

BOTANY MAJOR PROGRAMME
SUMMARY OF THE COURSE
(only 5th and 6th Semesters)

TOTAL PAPERS: THEORY: 27 & PRACTICAL 13

TOTAL MARKS: 2400

KEY:

BOTMT = BOTANY MAJOR THEORY

BOTMP = BOTANY MAJOR PRACTICAL

TOTAL LECTURE HOURS:

THEORY: 40 (Per Paper)

PRACTICAL: 15 (Per Paper)

MARKS DISTRIBUTION:

THEORY: (48 End + 12IA) [End=End Semester , IA=Internal Assessment]

PRACTICAL: (32 End + 12IA) [End=End Semester , IA=Internal Assessment]

Except BOTMP-605 (Based on course BOTMT 603 & BOTMT 604)where distribution of marks is=(52 End + 13IA) + 15 Marks in Project Work , Grand Total is 80 Marks.

SEMESTER V

BOTANY MAJOR
BOTMT - 501

Development and Reproduction in Angiosperm:

Marks: 4End+1IA =60

Objective of the course: The main objective of this course is to provide fundamental knowledge of structural and functional aspects of cell and cell organelles and the tools and techniques used in modern biological study.

Development in Angiosperm:

Marks: (24+6)=30

Unit-1: Organisation of tissues: Types of tissues, Meristematic and permanent, their types, structures, distribution and functions; theories of differentiation of roots and shoots.

Unit -2: Stele Body – origin and development, Root – stem transition, leaf traces and leaf gaps, branch gaps, abscission layer.

Unit -3: Secondary structures of roots and stems, initiation of cambium and its activities. 4 class hours

Unit-4: Anomalous secondary growth in thickness (*Amaranthus*, *Asparagus*, *Boerhavia* and *Mirabilis*).

Unit-5:Anatomico-physiological consideration of dermal, mechanical, conducting and photosynthetic system of tissues; anatomy of C3 and C4 plants.

Reproduction in Angiosperm::

Marks: (24+6)=30

Unit -1: A general account of the following topics: Development of male and female gametophyte of angiosperms; monosporic, bisporic & tetrasporic embryosac.

Unit –2: Fertilization, development of embryo; Apomixis, polyembryony, Palynology.
Unit –3: Development of Endosperm – nuclear, cellular, helobial; haustorial structures.

**BOTANY MAJOR
BOTMP - 502**

Marks: 40(32 End+8 IA)

Development in Angiosperm:

Study of primary, secondary and anomalous structures of stem and roots; Internal structures of different types of leaves; maceration of tissues; identification of the elements; Knowledge of single and double staining methods; preparation of temporary and permanent mounts.

Reproduction in Angiosperm:

Study of permanent slides of embryological importance and preparation of temporary slides of placenta and pollen grains (germinating).

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**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks: 32

1. Double staining slide (anatomy) drawing, labelling, description	12
2. Workout and study of permanent slide (embryological)	10
3. Practical record book	5
4. Viva-Voce	5
Total	32

**BOTANY MAJOR
BOTMT-503**

Marks:48 End+12 IA=60

Genetics & Plant Breeding, Biostatistics:

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge on plant genetics and application of genetic for improvement of crop, application of statistics in biology.

Genetics:

Marks: (20+5)=25

Unit – 1: Mendel's Laws, their critical appreciation, gene interactions and modified monohybrid and dihybrid ratios; concept of alleles, multiple alleles and multiple genes, Linkage, Crossing Over and basic knowledge of Gene Mapping.

Unit – 2: Determination of Sex, Sex Linked and Sex Limited Traits, Cytoplasmic Inheritance with

reference to Plastid Inheritance and Kappa Particle Inheritance.

Unit – 3: Chromosomal (numerical and structural) and Gene Mutation, concept of Biochemical Mutation.

Unit – 4: Basic ideas of Gene and its fine structure, Genetic Engineering and Gene Cloning, Concept Trans Gene.

Unit – 5: Human Genetics: Karyotype, important Syndromes and disorders

Plant Breeding:

Marks: (16+4)=20

Unit – 1: Methods of reproduction: Sexual, Vegetative, apomixes; Principles and methods of Plant Breeding: Introduction, Selection, Hybridization, Heterosis Breeding and concept of Mutation Breeding.

Unit – 2: In vitro Culture: Requirements, techniques and application in Crop Improvement.

Biostatistics:

Marks: (12+3)=15

Unit –1: Application of statistics in Biological Science, collection and classification of data for frequency distribution.

Unit –2: Measurement of Central Tendency; Mean, Media , Mode, Standard Error and Standard Deviation.

Unit –3: Test of Significance, Probability Test.

**BOTANY MAJOR
BOTMP-504**

Marks: 40(32 End+8 IA)

Concept of fixation, staining and squashing/smearing of materials for chromosome preparation. Temporary aceto-carmin and aceto-orcin smear preparations of root tips (onion/lily) and flowerbuds (onion/tradescantia); drawing, description of the mitotic and meiotic stages. Simple calculation of Mendelian ratios including ratios due to gene interaction

Study of floral biology and techniques of plant breeding emasculation, bagging, tagging and labelling.

Computation of central tendency and deviation: t-test, chi square test

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

Marks: 32

1. Genetics	9
2. Plant breeding	6
3. Biostatistics	7
4. Practical record book	5
5. Viva voce	5
Total	32

**SEMESTER V
BOTMT- 505**

Functional and Chemical Biology:

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge of modern approaches to functional and chemical biology of plants.

Unit –1: Concept of Biomolecules, Polymeric substances in plants- A brief study of Polysaccharides, Lipids, Proteins, Nucleic Acids, Chlorophylls with special reference to their functions.

Unit –2: Metabolic concept- Anabolism and Catabolism.

Unit– 3: Secondary plant products- Terpenoids, Phenols, Flavonoids, Anthocyanins, Alkaloids, Non-protein Amino Acids.

Unit –4: General account of – Plant Hormones and their role (Auxins, gibberellins, Cytokinins, Florigen Abscisic Acid), phytochrome, and storage products.

Unit –5. Mechanism of Source Sink Relationship.

**BOTANY MAJOR
BOTMP-506**

Marks: 40(32 End+8 IA)

1. Qualitative analysis of secondary metabolites in different plant samples.
2. Quantitative estimation of secondary metabolites in different plant samples
3. Qualitative and quantitative estimation of different photosynthetic pigments.
4. Determination of antioxidant capacity of various plant extracts of food and medicinal importance.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

Marks: (32+8)=40

1. Phytochemical analysis	
a) Major	14
b) Minor	8
2. Practical record book	5
3. Viva - Voce	5
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	Total 32

**BOTANY MAJOR
BOTMT- 507**

48 End+12 IA=60

Plant Ecology, Phytogeography and Evolution:

Objective of the course: The main objective of this course is to introduce the students with the basic principles and concepts of plant ecology, structure & function of natural plant units, habitat degradation and role of plant on improvement of habitat, conservation ecology, phytogeography & evolution.

Plant Ecology:

Marks: (32+8)=40

Unit – 1: Introduction: definition and scope of plant ecology, development of plant ecology in India and abroad, division of plant ecology; Edaphic factor: Soil Profile, Soil Properties(Physical & Chemical); Physiographic Factors: Types of Biotic Interactions.

Unit – 2: Ecosystem Ecology: Ecosystem Concept, Structure & Function, Ecological Pyramids, Food Chain, Food Web, Trophic Level, Ecological Niche, Flow of Energy in an ecosystem, Productivity, Nutrient Cycling, Biogeochemical Cycle (Water, Oxygen, Carbon Nitrogen, Sulphur and Phosphorous Cycle)

Unit – 3: Autecology and population dynamics: definition, characteristics of population, population growth forms; Synecology and Community Dynamics: structure and classification of plant community, community characteristics, Analytic and Synthetic characters; Plant Succession: Concept, Types of Succession, causes of Succession, the Climax concept; Plant Adaptation:Hydrophytes, Xerophytes, Helophytes and Epiphytes

Unit – 4: Ecosystem Dynamics: Definition, Types, Structure and Function of Ecosystem, concept of Energy Flow through Ecosystem; Nutrient Cycling and Biogeochemical Cycles with special reference to water, oxygen, carbon, nitrogen, sulphur and phosphorus cycles.

