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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Semester</th>
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<th>Course / paper</th>
<th>Title of course/ paper</th>
<th>Teaching Scheme</th>
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## Scheme of teaching under credit based semester system for M. Sc. Program in BOTANY.

### M.Sc. II

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</table>
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 availability 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 beginning 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)**

<table>
<thead>
<tr>
<th>SN</th>
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<th>Duration of paper / hrs.</th>
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<td>Gymnosperms and Paleobotany</td>
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<td>IV</td>
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Scheme of the examination under credit based semester system for M. Sc. Program in BOTANY.
M.Sc. II (Sem –III & IV)

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<td>Seminar</td>
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</table>
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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.

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</tr>
<tr>
<td>74 to 65</td>
<td>A: Very Good</td>
<td>05</td>
</tr>
<tr>
<td>64 to 55</td>
<td>B: Good</td>
<td>04</td>
</tr>
<tr>
<td>54 to 50</td>
<td>C: Average</td>
<td>03</td>
</tr>
<tr>
<td>49 to 45</td>
<td>D: Satisfactory</td>
<td>02</td>
</tr>
<tr>
<td>44 to 40</td>
<td>E: Pass</td>
<td>01</td>
</tr>
<tr>
<td>39 to 00</td>
<td>F: Fail</td>
<td>00</td>
</tr>
</tbody>
</table>

13. Final Grade Points

<table>
<thead>
<tr>
<th>Grade Points</th>
<th>Final Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0 TO 6.0</td>
<td>O</td>
</tr>
<tr>
<td>4.50 TO 4.99</td>
<td>A</td>
</tr>
<tr>
<td>3.50 TO 4.49</td>
<td>B</td>
</tr>
<tr>
<td>2.50 TO 3.49</td>
<td>C</td>
</tr>
<tr>
<td>1.50 TO 2.49</td>
<td>D</td>
</tr>
<tr>
<td>0.50 TO 1.49</td>
<td>E</td>
</tr>
<tr>
<td>0.00 TO 0.49</td>
<td>F</td>
</tr>
</tbody>
</table>

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

\[
\text{Grade Point Average} = \frac{\text{Total Grade Point Earned} \times \text{Credits hrs. for each course}}{\text{Total Credit Hours}}
\]

Cumulative Grade Point Average
GONDWANA UNIVERSITY
GADCHIROLI

SYLLABUS

BOTANY

M.Sc. Part-II
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 efficiencies); 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 (CO₂, CH₄, N₂O, 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 resilience); 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, CO₃, NO₃, Base deficiency.
5. Analysis of water quality for physical properties like colour, BOD, COD, O₂, CO₂ contents etc.
6  Study of adaptations in plants of Hydrophytic, Xerophytic and Halophytic zones.

Suggested Readings:
4. Anderson JM Ecology for environmental sciences: biosphere ecosystems and man
22. Reynolds CS 1984 The ecology of phytoplankton, Cambridge Univ Press
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:
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 biotechnology.

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 excises)


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

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: