Revised Syllabus For

Bachelor of Science (Part III) Botany

Semester- V-Paper -IX, X, XI, XII
and
Semester –VI- Paper -XIII, XIV, XV, XVI

Syllabus to be implemented from June 2012 onwards.
B] Shivaji University, Kolhapur
Revised Syllabus For
Bachelor of Science

1. TITLE : Subject- Botany
   Optional under the Faculty of Science

2. YEAR OF IMPLEMENTATION:- Revised Syllabi will be implemented from June 2012 onwards.

3. PREAMBLE:-
   [Note :- The Board of Studies should briefly mention foundation, core and applied components of the course/paper. The student should get into the prime objectives and expected level of study with required outcome in terms of basic and advance knowledge at examination level.]

4. GENERAL OBJECTIVES OF THE COURSE:
   (as applicable to the Degree concerned)

   Objectives:-
   1) To impart knowledge of Science is the basic objective of education.
   2) To develop scientific attitude is the major objective to make the students open minded, critical, curious.
   3) To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute the science.
   4) To understand scientific terms, concepts, facts, phenomenon and their relationships
   5) To make the students aware of natural resources and environment.
   6) To provide practical experience to the students as a part of the course to develop scientific ability to work in the field of research and other fields of their own interest and to make them fit for society.
   7) To The students are expected to acquire knowledge of plant and related subjects so as to understand natural phenomenon, manipulation of nature and environment in the benefit of human beings.
   8) To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self reliant and sufficient.
   9) To create the interest of the society in the subject and scientific hobbies, exhibitions and other similar activities.

5. DURATION
   The course shall be a full time course.

6. PATTERN:-
   Pattern of Examination will be Semester for Theory and Annual for practical.
7. FEE STRUCTURE: -
   As per Government /University rules.
   1. Refer brochure and prospectus of concern affiliated college/institute to Shivaji University, Kolhapur.
   2. Other fee will be applicable as per rules and norms of Shivaji University, Kolhapur.

8. ELIGIBILITY FOR ADMISSION:
   As per guidelines obtained from Shivaji University, Kolhapur by following rules and regarding reservations by Govt. of Maharashtra.

9. MEDIUM OF INSTRUCTION:
   The medium of instruction shall be in English.

10. STRUCTURE OF COURSE- B. Sc. III Botany (Optional)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subjects/Papers</th>
<th>Theory</th>
<th>Internal</th>
<th>Total Marks</th>
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<tr>
<td>1.</td>
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<td>Practical -I</td>
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11. SCHEME OF TEACHING AND EXAMINATION:-
    [The scheme of teaching and examination should be given as applicable to the course/paper concerned.]
THIRD YEAR - SEMESTER – V/VI: Botany (Optional)
Scheme of Teaching and Examination

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject/Paper</th>
<th>Teaching Scheme (Hrs/Week)</th>
<th>Examination Scheme (Marks)</th>
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12. SCHEME OF EXAMINATION :-
   • The examination shall be conducted at the end of each term for semester pattern.
   • The Theory paper shall carry 40 marks.
   • The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of 40 + 10 marks.
   • Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabi.

13. STANDARD OF PASSING:-
   As Prescribed under rules & regulation for each degree.

14. NATURE OF QUESTION PAPER COMMON MENTIONED SEPARATELY:

15. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS- (FOR REVISED SYLLABUS)
   (Introduced from June 2012 onwards)
<table>
<thead>
<tr>
<th>Paper No.</th>
<th>Title of Old Paper</th>
<th>Semester No</th>
<th>Paper No.</th>
<th>Title of New Paper</th>
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<tr>
<td>V.</td>
<td>Section I- Biology of Cryptogams. Section II- Microbiology and Plant Pathology</td>
<td>Semester- V</td>
<td>IX</td>
<td>Biology of Cryptogams. Microbiology and Plant Pathology</td>
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<td>VI.</td>
<td>Section I- Gymnosperms, Palaeobotany Section II- Angiosperms and Environmental Biology</td>
<td>Semester- VI</td>
<td>XIII</td>
<td>Gymnosperms &amp; Palaeobotany</td>
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<td>XIV</td>
<td>Angiosperms and Environmental Biology</td>
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<td>VII.</td>
<td>Section I- Genetics Section II- Microbial Genetics, Plant Breeding and Biostatistics</td>
<td>Semester- V</td>
<td>XI</td>
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<td>Microbial Genetics, Plant Breeding and Biostatistics</td>
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<td>VIII.</td>
<td>Section I- Plant Biochemistry Section II- Molecular biology and Biotechnology</td>
<td>Semester- V</td>
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<td>Molecular biology and Biotechnology</td>
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16. SPECIAL INSTRUCTIONS, IF ANY.