Unit -5: Habitat degradation: Pollution of air, water, soil and its impact on our environment; control of pollution with special reference to phytoremediation, public awareness and people's participation; Global Environmental Problems(Global Warming, Ozone Depletion, Acid Rain, Global Water Crisis), Concept on EIA.

Unit – 6: Conservation Ecology and Biodiversity: Definition and classification of Natural Resources, In-Situ & Ex-Situ Conservation in details; Biodiversity: Concept, origin, values, Hot-Spot of Biodiversity(Terrestrial & Marine), IUCN Red List Categories, Concept on Flagship, Keystone and Endemic Species, Biodiversity & Sustainable Development, Knowledge on WWF, IUCN,CITES,NBWL,NBA

Phytogeography:

(8+2)=10

Unit –1:Principles of static and dynamic phytogeography; general idea of the distribution of plants over the globe (from tropical to arctic zones) with special reference to the Phytogeographical Regions of India.

Evolution

(8+2)=10

Unit –1: Organic evolution: mechanism of organic evolution; theories of organic evolution (a general idea).

Unit –2: Modern concept of evolution and origin of life in the light of chemical evolution.

BOTANY MAJOR

Plant Ecology:

1. Study of the common instruments (P^H meter, spectrophotometer, colorimeter, Muffle furnace, hot air oven, growth chamber, soil thermometer, maximum and minimum thermometer, hygrometer, psychrometer or dry and wet bulb thermometer, lux meter etc.) used in ecological investigation.
2. Study of floristic composition within the college campus / outside near to the college campus.
3. Determination of minimum sampling size (Species-area-curve) for vegetation study.
4. Determination of minimum number of samples to be taken for vegetation study (Species-area-curve).
5. Determination of abundance and density of herbaceous species in a study area.
6. Determination of percentage frequency of herbaceous species in a study area.
7. Determination of root – shoot ratio of herbaceous plants grown in different conditions.
8. Determination of Relative Growth Rate (RGR) of herbaceous species grown in different conditions.
9. Study of ecosystem structure by analyzing the producer, consumer, and decomposer (if possible) and preparation of food chain and food web of a particular locality to show the probable path (s) of energy transformation through the system.
10. Study of standing crop biomass and productivity of an ecosystem.

Phytogeography:

1. Preparation of chart on the major biomes of the world / landscape with distribution of plants with reference to particular ecological condition (s).

Evolution:

2. Study of permanent slides / fossil rocks having evolutionary significance.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks: 32

1. Ecology	10
a) Major Expt.	7
b) Minor expt.	5
2. Phytogeography and evolution	5
3. Practical record book	5
4. Viva-Voce	5
Total	32

**Topic of the Project work may be given in the Semester-V and report should have scientific investigation and outcome with statistical analysis of data (where necessary). The same have to be presented in the headings: Title, Introduction, Objective, Materials & Methods, Results, Conclusion and References. The project will be evaluated in Semester-VI with the paper BOTMP-605. Separate project preferably be given to each student.*

Plant Physiology:

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge on major physiological aspects of plants.

- Unit –1: Plant water relationships: Diffusion, imbibition and Osmosis; water potential and chemical potential; absorption of water; mechanism of active and passive absorption; water holding and wilting co-efficient; co-efficient; transpiration, its mechanism and significant factors.
- Unit –2: Ascent of sap: Definition; different theories related to ascent of sap; physiological effects of water deficit and stress physiology; Mineral nutrition in plants: Role of micro and macro elements; mineral deficiency symptoms in plant growth; Translocation of Organic Solutes: Transport of Photosynthates.
- Unit –3: Nitrogen Metabolism: Nitrogen Fixation (Symbiotic and Non-Symbiotic), nif-gene and nitrification.
- Unit –4: Photosynthesis: Historical background and significance; mechanism a) Light Reaction – Red Drop, Emerson Effect, Photosynthetic Pigments; two pigment systems; Cyclic and Non-cyclic Electron Transport; Photophosphorylation and production of Assimilatory Power, (b) Dark Reaction: Calvin Cycle (C3 pathway), Hatch-Slack Pathway (C4 pathway); differences between C3 and C4 cycle; Photorespiration, Crassulacian Acid Metabolism (CAM) and Chemosynthesis; factors affecting photosynthesis.
- Unit –5: Respiration: Glycolysis and TCA Cycle, Pentose Phosphate pathway; oxidative phosphorylation.
- Unit – 6: Growth and Development: Definitions; Phases of Growth; Kinetics of Growth; Physiology of Seed Dormancy and Germination; Photoperiodism and Vernalisation; Phytohormones; Plant Movements –tropic and nastic.

**BOTANY MAJOR
BOTMP- 602**

Marks: 40(32 End+8 IA)

Properties of colloids: imbibition and absorption of water and solutes – Osmosis in plant tissues; determination of osmotic pressure and suction pressure; root plant tissues; determination of inorganic constituents of tissues and the experiments on transpiration, respiration, photosynthesis, growth and movement, ash analysis on transpiration, respiration, photosynthesis, growth and movement, ash analysis.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks: 32

1. Experiment		
a)Major		14
b)Minor		8
2. Practical record book		5
3. Viva voce		5
		Total
		32

BOTMT- 603

48 End+12 IA=60

Molecular Biology and Immunology:

Objective of the course: The main objective of this course is to introduce the students with the fundamentals of molecular biology and immunology.

Molecular Biology:

Marks: (32+8)=40

Unit –1: Nucleic Acids, DNA as genetic material, structure and functions of DNA & RNA, Watson & Crick Model of DNA, other forms of DNA (A & Z), Genome organization in prokaryotes and eukaryotes.

Unit–2: Replication of DNA- prokaryotes and eukaryotes, Transcriptions in prokaryotes and eukaryotes.

Unit–3: Features of genetic code wobble hypothesis, protein biosynthesis in prokaryotes and eukaryotes.

Unit–4: Recombination in Prokaryotes; Transformation, Conjunction and Transduction; , Concept of Transposons and Plasmids.

Unit –5: Regulation of Gene Expression in Prokaryotes- Operon concept (Lac)

Immunology:

Marks: (16+4)=20

Unit –1: Plant health management.

Unit –2: Immunity & resistant in mammals, principle of antigens and Antibodies reaction.

Unit–3: Interaction of plants with bacteria, virus and fungi; breeding for disease resistance, environment & immunity, laws in the distribution of immunity from infectious diseases in plants.

BOTANY MAJOR BOTMT-604

48 End+12 IA=60

Biophysics and Bioinformatics:

Objective of the course: The main objective of this course is to introduce the students with the tools and techniques of physical and computer sciences used in biological study.

Biophysics

Marks: (24+6)=30

Unit –1: Scope and development of Biophysics. P^H and buffer solution in details.

Unit –2: Laws of Thermodynamics, Concept of Free Energy, Redox Potential and Bioenergetics(only high energy compound)

Unit–3: X-ray Crystallography (XRD), Chromatography, LASER and its biological applications, Fluorescence and its application, Basic concept of NMR and Ultra Sound

Unit –3: Isotopes, Types, their importance in biological studies, measure of radioactivity.

Bioinformatics:

Marks: (24+6)=30

Unit-1: Fundamentals of bioinformatics: introduction, history and scope of bioinformatics; sources of information, internet world wide web and web browsers.

Unit-2: Biological database: introduction, basic concepts of primary and secondary databases; Nucleic acid and protein sequence database (NCBI, gene bank and SWISS-PROT); Data mining and data mining tools (ENTREZ).

Unit-3. Database search and sequence alignment, Tools of sequence alignment – FASTA and BLAST; methods of sequence alignment.

Unit-4: Phylogenetic analysis: basic concept, steps in evaluation of phylogeny and constructing phylogenetic trees.

BOTANY MAJOR BOTMP- 605

Marks: 80(52End+13IA), Project work 15

A. Molecular Biology and Immunology

1. Preparation of ball and stick model of Nucleolides.
2. Detection/Estimation of RNA/DNA
3. Study of antimicrobial activity (inhibition zone) of various plant extract of economic importance.

B. Biophysics and Bioinformatics:

1. Application of different microscopes in biological studies.
2. Separation techniques.
3. Different e-resources and database search.
4. Similarity search in sequence such as BLAST / FASTA.
5. Submission of charts and models etc.

*****PROJECT WORK:** **Topic of the Project work may be given in the Semester-V and report should have scientific investigation and outcome with statistical analysis of data (where necessary). The same have to be presented in the headings: Title, Introduction, Objective, Materials & Methods, Results, Conclusion and References. The project will be evaluated in Semester-VI with the paper BOTMP-605. Separate project preferably be given to each student.*

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 6 hrs.	Marks: 52+15=67
1. Molecular Biology	12
2. Immunology	8
3. Biophysics	10
4. Bioinformatics	10
5. Practical record book	7

6. Viva-Voce		5
	Total	52
***Project		15

		67

**BOTANY MAJOR
BOTMT- 606**

48 End+12 IA=60

Agrotechnology and Sustainable Utilization of Plants:

Objective of the course: The main objective of this course is to provide students comprehensive knowledge of usefulness of plant resources for human welfare.

Unit -1: Origin of cultivated plants, Vavilov's centre of origin of crop plants; ethnobotany and its importance in Indian context, Knowledge on Indigenous Knowledge System (IKS)

Unit – 2: Agrotechnology of rice, wheat, mustard, sunflower, sesume, groundnut, soyabean, gram, mung, pea, tea, coffee, potato, cabbage, cauliflower, tomato and their economic utilization

Unit – 3:Agrotechnology of Chilli, turmeric, zinger, cardamom, black piper, jute, cotton, ramie, bamboo, teak, sal, sisoo, ajar, nahar and their economic utilization.

Unit – 4:Medicinal importance of sarpagandha, ashwagandha, kalmegh, satmul, bos, giloi (Tinospora), bhot jalakia, amlakhi, arjun, silikha and their economic utilization .

Unit – 5: Aromatic and Petrocrops(Cultivation and economic utilization) of patchouli, citronella, vitivar, sasi, jatropha, era.

Unit – 6: Domestication of Plants; Germplasm Collection & Conservation, Importance of Germplasm of Wild Species:Gene Library, Gene Bank; Concept of , Biofertilizers, biopesticides and Organic farming; Useful aspect of Lower Group of Plants: Algae, Fungi, Lichen.

**BOTANY MAJOR
BOTMP- 607**

Marks: 40(32End+8IA)

1. Determination of soil pH , Soil Moisture, Water Holding Capacity (WHC)of different soil samples collected from different habitats and soil physical properties.
2. Study of botanical characteristics, useful part (s), and products.
3. Determination of protein, fat, oil content of certain materials.
4. Collection of useful plants/plant parts.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.	Marks:32
1. Soil analysis	10
2. Spot identification of useful plant / plant part(s) of different categories with distinguishing characters to be selected by the External Examiner.	12
4. Practical record book	5
5. Viva-Voce	5
Total	32

Books Recommended (including text books):

Cryptogamic Botany Vol I & II: Smith, Tata McGraw Hill.
 Introduction to lower plants: Round, Bultherworth.
 Morphology of Gymnosperms: Coulter & Chamberlein.
 Plant Anatomy: Basu, Willey.
 Introduction to Embryology: P. Maheswari.
 Introduction to Plant Taxonomy: Jeffrey, Churcil.
 Int. to Plant Physiology: Meyer & Anderson, East West.
 A Class Book of Botany: A.C. Dutta.
 Modern Concept of Ecology: Kumer, Vikash.
 Cell Biology: S.C. Rastogi, Rastogi Publication.
 General Microbiology Vol. I & II: Power & Daginaqala, Himalayan Publishing House.
 Economic Botany: Hill, McGraw Hill.
 Genetics: Winchester, Oxford & IBH.
 Fungi & Plant Diseases: Mundkar, Macmillan.
 Int. to Plant Physiology: Curtis & Clarke, McGraw Hill.
 Plant Pathology: Butter & Jones, Macmillan.
 Taxonomy of Vascular Plants: Lawrener, Macmillan.
 An Int. to Gymnosperms: S.C. Dutta, Asia Publishing House.
 The Primitive Land Plants: Bower, Macmillan.
 Fundamentals of Ecology: Odum, W.B. Saunders.
 Elements of Cytology: Cohen, Harcourt.
 Morphology and Taxonomy of Fungi: Bessey, Vikash.
 Morphology of Vascular Plants: Eames, Tata McGraw Hill.
 Introductory Mycology: Alexopolous, Willey.
 Plant Physiology Vol. I & II: Steward, Academic Press.
 Families of Flowering Plants Vol. I & II: Hutchinson, Macmillan.
 Plant Diseases: R.S. Singh, Oxford Hill.
 Fundamentals of Biostatistics: Prasad, Emkay Publication.
 An Int. to Taxonomy of Angiospers: Shukla & Mishra, Vikash.
 College Botany Practical Vol. I & II: Santra, Chatterjee & Das, Central Book.
 College Botany: Das Ganguly, Central Book.
 Economics Botany in tropics: Kochar, Macmillan.
 Concepts of Cell Biology: Verma & Agarwal, H. Chand.
 Industrial Microbiology: Patel, Macmillan.
 Principles of Soil Science: Rai, Macmillan.
 Text Book of Pteridophytes: Sharma, Macmillan.
 Genetic Engineering: Mitra, Macmillan.
 Genetics: Ahluwalia, Willey.
 Elementary Principles of Plant Breeding: Chaudhury, Oxford & IBH.
 Plant Breeding: Chopra, Oxford & IBH.

Genetics: Gardener.
 Principles of Genetics: Stickberger.
 Essentials of Genetics and Biotechnology: A.C.Gogoi
 Molecular Cytogenetics: Sinnoll, Dunne & Donbzhosky.
 A Text Book of Plant Ecology: R. S. Amharst.
 Population Ecology: M. Begon & M. Mortimer.
 Fundamentals of Ecology: M.C. Dogh.
 The Reproductive capacity of plants: E.J. Salisbury.
 Introduction to Environmental Management: Nag Choudhury.
 Environmental Biology: Trivedi & Raj.
 Microbiology: N.J. Pelczar et. al.
 General Microbiology: R.Y. Stainer et. al.
 Soil Microbiology: N. Walker.
 Molecular Viscosity: G.A. Knight.
 Petroleum Microbiology: R.M. Atlas.
 Agricultural Microbiology: Rangaswamy and Bhagyaraj.
 Biotechnology: Trichan.
 Microbial Genetics: Treifelder.
 Modern concept of Ecology: Verma & Agarwala
 Handbook of Agriculture: ICAR
 Economic Botany: Pandey
 A Handbook of Medicinal Plants: Prajapati; Sharma, Kumar, Purohit
 Medicinal Plants of N.E. India: NEDFI
 Cultivation of Medicinal Plants: Purohit & Vyas.
 Essentials of Genetics and Biotechnology:A.C.Gogoi, Anuradha Publication, Jorhat
 Fundamentals of Cell and Molecular Biology: Arvind K. Misra, Panima Publishing Corpn. New Delhi/Bangalore

DEPARTMENT OF LIFE SCIENCES: DIBRUGARH UNIVERSITY

UG SYLLABUS UNDER SEMESTER SYSTEM BOTANY GENERAL PROGRAMME

OUTLINE OF THE SYLLABUS

Semester-I 400 Marks

Compulsory course I: English-I	100=(80+20)
Non-major Course I: BOTGT-101: Algae, Fungi, Bacteria, Lichen, Virus, Plant Pathology : BOTGP-102:(Practical based on BOTGT-101)	48 End+12 IA 32 End+8 IA
Non-major Course II: Chemistry -I (Th)	100=(80+20)
Non-major Course III: Zoology -I (Th)	48 End+12 IA

