A. D., Davison, D. B.; Page, R. D. M.; Petsko, G. A.; Stein, L. D. and Stormo, G. D. 2008 Current Protocols in Bioinformatics, John-Wiley and Sons Publications, New York.
2. Baxevanis, A. D. and Ouellate, B. F. F. 2009 Bioinformatics: A Practical Guide to the analysis of genes and proteins. John-Wiley and Sons Publications, New York.
3. Gelvin, S. B. and Schilperoort, R. A (eds) 1994. Plant Molecular Biology Manual, 2nd edition. Kluwer Academic Publishers, Dordrecht, The Netherlands,
4. Glover, D. M. and Hames, B. D.(Eds) 1995. DNA Cloning 1: A Practical Approach: Core Techniques, 2nd edition PAS, IRL Press at Oxford University Press, Oxford.
5. Hackett, P. B. Fuchs, J. A. and Messing, J. W. 1988. An Introduction to Recombinant DNA Techniques. Basic Experiments in Gene Manipulation. The Benjamin/cummings Publishing Co., Inc. Menlo Park, California.

6. Maniatis et al. Molecular cloning Vol. I, II and III. Cold-Spring Harbor Lab Press.
7. Shaw, C. H. (Ed.) 1988, Plant Molecular Biology : A Practical Approach. IRl Press,
8. Oxford.

References: Online journals available on UGC V-SAT programme.

Suggested Readings:

1. Baxevanis, A. D., Davison, D. B.; Page, R. D. M.; Petsko, G. A.; Stein, L. D. and Stormo, G. D. 2008 Current Protocols in Bioinformatics, John-Wiley and Sons Publications, New York.
2. Baxevanis, A. D. and Ouellate, B. F. F. 2009 Bioinformatics: A Practical Guide to the analysis of genes and proteins. John-Wiley and Sons Publications, New York.
3. Brown, T. A. 1999. Genomes, John Wiley & Sons(Asia) Pvt. Ltd., Singapore.
4. Callow, J. A., Ford-Lloyed, B. V. and Newbury, H. J. 1997. Biotechnology and
5. Plant Genetic Resources: Conservation and Use, CAB International, Oxon UK.
6. Chrispeeels, M. J. and Sadava, D. E. 1994, Plants, Genes and Agriculture. Jones & Barlett Publishers, Boston, USA.
7. Glazer, A. N. and Nikaido, H. 1995. Microbial Biotechnology. W. H. Freeman & Company, New York, USA.
8. Gustafson, R. J. 2000. Genomes. Kluwer Academic Plenum Publishers, New York, USA.
9. Henry, R. J. 1997. Practical Applications of Plant Molecular Biology. Chapman & Hall, London, UK.
10. Jain, S. M., Sopory, S. K. and Veilleux, R.E. 1996. *In vitro* Haploid Production in Higher Plants, Vols. 1-5, Fundamental Aspects and Methods. Kluwer Academic Publishers, Dordrecht, The Netherlands.
11. Jolles, O. and Jornvall, H. (eds) 2000. Proteomics in Functional Genomics. Birkhauser Verlag, Basel, Switzerland.
12. Kartha, K. K. 1985. Cryopreservation of Plant Cells and Organs. CRC Press, Boca Raton, Florida USA.
13. Kingsman, S. M. Genetic Engineering : An Introduction to Gene Analysis and Exploitation in Eukaryotes, Blackwell Scientific Publications, Oxford, 1998
14. Mount W. 2004 Bioinformatics and sequence genome analysis 2nd Edi. CBS Pub. New Delhi
15. Old, R. W. and Primrose, S. B. 1989. Principles of Genome Analysis. Blackwell Scientific Publications. Oxford, UK.
16. Primrose, S. B.1995. Principles of Genome Analysis. Blackwell Scientific Ltd., Oxford, UK.
17. Raghavan, V. 1997. Molecular Biology of Flowering Plants. Cambridge University Press, New York, USA.
18. Watson, J. , Tooze and Kurtz Recombinant DNA: A short course

M. Sc. Botany Syllabus

Semester III

Course code/name: Paper- XII : Angiosperms- II

Module I:

General account, distinguished characters, floral variation and evolution, affinities of :- Magnolidae, Hamamelidae, Dilleniidae, Rosidae, Asteridae, circumscription as per Cronquist,1968

Module II:

Alismatidae, commelinidae, Aracidae, Lilidae; Interesting features and systematic position of Cucurbitaceae, Cactaceae, Asteraceae, Amentiferae, Lemnaceae, Palmae, Orchidaceae.

Module III:

Probable ancestors of angiosperms, primitive living angiosperms, speciation and extinction, IUCN categories of threat, distribution and global pattern of biodiversity.

Module IV:

Biological diversity concept and levels, role of biodiversity in ecosystem functions and stability, Endemism, hotspots and hottest hotspots, invasions and introductions, local plant diversities and its socioeconomic importance.

Practicals:

1. Description of a specimen from representative, locally available families.
2. Description of a species based on various specimens to study intra specific variation: collective exercise.
3. Description of various species of a genus, location of key characters and preparation keys at generic level.
4. Location of key characters and use of keys at family level.
5. Field trips within and around the campus; compilation of field notes and preparation herbarium sheets of such plants, wild or cultivated as are abundant.
6. Training in using floras herbaria for identification of specimens described in the class.
7. Demonstration of the utility of secondary metabolites in the taxonomy of some appropriate genera.

Comparison of different species of a genus and different genera of a family to calculate similarity coefficients and preparation of dendrograms.

Suggested Readings :

1. Devis, P.H. and Heywood, V. H. 1973. Principles of angiosperms taxonomy. Robert E. Kreiger Pub. Co. Newyork.
2. Grant, V. 1971. Plant Speciation, Columbia University press, London.
3. Grant W. F. 1984**.** Plant Biosystematics. Academic press, London.
4. Harisson, H.J. 1971. New concept in flowering plant Taxonomy. Hickman educational books Ltd. London.
5. Hislop-Harisson, J. 1967. Plant Taxonomy. English Language Book Sco. And Edward Arnold Pub. Ltd, UK.
6. Heywood, V. H. and Moore, D. M. 1984. Current concepts in Plant Taxonomy. Academic Press, London.
7. Joncs, A. D. and Wibins, A. D. 1971. Variation and adaptation in Plant species Hickman and Co. New York.
8. Jones, S. B., Jr.and Luchsinger, A. E. 1986. Plant Systematics (gd edition). McGraw- Hill Book Co., New York.
9. Nordentam, B., El Gazaly, G. and kassas, M. 2000. Plant systematic for 2ft century. Portlant press. Ltd, London.
10. Radford, A. E. 1986. Fundamentals of plant systematic. Harper and Raw publication, USA.
11. Solbrig, O.T. 1970. Principles and methods of plant Sytematics. The Macmillan Co. Publication Co. Inc., USA.
12. Woodland, D. W. 1991. Contemporary Plant Syatematics, Pentice Hall, New Jersery.
13. Takhtajan, A. L. 1997. Diversity and classification of Flowering Plants. Columbia University Press, New York.
14. Stebbins, G. L. 1974. Flowering Plants-evolution Above species Level. Edvard Arnold Ltd, London.
15. Joncs, A. D. and Wibins, A. D. 1971. Variation and adaptation in Plant species Hickman and Co.
16. Jones, S. B., Jr.and Luchsinger, A. E. 1986. Plant Systematics (gd edition). McGraw Hill Book Co., New Delhi.

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