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REVISED SYLLABUS FOR BOTANY
B. Sc. (Part III) (Semester V)
(Introduced from June 2012 onwards)

Paper – IX
Biology of Cryptogams (40 periods)

Unit 1. Algae : (10)
Sub-unit 1.1 Occurrence and distribution of algae.
Sub-unit 1.2 Origin and evolution of sex in algae. Various theories.
Sub-unit 1.3 Types of life cycles in algae – Haplontic, Diplontic,
Haplodiplontic, Isomorphic, Heteromorphic, Haplobiontic,
Diplobiontic. Triphasic.
Sub-unit 1.4 Study of life cycles – Chara and Ectocarpus
(Excluding development of sex organs and sporophyte).

Unit 2. Fungi (10)
Sub-unit 2.1 Reproduction in Fungi.
Sub-unit 2.2 Study of following types with emphasis on classification,
Structure of mycelium, nutrition, reproduction and economic
importance.
  a) Albugo b) Uncinula c) Agaricus.
  (Excluding developmental stages.)
Sub-unit 2.3 Mushroom Cultivation – Pleurotus sajor-kaju

Unit 3. Bryophytes (8)
Sub-unit 3.1 Evolution of gametophyte and sporophyte.
Sub-unit 3.2 Study of life cycle of Plagiochasma
(Excluding developmental stages).
Sub-unit 3.3 Alternation of generations in Bryophytes.

Unit 4. Pteridophytes (12)
Sub-unit 4.1 General account of Pteridophytes with reference to
  a. Structure of gametophytes.
  b. Alternation of generations in pteridophytes.
Sub-unit 4.2 Study of life cycle of Marsilea
(Excluding developmental stages.)
Unit 1: Microbiology
Sub-unit 1.1 Methods in Microbiology – Staining, Sterilization methods, Culture media, Pure culture methods.

Sub-unit 1.2 Micro-organisms in biological world and characteristic features of different groups –
   a) Bacteria
   b) Viruses,
   c) Phytoplasma
   d) Actinomycetes.
Sub-unit 1.3. Industrial applications of micro-organisms- organic acids, alcohol, antibiotics and bio-pesticides.

Sub-unit 1.4. Microbial Biofertilizers. Rhizobium, PSB, BGA & Trichoderma

Unit 2. Plant Pathology
Sub-unit 2.1 Classification of plant diseases based on Pathogens, Crops, and Symptoms.
Sub-unit 2.2 Transmission of pathogen- Seed born, Soil born and Air born.

Unit 3. Study of Plant diseases
Sub-unit 3.1 Phytoplasma – Grassy shoot disease of Sugarcane.
Sub-unit 3.2 Viral – Yellow vein mosaic of Bhendi.
Sub-unit 3.3 Bacterial – Citrus canker.
Sub-unit 3.4 Fungal – a. Downy mildew of Bajara.
   b. Leaf spot of Turmeric
   c. Grain Smut of Jowar.
   d. Anthracnose of Bean.
Unit 1. Mendelism

Sub-unit 1.1 Introduction and Basic terminologies in genetics.

Sub-unit 1.2 Principles of Inheritance.
   Law of Dominance
   Law of Segregation
   Law of Independent Assortment
   Back Cross and Test Cross

Sub-unit 1.3 Gene Interactions
   a) Complementary gene interactions
   b) Supplementary gene interactions
   c) Epistasis and Hypostasis.

Sub-unit 1.4 Linkage and Recombination
   a) Introduction
   b) Cytological Proof for recombination
   c) Crossing over and its significance, crossing over a measure of genetic distance
   d) Linkage phases, Linkage groups, Complete and incomplete linkages

Unit 2. Multiple Allelism

Sub-unit 2.1 Introduction and definition
Sub-unit 2.2 Self incompatibility in plants

Unit 3. Sex Chromosomes and Sex linked inheritance

Sub-unit 3.1 Autosomes and sex chromosomes.
Sub-unit 3.2 Chromosomal theory of Sex determination.
Sub-unit 3.3 Mechanism of Sex determination.
Sub-unit 3.4 Quantitative Inheritance
   a) Quantitative traits versus qualitative traits and analysis of quantitative traits.
   b) Population Genetics - Hardy-Weinberg Law

Unit 4. Maternal Inheritance

Sub-unit 4.1 Mendelian inheritance versus extrachromosomal inheritance

Sub-unit 4.2 Plastid inheritance.

Sub-unit 4.3 Alterations in the genetic make-up and it's significance
   a) Introduction
   b) Changes in chromosome structure.
   c) Changes in chromosome number
Unit 1. Carbohydrate Metabolism:
- Sub-unit 1.1 Introduction, broad classification of Carbohydrates.
- Sub-unit 1.2 – Properties of Monosaccharides
  Examples- Pentose and Hexose
- Sub-unit 1.3 Properties of Oligo saccharides
  Examples- Sucrose and Lactose.
- Sub-unit 1.4 Properties of Polysaccharides
  Examples -Starch and Cellulose
- Sub-unit 1.5 Isomers, enantiomers and epimers
- Sub-unit 1.6 Biosynthesis and degradation of starch.
- Sub-unit 1.7 Significance of Carbohydrates.