MARKS DISTRIBUTION:

THEORY: (48 End + 12 IA) [End=End Semester, IA=Internal Assessment]
PRACTICAL: (32 End + 12 IA) [End=End Semester , IA=Internal Assessment]

SEMESTERWISE COURSE CONTENT:

Semester I	100 Marks
BOTGT-101: Algae, Fungi, Bacteria, Lichen, Virus, Plant Pathology	48 End+12 IA
BOTGP-102 Based on BOTGT-101	32 End+8 IA
Semester II	100 Marks
BOTGT-201 Bryophytes, Pteridophytes, Gymnosperms	48 End+12 IA
BOTGP-202 Based on the BOTGT-201	32 End+8 IA
Semester III	100 Marks
BOTGT-301 Morphology, Development and Reproduction of Angiosperms	48 End+12 IA
BOTGP-302 Based on BOTGT-301	32 End+8 IA
Semester IV	100 Marks
BOTGT-401 Physiology & Economic Botany	48 End+12 IA
BOTGP-402 Based on BOTGT-401	32 End+8 IA
Semester V	100Marks
BOTGT-501 Cytogenetics, Evolution & Biostatitstics	48 End+12 IA
BOTGP-502 Based on BOTGT-501	32 End+8 IA
Semester VI	100 Marks
BOTGT-601 Biochemistry, Ecology & Plant Geography	48 End+12 IA
BOTGP-602 Based on BOTGT-601	32 End+8 IA

**DEPARTMENT OF LIFE SCIENCES
DIBRUGARH UNIVERSITY
UG SYLLABUS UNDER SEMESTER SYSTEM
BOTANY GENERAL PROGRAMME**

Objective : The main objective of the course is to provide fundamental knowledge to under graduate students about diversity structure and reproduction of plants along with the physiology of various life processes at genetic, cellular and molecular levels. Skills based courses are also include to increase the employability of the students.

Examination: 20% marks each of theory and practical papers shall be evaluated as Internal Assessment (IA). The distribution of courses and marks will be as follows:

SYLLABUS

SEMESTER – I

**BOTANY I (GENERAL)
BOTGT-101**

Lower Cryptogams (Algae, Fungi, Bacteria & Virus, Plant Pathology, Lichen)

48 End+12 IA = 60 Marks

Algae:

Marks: (12+3)=15

Unit –1: A general account of different algal groups, their relationship basing on the structure, lifehistories of the types and the economic importance of algae.

- a. Cholorophyceae: *Chlamydomonas*, *Volvox*, *Coleochaete*, *Oedogonium* and *Chara*.
- b. Bacillariophyceae: A general account.
- c. Phaeophyceae: *Ectocarpus*, *Fucus*.
- d. Rhodophyceae: *Polysiphonia* and *Batrachospermum*.
- e. Myxophyceae: *Nostoc* and *Anabaena*.

Fungi, Bacteria, Virus, Plant Pathology and Lichen: Marks: (12+3)+(8+2)+(8+2)+(8+2)=45

Unit –1: A general knowledge of the different fungal groups, their relationship based on the structure and life histories of the types-

- a. Phycomycetes: *Phytophthora*, *Synchytrium*.
- b. Ascomycotina: *Peziza*, *Penicillium*, *Xylaria*
- c. Basidiomycotina: *Puccinia*, *Psaliota*, *Polyporus*, *Cyathus*. Fungi Imperfecti.
- d. General account of bacteria and virus
- e. Rust of Wheat, Grey Blight of Tea, Late Blight of Potato.
- f. Thallus structure and economic importance of lichen.

**BOTANY II (GENERAL)
BOTGP 102**

Marks: 40 (32 End+8 IA)

Study of vegetative morphology and reproductive structures of selected representative groups.

**SCHEME OF PRACTICAL EXAMINATIONS
(End Semester)**

Time: 4hrs.

Marks: 32

Algae/Fungi	16
Bacteria, Plant pathology	8
Laboratory Note Book	4
Viva-Voce	4
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	Total 32

Text Book:

1. Botany for Degree students: A.C. Dutta
2. College Botany Vol. II: Mukherjee, Das & Ganguly, Central Book.
3. Studies in Botany:
4. Text Book of thallophytes: Sharma
5. Plant Pathology: Mehrotra
6. Algae: B.R. Vaishistha
7. Fungi: B.R. Vaishistha

SEMESTER II

**BOTANY III (GENERAL)
BOTGT-201**

Bryophytes, Pteridophytes, & Gymnosperms:

48 End+12 IA= 60

Objective of the course: The main objective of this course is to introduce the undergraduate students with the basic knowledge of structure, forms and reproduction, evolution of tissue systems, seed habit in higher cryptograms & Gymnosperms.

Bryophytes:

Marks:(12+3)=15

Unit –1: A general account of the structure and life histories of the following:

Riccia, Marchantia, Anthoceros and Polytrichum.

Pteridophytes:

Marks: (20+5)=25

Unit –1: A general account of the structure and life histories of the following:

Lycopodium, Selagnella, Equisetum, Ophioglossum, Polypodium and Marsilea.

Gymnosperms:

Marks: (16+4)=20

Unit –1: Classification of Gymnosperms.

Unit –2: Morphological and reproductive studies and life histories of *Cycas, Pinus* and *Gnetum*.

**BOTANY IV (GENERAL)
BOTGP-202**

Marks: 40(32 End+8 IA)

Study of vegetative morphology and reproductive structures of selected representative groups.

**SCHEME OF PRACTICAL EXAMINATIONS:
(End Semester)**

Time: 4hrs.

Marks:32

Bryophyte	8
Pteridophyte	8
Gymnosperms	8
Laboratory Note Book	4
Viva-Voce	4
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Total	32

Text Book:

1. Botany for Degree students: A.C. Dutta
2. College Botany Vol. II: Mukherjee, Das & Ganguly, Central Book.
3. Studies in Botany:
4. An introduction to Gymnosperms: Dutta, Kalyani
5. Text Book of Pteridophytes: Sharma, Macmillan.
6. Bryophytes: N.S. Parihar
7. Pteridophytes: B.R. Vasistha

SEMESTER III

**BOTANY V (GENERAL)
BOTGT-301**

Morphology, Taxonomy, Development and Reproduction of Angiosperms

48 End+12 IA=60

Objective of the course: The main objective of this course is to introduce the undergraduate students with the terminologies used in description of angiospermic plants, basic knowledge of plant classification, tissues & tissue systems, development of primary & secondary plant bodies and development of male & female reproductive components & their functions.

Morphology & Taxonomy:

Marks: (24+6)=30

Unit –1: Knowledge of the principles of classifications of angiosperms; salient features of system of classification proposed by Linnaeus, Bentham and Hooker and Engler and Prantl's.

Unit–2: Nomenclature- morphological details, diagram and floral formula of angiospermic species of the following families citing common and economically plants.

Unit–3:*Magnoliaceae, Brassicaceae, Malvaceae, Fabaceae, Rosaceae, Apiaceae, Lamiaceae, Euphorbiaceae; Orchidiaceae, Musaceae, Lilliaceae, Arecaceae and Poaceae.*

Development and Reproduction:

Marks: (24+6)=30

Unit–1: Meristems and organization of root and shoot apices;Tissues and tissue systems, the primary body, stealer structures

Unit-2: The secondary growth: cambium and its derivatives, anomalous types, periderm.
 Unit-3: Microsporangium and development of male gametophyte; Megasporangium and development of female gametophyte.
 Unit-4: Embryo and Endosperm development.

SEMESTER III

BOTANY VI (GENERAL)

BOTGP-302

Marks: 40(32 End+8 IA)

Study of vegetative morphology, reproductive structures of selected species, tissue differentiation by double staining technique, permanent slides of embryology.