Unit 2. Lipid Metabolism:
- Sub-unit 2.1 Introduction and classification of lipids
- Sub-unit 2.2 Saturated fatty acids- properties and examples-Stearic and Palmitic acid.
- Sub-unit 2.3 Unsaturated fatty acids- properties and examples-Linoleic and Linolenic acids.
- Sub-unit 2.4 General outline of fatty acid biosynthesis.
- Sub-unit 2.5 Beta Oxidation.
- Sub-unit 2.6 Gluconeogenesis of fatty acids during germination.
- Sub-unit 2.7 Significance of lipids

Unit 3. Protein Metabolism
- Sub-unit 3.1 Introduction, structure, properties and characteristics of amino acids
- Sub-unit 3.2. Brief outline of biosynthesis of amino acids – Aspartate and Proline
- Sub-unit 3.3 Protein - structure and classification
- Sub-unit 3.4 Out line of protein biosynthesis in prokaryotes and eukaryotes
- Sub-unit 3.5. Post translational modification.

Unit 4. Nucleic Acids
- Sub-unit 4.1 Composition of nucleic acids.
- Sub-unit 4.2 Structure of - DNA, A, B and Z forms
- Sub-unit 4.3 Structure and Types of RNA and their role.
B. Sc. (Part III) (Semester VI)

**Paper -XIII**  
Gymnosperms and Palaeobotany  
(40 Periods)

**Unit 1. Gymnosperms :**  
Study of following gymnosperms with reference to distribution, organography, anatomy and reproductive structures, sporophytes and gametophytes, fertilization, embryogeny, seed structure and phylogeny.  
Sub-unit 1.1 Cycadales - *Zamia*,  
Sub-unit 1.2 Coniferals - *Thuja*,  
Sub-unit 1.3 Gnetales – *Gnetum*

**Unit 2. Palaeobotany**  
Sub-unit 2.1 a Geological time-scale  
b. Carbon dating  
Sub-unit 2.2 Concept of form genera and nomenclature

**Unit 3. Study of following form genera with reference to systematic position, external morphology, anatomy and affinities**  
a. *Calamites*  
b. *Lyginopteris*  
c. *Enigmocarpon*

**Unit 4. Applications of Palaeobotany**  
Sub-unit 4.1 Role of microfossils in oil and coal exploration.  
Sub-unit 4.2 Oil and coal as fossil fuels.  
Sub-unit 4.3 Biotic origin of oil and coal.
Paper –XIV

Angiosperms and Environmental Biology (40 Periods)

Unit 1. Angiosperms (11)

Subunit 1.1 Phylogeny of angiosperms: A general account of the origin of Angiosperms (With special reference to Gnetalean theory)

Subunit 1.2 Systems of Classification.
   a. Engler and Prantl’s system.
   b. Takhtajan’s system.

Subunit 1.3 Modern Taxonomy: Taxonomy in relation to anatomy, embryology, palynology, cytology (Cytotaxonomy) in plants.

Unit 2. Flower (15)

Subunit 2.1 Concept of flower as a modified shoot.

Subunit 2.2 Structure of anther – Microsporogenesis and development of male gametophyte.

Subunit 2.3 Structure of Pistil – Structure of typical ovule, ovule types, megasporogenesis, development of female gametophyte (embryo sac), embryo sac types – monosporic, bisporic and tetrasporic

Subunit 2.4 Pollination
   a) Mechanism of pollination – Vallisneria, Calotropis, Maize.
   b) Pollen stigma interaction.
   c) Double fertilization and endosperm formation
   d) Apomixis

Subunit 2.5 Development of embryo in Monocotyledons and Dicotyledons

Unit 3. Environmental Biology (07)

Sub-unit 3.1 Introduction – Interrelationship between the living world and the environment, components and dynamism, homeostasis, & relevance to man

Sub-unit 3.2 Impact of human activities on environment – Causes, Prevention and control of – Air, water and Soil Pollution

Sub-unit 3.3 Brief account of environmental toxicology – Eutrophication, bioaccumulation and biomagnifications (2)

Unit 4. Environmental Crisis (5)

Sub-unit 4.1 Desertification, Ozone depletion and Global warming
Sub-unit 4.2 Role of National and International Organizations in environmental management.
Unit 1. Microbial Genetics
- Sub-unit 1.1 Introduction
- Sub-unit 1.2 Bacterial genome
- Sub-unit 1.3 DNA viruses
- Sub-unit 1.4 RNA viruses
- Sub-unit 1.5 Recombination in Bacteria - Transformation, Transduction and Conjugation