SCHEME OF PRACTICAL EXAMINATIONS:

(End Semester)

Time: 4hrs.

Marks: 32

Morphology and taxonomy	12
Development and reproduction	12
Lab. Note Book	4
Viva-Voce	4
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Total	32

Text Book:

1. Botany for Degree students: A.C. Dutta
2. College Botany Vol. II: Mukherjee, Das & Ganguly, Central Book.
3. Studies in Botany:
4. Morphology of Angiosperms: M.L. Chopra
5. Plant Anatomy: Pandey.
6. Systematic Botany: O.P. Sharma

SEMESTER IV

BOTANY VII (GENERAL)

BOTGT-401

Physiology & Economic Botany:

48 End+12 IA = 60

Objective of the course: The main objective of this course is to introduce the undergraduate students with the basic knowledge of physiological activities of plants through the mechanisms of absorption of inorganic components & production and functions of organic components & role of external factors upon them.

Physiology:**Marks: (32+8)=40**

Unit-1: An elementary knowledge; importance of water to plant life, diffusion, imhibition, osmosis and plasmolysis; absorption of water and solutes.

Unit-2: Micro nutrition: Essential macro and micro elements and their role, transportation and exudation, ascent of sap and translocation.

Unit-3: Enzymes, co-enzymes and their role in biochemical processes.

Unit-4: Photosynthesis: mechanism and factors affecting photosynthesis, Calvin Cycle, carbon fixation in Calvin Cycle.

Unit-5: Respiration: mechanism (Glycolysis & Kreb Cycle) and significance of respiration; fermantation; growth and development: definations, phases of growth and development; dormancy and germination of seeds.

Unit-6: Hormones: Auxin, Gibberellin, Cytokinins, Florigen; concept of photoperiodism and vernalisation; tropic and nastic movement.

Economic Botany:**Marks: (16+4)=20**

Unit -1: A general knowledge of the following economically important plants with reference to their local names, scientific names and parts used.

- a. Cereals-Rice, Wheat and Maize.
- b. Pulses – Pea and Soyabean.
- c. Oil seeds – Mustard, Ground Nut, Coconut and Sunflower.
- d. Fibre Yielding Plants – Jute, Cotton, Ramie.
- e. Medicinal Plants – Rauvolvia, Swertia, Ocimum and Neem.
- f. Timber yielding Plants – Sal, Sissoo, Teak, Holokh.
- g. Non-alcoholic Beverages – Tea and Coffee.

BOTANY VIII (GENERAL)**BOTGP-402****32 End+8 IA =40****Physiology:**

Performance of simple physiological experiments from the prescribed course.

1. Phenomenon of inhibition.
2. Phenomenon of Plasmolysis.
3. Phenomenon of Transpiration – 3 expts. (minimum).
4. Phenomenon of Photosynthesis – 3 expts. (minimum).

Economic Botany:

Candidates to submit some specimens with proper identification and herbarium sheets of some economically important plants.

SCHEME OF PRACTICAL EXAMINATIONS:**(End Semester)****Time: 4hrs.****Marks:32**

Plant Physiology	14
Economic Botany (including collection)	10

Laboratory Note Book	4
Viva Voce	4
Total 32	

Text Book:

1. Botany for Degree students: A.C. Dutta
2. College Botany Vol. II: Mukherjee, Das & Ganguly, Central Book.
3. Economic Botany: Pandey
4. A Text Book of Plant Physiology: Malik & Srivastava.
5. Handbook of Agriculture: ICAR

SEMESTER V

**BOTANY IX (GENERAL)
BOTGT 501**

Cytogenetics, Evolution & Biostatistics: 48 End+12 IA= 60

Objective of the course: The main objective of this course is to introduce the undergraduate students with the basic knowledge of structures & function of cell and cell organelles, genetic materials, principles of genetics, modern concepts of evolution and the statistical tools useful in biology.

Cytogenetics Marks: (32+8)=40

Unit-1: Detail structure and functions of Nucleus, Chromosomes, Cell Wall, Cell membrane, (physical and chemical organisation and types), Mitochondria, Plastids & Ribosomes and replication of DNA and RNA.

Unit-2: Concept of Polyploidy and its application, Mendel's Laws, Linkage, Crossing Over and Chromosome Mapping, concept of Gene, Allele and Mutation.

Unit-4: Knowledge of Non-Chromosomal Inheritance, concept of Genetic Engineering and Crop Improvement.

Unit-5: Concept of Protoplast, Cell & Organ Culture, Tissue Culture Techniques & its Application and Somatic Hybridisation

Evolution: (8+2)=10

Unit -1: Origin of life, Evidences of Organic Evolution; mechanism of evolution; theories of organic evolution.

Unit -2: Modern concept of evolution (Molecular basis of evolution).

Biostatistics (8+2)=10

Unit -1: Importance of biostatistics, mean, median, and mode; mean deviation and standard deviation, standard error, test of significance.

**BOTANY X (GENERAL)
BOTGP 502**

Cytogenetics:

Knowledge of chromosomal stains and study of chromosomes by smearing the root tips using proper stains.

Biostatistics Some suitable problems on Central Tendency, Standard Error and Standard Deviation

Evolution: Study of fossil slides/ rocks

SCHEME OF PRACTICAL EXAMINATIONS:
(End Semester)

Time: 4hrs.

Marks: 32

Cytogenetics	16
Biostatistics	8
Laboratory Note Book	4
Viva-Voce	4

Total 32

Text Book:

1. Fundamentals of Biostatistics: Prasad, Emby Publications
2. Cytology, Genetics, Evolution and Ecology: Verma & Agarwalla
3. Genetics: P.K. Gupta
4. Cytogenetics & Plant Breeding: Sukla & Chandey.
5. Elements of Cytology: N.S. Chonn

SEMESTER VI
BOTANY XI (GENERAL)
BOTGT-601

Biochemistry, Plant Ecology and Plant Geography: **48 End+12 IA =60**

Objective of the course: The main objective of this course is to introduce the undergraduate students with the basic knowledge of acid base concept and its importance, importance of macromolecules, ecological importance of plants, their distribution and ecosystem structure & function of ecosystem.

Biochemistry: **Marks: (16+4)=20**

Unit-1: Basic principles of biochemistry, acid, base, pH and buffer (inorganic and organic) enzymes, (physiochemical properties), Vitamins & Coenzymes and their importance.

Unit -2: General account of Carbohydrates, Fats, Proteins, Nucleic Acids and their importance

Plant Ecology: **Marks: (24+6)=30**

Unit-1: Ecological factors and their role in plant biodiversity.

Unit-2: Structure and function of ecosystem, energy flow through ecosystem, an overview on different types of ecosystem.

Unit-3: Plant communities: definition, classification, characteristics, function, succession and adaptation: concept and types.

Unit-5: Pollution: Air, Water, Soil, global climate change : Green House Effect, Ozone Depletion, Acid Rain), Deforestation and Consequences of Deforestation.

Unit-4: Natural Resources: Renewable and Non- Renewable Resources, Conservation and Management of Natural Resources, Natural Capital, IUCN Red List Categories, Knowledge on WWF, IUCN, CITES, NBWL, NBA

Unit-5: Biodiversity: Definition, Concept on Hot Spot of Biodiversity,

Plant Geography: **(8+2)=10**

Unit -1: General account on the Phytogeographical Regions of India with special reference to the Eastern Himalayas

Unit -2: Endemism and Endemic flora – a general account.

BOTANY V (GENERAL)
BOTGP-602

Biochemistry:

Detection of Carbohydrates, Fats and Proteins.

Plant Ecology and Phytogeography:

Study of floristic composition study of different habitats, Study of producer, consumer and decomposer (if possible) and preparation of food chain and food web to show the probable path of energy transformation through the ecosystem, study of adaptation in plants, collection of representative plant samples of different habitats.