Unit 2. Methods of Plant Improvement
- Sub-unit 2.1 Introduction.
- Sub-unit 2.2 Aims and objectives of plant breeding.
- Sub-unit 2.3 Methods of plant breeding.
  a) Introduction and Acclimatization.
  b) Selection
    i) Mass Selection,
    ii) Pure line Selection
    iii) Clonal Selection
  c) Hybridization techniques in self-pollinated crops and cross pollinated crops.
  d) Male sterility and significance in plant breeding.
  e) Hybrid vigour

Unit 3. Breeding in field crops
- Sub-unit 3.1 Breeding in Groundnut
- Sub-unit 3.2 Breeding in Sugarcane
- Sub-unit 3.3 Role of Mutation and Polyploidy in plant breeding

Unit 4. Biostatistics
- Sub-unit 4.1 Collection and presentation of data
- Sub-unit 4.2 Measures of central tendency - Mean, Mode and Median
- Sub-unit 4.3 Variance and standard deviation, Coefficient of variation
- Sub-unit 4.4 Test of Significance (T-text), Chi-square test (X² test)
- Subunit 4.5 Application of Computers in Biological Education
Paper – XVI

Molecular Biology and Biotechnology (40 periods)

Unit 1. DNA replication and recombination (13)
   Sub-unit 1.1 Replication of DNA and role of DNA polymerases
   Sub-unit 1.2 Denaturation and renaturation of DNA.
   Sub-unit 1.3 Recombination at molecular level.
   Sub-unit 1.4 Gene Structure, expression and regulation
      Operon concept – lac operon

Unit 2. Recombinant DNA Technology (12)
   Sub-unit 2.1 Introduction and principles.
   Sub-unit 2.2 Enzymes involved in recombinant DNA technology.
   Sub-unit 2.3 Vectors – Concept
   Sub-unit 2.4 Southern and northern blotting.
   Sub-unit 2.5 DNA fingerprinting – RFLP, RAPD, AFLP.
   Sub-unit 2.6 PCR.
   Sub-unit 2.7 Genomics and DNA libraries.

Unit 3. Genetic Engineering (6)
   Sub-unit 3.1 Introduction to transgenic plants.
   Sub-unit 3.2 Reporter genes.
   Sub-unit 3.3 Role of Agro bacterium in crop biotechnology
   Sub-unit 3.4 Achievements in Plant Biotechnology.

Unit 4. Plant Tissue Culture (9)
   Sub-unit 4.1 Principles of tissue culture.
   Sub-unit 4.2 Terminology in tissue culture.
   Sub-unit 4.3 Cellular differentiation and Totipotency.
   Sub-unit 4.4 Organogenesis and embryogenesis.
   Sub-unit 4.5 Application of plant tissue culture
      a. Protoplast culture.
      b. Somatic hybridization.
      c. Micropropagation.
Shivaji University, Kolhapur
Revised Syllabus
B. Sc. PART - III
BOTANY
(Introduced from 2012-2013)

Practical- I

(Based on Paper IX and X: Biology of Cryptogams and Microbiology and Plant Pathology)

Unit 1. Algae
Sub-unit 1.1 Identification of following algae (any four) 2 Pr.
   a) Hydrodictyon  b) Zygnema  c) Padina  d) Caulerpa  e) Diatoms
Sub-unit 1.2. Life cycle of following genera 2 Pr.
   a) Chara  
   b) Ectocarpus

Unit 2. Fungi
Sub-unit 2.1 Identification of following Fungi (any four) 1 Pr.
   a) Phyllichora b) Alternaria c) Clavaria d) Melampsora e) Rhizopus
Sub-unit 2.2 Life cycle of following types 3 Pr
   a) Albugo  
   b) Uncinula  
   c) Agaricus
Sub-unit 2.3 Cultivation of mushrooms 1 Pr

Unit 3. Bryophytes
Sub-unit 3.1 Identification of following Bryophytes (any four) 1 Pr
   a) Marchantia b) Targionia c) Cyathodium  
   d) Notothyillus e) Fossombronia f) Asterella
Sub-unit 3.2 Life cycle of Plagiochasma 2 Pr.

Unit 4. Pteridophytes
Sub-unit 4.1 Identification of following Pteridophytes (Any four) 1 Pr
   a) Isoetes b) Adiantum c) Lygodium d) Osmunda  
   e) Asplenium f) Azolia g) Blechnum h) Ophioglossum
Sub-unit 4.2 Life cycle of Psilotum (Permanent slides only)  
Sub-unit 4.3 Life cycle of Marsilea  
Sub-unit 4.4 Preparation of PDA (Slants and Plates) and sterilization 2 Pr  
Sub-unit 4.5 Isolation and inoculation 1 Pr