**SCHEME OF PRACTICAL EXAMINATIONS
(End Semester)**

Time: 4hrs.**Marks: 32**

Biochemistry	10
Plant Ecology and Phytogeography (including collection)	14
Laboratory Note Book	4
Viva-Voce	4
Total	32

Text Book:

1. A Text Book of Plant Ecology: R.S. Ambasht
2. Concept of Ecology: E.J. Kormandy
3. Modern Concept of Ecology : M.C. Dash
4. Modern Concept of Ecology: Verma & Agarwala
5. Fundamentals of Ecology: E.P. Odum
6. Biochemistry: A.L. Lenninger, Macmillan.
7. Biochemistry: Suyer, Academic Press.
8. Biochemistry: Trehan, Willey Eastern
9. Cell Physiology: A.C. Ghose.
10. College Botany in Tropics: Kochar, Macmillan.
11. College Botany Practical Vol. I and II: Santra, Chatterjee & Das, Central Book.
12. College Botany Vol. I and II: Mukherjee, Das & Ganguly, Central Book.

TOTAL MARKS: 2400

There shall be **27 (twenty seven)** courses **13(thirteen)** each of theory and practical courses for TDC Botany Major programme. The distribution of courses and marks will be as follows:

Semester-I	Total Marks: 400
Compulsory course-I: English I	100
Non-major Course I: Zoology I (Th)	48 End+12 IA= 60
Non-major Course I: Zoology II (Pr)	32 End+8 IA= 40
Non-major Course: II =Chemistry I (Th)	100
BOTMT-101: Algae, Fungi and Lichen	48 End+12 IA= 60
BOTMP-102: Based on BOTMT-101	32 End+8 IA = 40
	Total 400
 Semester II	 Total Marks: 400
Compulsory course-II: Computer Skill-II	100
Non-major Course I: Zoology III (Th)	48 End+12 IA=60
Non-major Course I: Zoology IV (Pr)	32 End+8 IA=40
Non-major Course II =Chemistry –I (Th)	100
BOTMT-201: Plant Pathology and Bryophytes	48 End+12 IA=60
BOTMP-202: Based on BOTMT-201	32 End+8 IA = 40
	Total 400
 Compulsory course III: Environmental Studies	 100*
 Semester III	 Total Marks: 400
Non-major Course I: Zoology V (Th)	48 End+12 IA =60
Non-major Course I: Zoology VI (Pr)	32 End+8 IA =40
Non-major Course II: Chemistry III (Th)	48 End+12 IA =60
Non-major Course II: Chemistry IV (Pr)	32 End+8 IA =40
BOTMT-301: Pteridophytes, Gymnosperms, and Palaeobotany	48End+12 IA =60
BOTMP-302: Based on course 301	32End+8 IA =40
BOTMT-303: Microbiology and Biotechnology	48End+12 IA =60
BOTMP-304: Based on BOTMT-303	32End+8 IA =40
	Total 400

Semester IV**Total Marks: 400**

Non-major Course I: Zoology VII (Th)	48 End+12 IA =60
Non-major Course I: Zoology VIII (Pr)	32 End+8 IA =40
Non-major Course II: Chemistry VII (Th)	48 End+12 IA =60
Non-major Course II: Chemistry VIII (Pr)	32 End+8 IA =40
BOTMT-401: Morphology and Taxonomy of Angiosperms	48 End+12 IA =60
BOTMP-402: Based on BOTMT-401	32 End+8 IA= 40
BOTMT-403: Cell Biology and Modern Laboratory Technique	48 End+12 IA =60
BOTMP-404: Based on BOTMT-403	32 End+8 IA =40

Total 400
Semester V**Total Marks: 400**

BOTMT-501: Development and Reproduction in Angiosperms	48 End+12 IA=60
BOTMP-502: Based on course BOTMT-501	32 End+ 8 IA=40
BOTMT-503: Genetics, Plant Breeding & Biostatistics	48 End+12 IA=60
BOTMP-504: Based on BOTMT-503	32 End+8 IA =40
BOTMT-505: Functional and Chemical Biology	48 End+12 IA=60
BOTMP-506: Based on BOTMT-505	32 End+8 IA =40
BOTMT-507: Plant Ecology, Phytogeography and Evolution	48 End+12 IA=60
BOTMP-508: Based on BOTMT-507	32 End+8 IA =40

Total 400
Semester VI**Total Marks: 400**

BOTMT-601: Plant Physiology	48 End+12 IA =60
BOTMP-602: Based on BOTMT-601	32 End+ 8 IA =40
BOTMT-603: Molecular Biology and Immunology	48 End+12 IA =60
BOTMT-604: Biophysics and Bioinformatics	48 End+12 IA =60
BOTMP-605: Based on course BOTMT-603 & 604 + Project	52 End+13 IA +15=80
BOTMT-606: Agro-technology and Sustainable Utilization of Plants	48 End+12 IA =60
BOTMP-607: Based on course BOTMT-606	32 End+8 IA =40

Total 400
Grand Total=Semester (I+II+III+IV+V+VI) =2400 mark**BOTANY MAJOR PROGRAMME**

SUMMARY OF THE COURSE

TOTAL PAPERS: THEORY: 27 & PRACTICAL 13

TOTAL MARKS: 2400

KEY:

BOTMT = BOTANY MAJOR THEORY

BOTMP = BOTANY MAJOR PRACTICAL

TOTAL LECTURE HOURS:

THEORY: 40 (Per Paper)

PRACTICAL: 15 (Per Paper)

MARKS DISTRIBUTION:

THEORY: (48 End + 12IA) [End=End Semester , IA=Internal Assessment]

PRACTICAL: (32 End + 12IA) [End=End Semester , IA=Internal Assessment]

Except BOTMP-605 (Based on course BOTMT 603 & BOTMT 604)where distribution of marks is=(52 End + 13IA) + 15 Marks in Project Work , Grand Total is 80 Marks.

SEMESTER- I
BOTANY MAJOR
BOTMT 101

Algae, Fungi and Lichen:

48 End+12 IA =60

Objective of the course: The main objective of this course is to provide basic knowledge of thallus, morphology, reproduction and evolution of lower cryptograms and plant pathology..

Algae:

Marks: (20+5)=25

Unit –1: General characters, classification and economic importance of algae; its phylogeny and distribution in India.

Unit –2:Vegetative structure: cell and thallus structure; algal chromatophores and pigments; range of thallus structure; Reproduction: Vegetative, asexual, sexual and pattern of life cycles.

Unit –3: A comprehensive knowledge of the following classes with special reference to the structure and life histories of the genera mentioned below:

- a) Myxophyceae: *Nostoc* and *Anabaena*;
- b) Chlorophyceae: *Chlorella*, *Volvox*, *Oedogonium*, *Coleochaete*, *Chara*
- c) Xanthophyceae: *Vaucheria*
- d) Bacillariophyceae: A general account.
- e) Phaeophyceae: *Ectocarpus* and *Fucus*.
- f) Rhodophyceae: *Polysiphonia* and *Batrachospermum*.

Fungi:

Marks: (20+5)=25

Unit –1. Salient features of fungi, fungal cell structure and fungal nutrition; Classification of fungi (Alexopoulos, 1969 &1983) and their distribution in India.

Unit –2. Comparative account of structure, method of reproduction and mode of spore dispersal of fungi; Economic importance of fungi.

Unit –3. Comprehensive knowledge of the following groups with special reference to the structure and life histories of the genera mentioned below from an evolutionary point of view.

- (a) **Mastigomycotina:** *Myxomycetes*: a general account, *Albugo*, *Pythium*.
- (b) **Zygomycotina:** *Rhizopus*.
- (c) **Ascomycotina:** *Peziza*
- (d) **Basidiomycotina:** *Puccinia*, *Polyporus*, *Cyathus*, *Agaricus*
- (e) **Deuteromycotina:** *Aspergillus*, *Alternaria*, *Penicillium*

Lichen:

Marks: (8+2)=10

Unit –1: A general account with particular reference to types and their detail cell structure.

Unit -2: Mode of reproduction, symbiotic association, nutrition and economic importance.