Unit 5. Microbiology and Plant Pathology
Sub-unit 5.1 Micrometry 1 Pr
Sub-unit 5.2 Plant diseases as per theory 4 Pr
Sub-unit 5.3 Study of fermentation by yeast. 1 Pr
Sub-unit 5.4 Study of bio-fertilizers. 1 Pr
Practical – II

(Based on Paper XIII and XIV: Gymnosperms, Palaeobotany, Angiosperms and Environmental Biology)

Unit 1. Gymnosperms and Palaeobotany

Sub-unit 1.1 Anatomical structure in rachis of Cycas and Zamia by sections.
Sub-unit 1.2 Anatomical structure in wood of Pinus and Thuja by maceration.
Sub-unit 1.3 Structure of male and female cones of Thuja and Gnetum.
Sub-unit 1.4 Study of Pollen grain structure of Thuja and Pinus by shape, size, exine, germ pore number and number of constituent cell.
Sub-unit 1.5 Study of fossils – Calamites, Lyginopteris, Enigmocarpon.

Unit 2. Embryology

Sub-unit 2.1 Study of V.S. of typical ovule and types of ovules.
Sub-unit 2.2 Pollen grain germination by hanging drop and sitting drop techniques in Impatiens and Catharanthus roseus or any suitable material.
Sub-unit 2.3 Diversity in the structure of stigma, style, stigmatic papillae and transmitting tissue of style in suitable material (Clitoria, Hibiscus, Maize, Ocimum & Citrus)
Sub-unit 2.4 Microdissection of embryo with suspensor in Cucumis, Grevillea, Boerhaavia and Cyamopsis (any suitable material.)
Sub-unit 2.5 Study of self incompatibility in Hamelia, Catharanthus roseus & Sesamum.
Sub-unit 2.6 Study of seed dispersal with suitable materials.

Unit 3. Angiosperms

Sub-unit 3.1 Study of fruit dispersal with suitable materials.
Sub-unit 3.2 Study of following plant families.
Sub-unit 3.3 Identification of Genus and Species with the help of flora.

Unit 4. Environmental Biology

Sub-unit 4.1 Determination of DO (Dissolved Oxygen) and BOD (Biological Oxygen Demand) in polluted and non polluted water samples (any two)
Sub-unit 4.2 Titrimetric estimation of free CO2 and bicarbonates in polluted and non polluted water samples (any two)
Sub-unit 4.3 Analysis of electrical conductivity, temperature and pH of different water samples.
Practical – III

(Based on Paper XI and XV: Genetics, Microbial Genetics, Plant Breeding and Biostatics)

(Each sub-unit should be completed in one practical unless Specifically mentioned)

Unit 1. Mendelian genetics.
1.1 Study of Mendelian traits in garden pea.
1.2 Examples of linkage and crossing over.
1.3 Examples on polygene inheritance.

Unit 2. Cytological techniques
2.1 Study of meiosis in Allium buds. (2 Pr)
2.2 Determination of chromosome count in PMCs in Allium. (2 Pr)
2.3 Preparation of karyotypes – idiograms by using photographs.
2.4 Determination of interspecific variations in chromosome number in Allium.

Unit 3 Meiotic anomalies in chromosomes
Detection of meiotic anomalies in chromosomes in Rhoeo. (2 Pr)

Unit 4 Plant Propagation
4.1 Study of correlation of floral structure in insect pollinated plants (Any two) Salvia, Sesamum, Pea, Plectranthus, Ceropegia, Helianthus.
4.2 Study of correlation of floral structure with pollination system in castor and maize.
4.3 Field exploration for detection of male sterile lines in Maize.
4.4 Determination of pollen fertility by using staining technique.

Unit 5 Breeding techniques
5.1 Breeding technique in Brassicaceae.
5.2 Breeding technique in Fabaceae.
5.3 Breeding technique in Malvaceae.
5.4 Breeding technique in Poaceae.

Unit 6 Biometry
6.1 Camera Lucida drawings. (Minimum two)
6.2 Measure of central tendency of given data.
6.3 Analysis of the given data using computer / Study of frequency distribution and it’s graphic presentation. (2 Pr)
Practical-IV

(Based on Paper XII and XVI: Plant Biochemistry and Molecular Biology and Biotechnology)

(Each sub-unit should be completed in one practical unless specifically mentioned)

Unit 1. Carbohydrates
1.1 Qualitative tests for sugars in plant material. (Any two tests)
1.2 Qualitative tests for starch and cellulose in plant material (Any two tests)

Unit 2. Proteins
2.1 Qualitative tests for proteins in plant material. (Any two tests)
2.2 Determination of isoelectric point of protein in plant material.
2.3 Identification of amino acids in plant extract by TLC.
2.4 Estimation of proteins in plant sample by Biuret method.