BOTANY MAJOR

BOTMP-102

Marks: 40(32 End+8I A), 10 class hours

Algae, Fungi & Lichen:

Preparation, drawing, description and identification of the types prescribed for study in theory syllabus and microscopic measurements and camera lucida drawing of fungal types.

SCHEME OF THE PRACTICAL EXAMINATION:

(End Semester)

Time: 4 hrs.

Marks: 32

1. Slide preparation (algae)	8
2. Drawing labelling & description (with Camera lucida drawing and spore measurement of fungi / pathology.	8
3. Lichen	3
4. Identification	3
5. Practical record book	5
6. Viva voce	5
Total	32

* Book list is given at the end of the programme.

Semester II

BOTANY MAJOR

BOTMT-201

Plant Pathology and Bryophytes:

48End+12IA= 60

Objective of the course: The main objective of this course is to provide fundamental knowledge on the structure, morphology, reproduction, alternation of generation and tissue organisation and spore dispersal mechanisms in Bryophytes.

Plant Pathology:

Marks: (24+6)=30

Unit –1: Principles of plant pathology with special reference to systematic and localised diseases and symptoms.

Unit –2: Host parasite interaction, (toxins, enzymes ,resistant).

Unit –3: Plant disease management through physical, chemical, biological, regulatory and cultural methods, and post harvest management.

Unit –4: Study of the following diseases and their methods of control: late blight of potato, ergot of rye, loose smut of wheat, rust of wheat, red rot of sugarcane, grey blight of tea, citrus canker and mosaic disease of tobacco.

Bryophytes:

Marks: (24+6)=30

Unit–1: General account, classification and distribution in India

Unit–2: Evolution of saprophytes and spore dispersal mechanism Comparative account of the gametophyte

Unit–3: A comparative knowledge of the structure and life history of the following types from the evolutionary point of view and their ecology and economic importance.

Riccia, Marchantia, Anthoceros, Sphagnum, Polytrichum

BOTANY MAJOR IV
BOTMP-202

Marks: 40(32End+8IA)

Plant Pathology & Bryophyte:

Preparation of slides by cutting sections, drawing, labelling, description and identification of the types prescribed in the theory syllabus, microscopic measurement and camera lucida drawing of vegetative and reproductive types.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

Marks: 32

1. Plant Pathology	8
2. Slide preparation (Bryophyte)	7
3. Identification	4
4. Slide submission	3
5. Practical record book	5
6. Viva voce	5
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Total	32

SEMESTER III

BOTM - 301

Pteridophytes, Gymnosperms and Palaeobotany:

48 End+12 IA = 60

Objective of the course: The main objective of this course is to provide comparative account of structural morphology, distribution anatomy, reproduction and evolution of seed habit in higher cryptogams; special emphasis is to be given on the stelar structure and evolutionary links.

Pteridophytes

Marks: (20+5)=25

Unit –1: General classification, organisation and affinities, distribution in India and economic importance.

Unit –2: Stelar organisation in Pteridophytes; Evolution of sporophytes and sporophylls in

Pteridophytes; Homospory and Heterospory and its importance in evolution of seed habit

Unit –3: Comparative study of morphology and life history of *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Marsilea*.

Gymnosperms:

Marks: (16+4)=20

Unit –1: Classification, distribution and economic importance.

Unit –2: Comparative and evolutionary study of morphology, anatomy and reproduction of *Cycas*, *Pinus*, *Ginkgo*, *Gnetum*.

Palaeobotany:

Marks: (12+3)=15

Unit –1: An elementary knowledge of paleobotany – process and the theory of fossilization, geological periods and importance of Paleobotany.

Unit –2: General account of anatomy and reproduction of the following types:

- (a) Pteridophytes – *Rhynia*, *Hornea*, *Psilophyton*, *Sphenophyllum*
 (b) Gymnosperms – Cycadefilicales (*Lyginopteris*), Bennettitales (*Willimasonia*) and Cordaitales (*Cordaites*).

**BOTANY MAJOR
 BOTMP- 302**

Marks: 40(32 End+8 IA)

Pteridophyte:

Preparation of slides by cutting section, drawing, labelling, description and identification of the types, prescribed in the theory syllabus.

Gymnosperm:

Preparation of slides by cutting section drawing, labelling, description and identification of the types, prescribed in the theory syllabus.

Palaeobotany:

**SCHEME OF THE PRACTICAL EXAMINATION:
 (End Semester)**

Time: 4 hrs.

Marks: 32

1. Slide preparation (Pteridophytes)	8
2. Slide preparation (gymnosperms)	8
3. Identification (Paleobotany)	6
4. Practical record book	5
5. Viva voce	5
Total	32

**BOTANY MAJOR VII
 BOTMT-303**

Microbiology and Biotechnology:

Marks:48 End+12 IA = 60

Objective of the course: The main aim of this course is to introduce the students with the basic knowledge of microbiology and biotechnology in the light of recent developments.

Microbiology:

Marks: (32+8)=40

Unit –1: Contribution of scientists for development of microbiology.

Unit –2: Classification of micro-organisms and characteristic features of different groups of micro-organisms, brief knowledge of bacteria, cyanobacteria, virus, bacteriophage, mycoplasma (Structure, reproduction and importance).

Unit –3: Elementary principles of isolation, and cultivation of micro-organisms and pure culture concept; General ecology of soil microflora, mycorrhiza and bacteriorrhiza.

Unit –4: Microbiology of food, milk and water.

Unit –5: Importance of micro-organisms for human welfare, elementary knowledge of disease caused by microbes to man, and plants (only two diseases from each group, mentioning causal organism, symptoms and control measures).

Biotechnology:

Marks: (16+4)=20

Unit – 1: Introduction, scope of biotechnology, recent advances in biotechnology, application of biotechnology in agriculture and industry, concepts pertaining to biofertilizers.

Unit – 2: Genetic Engineering and its merits and demerits

Unit – 3: Tissue culture: basic principle, medium, protoplast fusion and somatic hybridization.

Unit – 4: Basic knowledge of industrial microbiology with reference to production of Alcohol, Vinegar and Antibiotic.

**BOTANY MAJOR
BOTMP-304**

Marks: 40(32 End+8 IA)

Use of the following apparatus - Hot air oven, autoclave, incubator, sterilization techniques/ methods, preparation of different types of media and cultures, dilution plate technique, staining of bacteria, slide preparations, demonstration of tissue culture techniques.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks:32

1. Different techniques (Microbiological /Biotechnological)	12
2. Demonstration	10
3. Practical record book	5
4. Viva-Voce	5
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Total	32

SEMESTER IV

**BOTANY MAJOR IX
BOTMT= 401**

Morphology and Taxonomy of Angiosperms:

Marks:48 End+12 IA = 60

Objective of the course: The main aim of this course is to provide fundamentals of Angiosperm morphology and classification with special reference to the polygenerid relationship of various taxa.

Morphology of Angiosperms:

Marks: (16+4)=20

Unit –1: Detail study of Morphological characters:

- (i) Carpel polymorphism
- (ii) Origin of angiosperms

- (iii) Evolution of inflorescence
- (iv) Role of morphology in the classification of the flowering plants.

Taxonomy of Angiosperms

Marks: (16+4)=20

Unit –1: History of plant classification, its aims and objectives, outlines of the main classifications (systems of classification) – Artificial, Natural, Phylogenetic and Modern with special reference to Linnaeus, Bentham and Hooker, Engler and Prantl, Hutchinson and Takhtajan’s classification.

Unit –2: Generic names, specific epithets, citation and authority, binomial nomenclature, taxonomic keys; typification and priority; importance of herbarium specimens and their preparations; role of herbaria and botanical gardens; documentation (floras, monographs, manuals, journals, abstracts, indices and dictionaries).

Unit –3: Details on Cytotaxonomy, Chemotaxonomy, Numerical Taxonomy and Biosystematics.