Unit 3 Lipids
3.1 Determination of fatty acid value of oil sample.
3.2 Qualitative tests for lipid in plant material. (Any two tests)

Unit 4 Nucleic acids
4.1 Calorimetric estimation of DNA using di-phenyl amine.
4.2 Isolation of plant genomic DNA and its spooling.
4.3 Isolation of total RNA from plant tissue and its calorimetric estimation.(2 Pr)

Unit 5 Tissue Culture
5.1 Preparation of tissue culture medium (M.S.) and its sterilization. (2 Pr)
5.2 Demonstration of techniques of in vitro culture of various explants. (3Pr)

Unit 6 Techniques in Biochemistry and Biology
6.1 Microtomy or Microphotography (4Pr)
6.2 Separation of alkaloids by TLC.
6.3 Separation of isozymes using gel electrophoresis. (4 Pr)
SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part-III: Practical Examination in Botany
February/March-2012
Practical-I

Time: 11.00 a.m. onwards

N. B.: Do not write about points of theoretical information, unless asked specifically.

Q. 1. Identify and classify the specimens A, B, C and D. Draw neat labeled sketches. Leave at least one slide of each specimen for inspection. (20)

Q. 2. Inoculate the given culture E of the fungus on the slants of PDA (No written answer) (4)

Q. 3. Measure the dimensions of the given spore/pollen grain from specimen F under low and high power. Record your readings. (Show at least one reading to the examiner) (4)

Q. 4. Set up the experiment showing fermentation (No written answer) (4)

Q. 5. Identification-
   a) Identify and describe the specimen G and H. (4)
   b) Identify the plant disease I and J. Give their causal organisms, symptoms or control measures. (4)

Q. 6. a) Submission (5)
   b) Journal (5)

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B. Sc. Part-III: Practical Examination in Botany
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Practical-II

Time: 11.00 a.m. onwards

N. B.: Do not write about points of theoretical information, unless asked specifically.

Q. 1. Identify and describe the structures observed in the specimen A and B. Leave at least one slide of each specimen for inspection. (6)

Q. 2. Assign the specimen C and D to their respective families on the basis of characters observed by you in them. Mention important vegetative and floral characters. Draw the floral diagram of specimen C. Show your preparation to the examiner. (8)

Q. 3. With the help of flora, identify the genus and species of the given specimen. (4)

Q. 4. Dissect the specimen E to expose the embryo. (No written answer) (4)

OR
Show the structure of stigma and style in the specimen E. (No written answer) (4)

Q. 5. Set up the experiment assigned to you. (No written answer) (5)

Q. 6. Identification-
   a) Identify and describe the specimen /slide F. (2)
   b) Identify and describe the specimen /slide G.
   c) Identify and describe the specimen H.
   d) Identify and describe the specimen /slide I.

Q. 7. a) Tour report (5)
   b) Submission (5)
   c) Journal (5)
SHIVAJI UNIVERSITY, KOLHAPUR
B. Sc. Part-III: Practical Examination in Botany
February/March-2012
Practical-III

Time: 11.00 a.m. onwards                                                                     Total Marks: 50
N. B. : Do not write about points of theoretical information, unless asked specifically.

Q. 1. Solve the given problem on linkage/crossing over/polygene inheritance. (6)

Q. 2. Show the chromosomal abnormalities from the specimen A.
   (No written answer)                                                                             (5)

Q. 3. a) Prepare the ideogram using given Photograph B.                                       (5)
   b) Determine the mean, median and mode by using sample C.                  (5)

   OR

   Determine the frequency distribution and prepare a histogram/
   polygon/line graph from specimen C.                                                               (5)

Q. 4. a) Show the breeding technique in given plant material D and E.                          (8)
   (No written answer)
   b) Find out the pollen fertility in given specimen E. (No written answer) (5)

Q. 5. Cut the given material embedded in paraffin and prepare the slides.
   Keep the slides for drying.
   OR

   Take microphotograph of prepared permanent slide and transfer
   the image on computer.

Q. 6. Identification-
   a) Identify and describe the mutant type.                                                   (2)
   b) Comment on floral structure and pollination mechanism.                                   (2)
   c) Identify and describe.                                                                (2)

Q. 7. a) Submission – including cytological slides.                                           (5)
   b) Journal                                                                       (5)
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B. Sc. Part-III: Practical Examination in Botany  
February/March-2012  
Practical-IV

Time: 08.00 a.m. onwards                                                Total Marks: 50
N. B. : Do not write about points of theoretical information, unless asked specifically.
Q. 1. Demonstrate the presence of carbohydrates/lipids/proteins by using biochemical tests from given plant material A. (10)
Q. 2. Isolate RNA/DNA.

OR
Estimate Proteins/DNA/ Determination of fatty acid value.

OR
Separate amino acids/alkaloids from given sample or plant material B by TLC. (8)

Q. 3. Demonstrate the technique of inoculation of explant C on culture medium. (No written answer) (6)

Q. 4. Stain the slides of Microtomy prepared earlier and show it to the examiner. (No written answer) (10)

OR
Microphotography- Edit and Format the image of photograph, label, print and show to the examiner. (No written answer) (10)

Q. 5. Identification-
   a) Identify and comment upon biochemical test D. (3)
   b) Identify and describe. (3)

Q.7. a) Submission of Microtomy slides/ Submission of Microphotographs. (5)
   b) Journal (5)
(iii) Specific Objectives: As per general objectives of the course.

(iv) Unit: Unitwise number of lectures are given for all papers.

(v) Recommended Reading:

**List of Books Recommended for B. Sc. III (Botany)**


74. Aneja.K.R. 1993 Experiments in Micrology, Plant Pathology and Tissue
102. Hot Spocts of Endemic Plants ad India Burma & Nepai M.P.
105. Microbiology – Peicar and Reid.
108. Introduction pteridophtya – A Rashid.
111. Press – P. Macheshwari and V. Vasid.
113. An Introduction to Palaeobotany – C. A. Arnold.
123. An Introduction to Embryology of Angiosperms – P. Maheshwari.
126. An Introduction to plant Anatomy – A. J. Eames and M. C. Danialls.
134. Cytology Cytogenetics – C. P. Swanson.
135. Cytogenetics and Plant Breeding.
136. S N. Chandrashekharan and S. V. Partha Sarathy.
137. The Physiology of flowering – W.S. Hiiman.
140. Introduction to Practical Biochemistry – D. T. Plummee.
142. Dr. Naik V.N. – Toxonomy of Angiosperms.
143. V. Varma – A text book of plant Physiology.
144. Malik and Shrivastava – Plant Physiology ( S. Chanda Co.)
145. Dnyansagar – Cytology and Genetics (T. Magrewith & Co.)
151. Ahmedulah M. & Nayar M. P. – Endemic plants of India
155. Plant tissue and Organ culture – UNESCO and University of Delhi.
156. Plant Ecoloy – J. E. Weaver and F. E. Clements.
158. Plant Micro Technique – D. A. Johanson.
159. Shivanna- Pollen.
C) OTHER FEATURES:

1. **INTAKE CAPACITY / NUMBER OF STUDENTS:-**
   As per university rules.

2. **TEACHERS QUALIFICATIONS:-**
   - As prescribed by norms.
   - However required number of core faculty should be given for particular course along with paper wise and Specialization wise work load allocation.
   - Work load details should be as per Apex body/UGC/State Govt./University norms.

3. **The Board of studies should clearly mention the required Books, Journals and specific Equipments necessary for the Course.**

(A) **LIBRARY**: Library be equipped with the required Reference and Text Books, Journals and Periodicals for higher and advanced studies as per stated in revised syllabus and approved by BOS.

(B) **SPECIFIC EQUIPMENTS:**
   T.V., V.C.R. V.C.P., L.C.D., Overhead Projector, Computers and necessary software and operating systems etc. are necessary to run the course.

(C) **LABORATORY SAFETY EQUIPMENTS:**
   i) Fire extinguishers at least two sets in each laboratory of 600 sq.ft. Area.
   ii) Leakage of gases be avoided.
   iii) First aid kit be made available.
   iv) Sugar / Glucose – 500gm pack- a pinch of sugar and a cup of drinking water in hypoglycemic condition or in extreme weakness of student or a person concerned

**B) GENERAL SAFETY RULES FOR LABORATORY WORK**

1) List of equipments needed for Laboratory Safety:-

1. Fire extinguisher
2. First Aid Kit
3. Good earthing and insulated wirings for electrical supply.
4. Emergency exit
5. Apron and goggles wherever necessary
6. Fuming Chambers
7. Masks flows and shoes while handling hazardous chemicals & gases (Good valves, manometers and regulators for gas supply)
8. Operational manuals for instruments (handling to be made as suggested.)
10. Leakage of gases to be avoided.
11. Cylinders or flow pipes to handle Acids.
12. No weighings for NaOH and hygroscopic substances.
13. Stabilized supply in the laboratory.
2) **There Is No Substitute for Safety**

1. Any injury no matter how small, it must be reported to teacher immediately.
2. a) In case any chemical enters your eyes go immediately to eye-wash facility and flush your eyes and face with large amount of water.
   b) For acid or phenol split, do not use water instead put some bicarbonate.
3. In case of fire, immediately switch off all gas connections in the laboratory and pour sand on the source of fire or cover it with asbestos or cement sheet.
4. While leaving laboratory, make sure that gas, water taps and electricity are switched off.
5. Remove your lab coat. Gloves and clean your hands before leaving laboratory.
6. Make your workplace clean before leaving the laboratory.
7. Keep your hands away from your face, while working in laboratory.
8. Each laboratory must have a first aid box.
9. Know what to do in case of emergency - e.g.
   (a) Know the place of fire extinguisher and first aid box.
10. Don't use cell phones in the laboratory.
    (a) Remember important phone numbers

3) **DO's**

1. Always wear lab coat, shoes in the laboratory. Every student must have their weight box, a napkin etc.
2. Maintain separate record book for each subject.
3. Keep your belongings at the place allotted for the same.
4. Maintain silence, order, cleanliness and discipline in the laboratory.
5. Work at the place allotted to you or specially used for certain operations.
6. Keep the working table clean.
7. Handle the laboratory equipments, glassware and chemical with great care.
8. Use only required quantities of material and apparatus of essential size.
9. Perform the test in their proper order.
10. Know the location of eye wash fountain and water shower.
11. Minimize your exposure to organic solvents.
12. The Metal like sodium should be kept under kerosene or liquid paraffin layer in a vessel with a cork stopper.
13. Sodium metal should be cut on dry filter paper. The cut off pieces of sodium should be immediately collected in a vessel containing kerosene or liquid paraffin.
14. Always pour acid into water when diluting and stir slightly.
15. All operations involving poisonous flammable gases and vapours should be carried out in the flame chamber (with exhaust facility)

16. Ladies should avoid wearing saree. If it is there, apron is essential.

4) **DON’T**

1. Don’t work alone in the laboratory
2. Don’t leave the glass wares unwashed.
3. Don’t take apparatus, chemicals out of lab.
4. Don’t leave any substance in a vessel or bottle without label.
5. Don’t weigh the reagent directly on the balance pan.
6. Don’t throw the cut off pieces of sodium metal in sink or water. Transfer it immediately in its container.
7. Don’t take sodium metal with hands. Use forceps.
8. Don’t panic and run in case of fire. Use the fire extinguishers or sand buckets.
9. Don’t breathe the vapours of organic solvents.
10. Don’t pour any unused reagent back in its stock bottle.
11. Don’t eat or drink any food in laboratory.
12. Don’t use inflammable solvents like benzene, ether, chloroform, acetone and alcohol around flame.
13. Don’t distill to dryness.
14. Don’t exchange stoppers of flasks and bottles containing different reagents.
15. Don’t leave reagent bottle lying on the table.
16. Don’t disturb the order of reagent bottles in which they are placed.
17. Don’t bring reagent on your working table from the general shelf.
18. Don’t throw burning matchstick into dustbin.
19. Don’t leave the laboratory without permission.

5) **LABORATORY / FIELD WORK CARE AND SAFETY FOR BOTANY STUDENTS**

1. Unnecessary wastage of plant material during practicals should be avoided.
2. During study tour / personal collection, more emphasis be given on study of plants in nature and collection of wild plants should not be carried out.
3. If at all the collection of the plant material in needed, it should be carried out under supervision of concerned teacher. Collection of poisonous plants / poisonous mushrooms should be avoided.
4. Oral intake of unknown plant material, out of curiosity, during practical or collection tour is strictly prohibited.
5. If there is any allergic reaction while handling the plants / plant parts / pollen grains / fungal specimens it should be immediately brought to the notice of the concerned teacher and reported to the registered medical purloiner.

6. Wearing of hand gloves (and mask) is essential while handling poisonous plants / herbarium sheets / toxic and hazardous chemicals / reagents / strong acids / strong alkalis during the experiment should be made with vacuum pipette / auto pipette / burette under the supervision of concerned teacher / lab assistant.

7. Highly inflammable organic solvents (alcohol, acetone etc.) should not be kept in vicinity of spirit lamp.

8. The laboratory safety measures adopted for handling of hazardous chemicals in chemistry practicals should be followed for conducting practicals in plant biochemistry / microbiology.

9. Operational manuals for equipments such as centrifuge, autoclave, spectrophotometer should be followed.

10. In case of minor injuries, preliminary treatment should be undertaken with the help of first aid kit available in the laboratory. In case of serious injury, concerned teacher should be immediately contacted for consultation to the physician.

11. The instruction report for breeding, experimentation will be submitted in a week period. (Which are laid down by Ministry of Social Justice & Empowerment and Ministry of Environment and Forests, Govt. of India).

Note:

Practical Examination Instaurations:

A) Each candidate must produce a certificate from the Head of the Department stating that he/she completed practical course in satisfactory manner recommended by Board of studies and Laboratory journal has been properly maintained. Every candidate must have recorded his/her observations in the laboratory journal and written report on each exercise performed. Every journal is to be checked and signed periodically by a teacher-in-charge and certified by the Head of the Department at the end of year. candidates are to produce their journal at the time of practical examination. without which he/she will be all med to appear for practical examination.

B) Excursions for the study of plants in their natural habitat in local areas or any suitable areas should be arranged. There shall be one teacher incharge for not more than 12 students and one additional lady teacher, one field collector and one peon are to be allowed for study tour. T.A. and D.A. be paid to the concerning staff as per university rules.