Unit–4: A detailed knowledge of the following families and their phylogenetic affinities and economically important plants:

Dicotyledons: *Magnoliaceae, Malvaceae, Rubiaceae, Fabaceae, Rosaceae, Solanaceae, Cucurbitaceae, Apiaceae, Asteraceae, Lamiaceae, Theaceae, Apocynaceae and Euphorbiaceae*

Monocotyledons : *Orchidaceae, Musaceae, Zingiberaceae, Arecaceae and Poaceae, Commelinaceae, Cyperaceae.*

**BOTANY MAJOR
BOTMP-402**

Marks: 40(32 End+8 IA)

Candidates will be asked to dissect, draw and describe the plants in simple technical language and identify up to genera with the help of identifying keys.

Submission of preserved and dry botanical specimens, herbarium sheets, permanent and semi-permanent slides of roots, leaves and pollen grains.

Field Study: Students to be visited local place(s) of botanical interest and to submit a field report on the visit.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks: 32

1. Dissection, drawing, labelling, description	12
2. Herbarium	3
3. Practical record book	5
4. Field Study Report	7
4. Viva-Voce	5
Total	32

**BOTANY MAJOR
BOTMP- 404**

Marks: 40(32 End+8 IA)

Cell biology:

Paraffin methods of making slides; preparation of paraffin blocks with specimen
teaming. fixing; cuttings of ribbon with specimen

Modern Laboratory Technique:

Separation of plant pigments and amino acids by paper chromatography/TLC. Demonstration of modern biological tools as per theory syllabus mentioning their principle, function and uses in the biological sciences.

SCHEME OF THE PRACTICAL EXAMINATION:

(End Semester)

Time: 4 hrs.

Marks: 32

1. Cell biology	12
2. Separation techniques	10
3. Practical record book	5
4. Viva voce	5
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Total	32

SEMESTER V

BOTANY MAJOR BOTMT - 501

Development and Reproduction in Angiosperm:

Marks: 4End+1IA =60

Objective of the course: The main objective of this course is to provide fundamental knowledge of structural and functional aspects of cell and cell organelles and the tools and techniques used in modern biological study.

Development in Angiosperm:

Marks: (24+6)=30

Unit-1: Organisation of tissues: Types of tissues, Meristematic and permanent, their types, structures, distribution and functions; theories of differentiation of roots and shoots.

Unit -2: Stele Body – origin and development, Root – stem transition, leaf traces and leaf gaps, branch gaps, abscission layer.

Unit -3: Secondary structures of roots and stems, initiation of cambium and its activities. 4 class hours

Unit-4: Anomalous secondary growth in thickness (*Amaranthus*, *Asparagus*, *Boerhavia* and *Mirabilis*).

Unit-5:Anatomico-physiological consideration of dermal, mechanical, conducting and photosynthetic system of tissues; anatomy of C3 and C4 plants.

Reproduction in Angiosperm::

Marks: (24+6)=30

Unit -1: A general account of the following topics: Development of male and female gametophyte of angiosperms; monosporic, bisporic & tetrasporic embryosac.

Unit -2: Fertilization, development of embryo; Apomixis, polyembryony, Palynology.

Unit -3: Development of Endosperm – nuclear, cellular, helobial; haustorial structures.

BOTANY MAJOR BOTMP - 502

Marks: 40(32 End+8 IA)

Development in Angiosperm:

Study of primary, secondary and anomalous structures of stem and roots; Internal structures of different types of leaves; maceration of tissues; identification of the elements; Knowledge of single and double staining methods; preparation of temporary and permanent mounts.

Reproduction in Angiosperm:

Study of permanent slides of embryological importance and preparation of temporary slides of placenta and pollen grains (germinating).

SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)

Time: 4 hrs.

Marks: 32

1. Double staining slide (anatomy) drawing, labelling, description	12
2. Workout and study of permanent slide (embryological)	10
3. Practical record book	5
4. Viva-Voce	5
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Total	32

BOTANY MAJOR
BOTMT-503

Marks:48 End+12 IA=60

Genetics & Plant Breeding, Biostatistics:

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge on plant genetics and application of genetic for improvement of crop, application of statistics in biology.

Genetics:

Marks: (20+5)=25

Unit – 1: Mendel's Laws, their critical appreciation, gene interactions and modified monohybrid and dihybrid ratios; concept of alleles, multiple alleles and multiple genes, Linkage, Crossing Over and basic knowledge of Gene Mapping.

Unit – 2: Determination of Sex, Sex Linked and Sex Limited Traits, Cytoplasmic Inheritance with reference to Plastid Inheritance and Kappa Particle Inheritance.

Unit – 3: Chromosomal (numerical and structural) and Gene Mutation, concept of Biochemical Mutation.

Unit – 4: Basic ideas of Gene and its fine structure, Genetic Engineering and Gene Cloning, Concept Trans Gene.

Unit – 5: Human Genetics: Karyotype, important Syndromes and disorders

Plant Breeding:

Marks: (16+4)=20

Unit – 1: Methods of reproduction: Sexual, Vegetative, apomixes; Principles and methods of Plant Breeding: Introduction, Selection, Hybridization, Heterosis Breeding and concept of Mutation Breeding.

Unit – 2: In vitro Culture: Requirements, techniques and application in Crop Improvement.

Biostatistics:

Marks: (12+3)=15

Unit –1: Application of statistics in Biological Science, collection and classification of data for frequency distribution.

Unit –2: Measurement of Central Tendency; Mean, Median, Mode, Standard Error and Standard Deviation.

Unit –3: Test of Significance, Probability Test.

**BOTANY MAJOR
BOTMP-504**

Marks: 40(32 End+8 IA)

Concept of fixation, staining and squashing/smearing of materials for chromosome preparation. Temporary aceto-carmin and aceto-orcin smear preparations of root tips (onion/lily) and flowerbuds (onion/tradescantia); drawing, description of the mitotic and meiotic stages. Simple calculation of Mendelian ratios including ratios due to gene interaction

Study of floral biology and techniques of plant breeding emasculation, bagging, tagging and labelling.

Computation of central tendency and deviation: t-test, chi square test

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

Marks: 32

1. Genetics	9
2. Plant breeding	6
3. Biostatistics	7
4. Practical record book	5
5. Viva voce	5
Total	32

**SEMESTER V
BOTMT- 505**

48 End+12 IA=60

Functional and Chemical Biology:

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge of modern approaches to functional and chemical biology of plants.

Unit –1: Concept of Biomolecules, Polymeric substances in plants- A brief study of Polysaccharides,

Lipids, Proteins, Nucleic Acids, Chlorophylls with special reference to their functions.

Unit –2: Metabolic concept- Anabolism and Catabolism.

Unit– 3: Secondary plant products- Terpenoids, Phenols, Flavonoids, Anthocyanins, Alkaloids, Non-protein Amino Acids.

Unit –4: General account of – Plant Hormones and their role (Auxins, gibberellins, Cytokinins,Florigen Absisic Acid), phytochrome, and storage products.

Unit –5. Mechanism of Source Sink Relationship.

**BOTANY MAJOR
BOTMP-506**

Marks: 40(32 End+8 IA)

5. Qualitative analysis of secondary metabolites in different plant samples.
6. Quantitative estimation of secondary metabolites in different plant samples
7. Qualitative and quantitative estimation of different photosynthetic pigments.
8. Determination of antioxidant capacity of various plant extracts of food and medicinal importance.

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 4 hrs.

Marks: (32+8)=40

2. Phytochemical analysis	
c) Major	14
d) Minor	8
2. Practical record book	5
3. Viva - Voce	5
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Total	32

**BOTANY MAJOR
BOTMT- 507**

48 End+12 IA=60

Plant Ecology, Phytogeography and Evolution:

Objective of the course: The main objective of this course is to introduce the students with the basic principles and concepts of plant ecology, structure & function of natural plant units, habitat degradation and role of plant on improvement of habitat, conservation ecology, phytogeography & evolution.

Plant Ecology:

Marks: (32+8)=40

Unit – 1: Introduction: definition and scope of plant ecology, development of plant ecology in India and abroad, division of plant ecology; Edaphic factor: Soil Profile, Soil Properties(Physical & Chemical); Physiographic Factors: Types of Biotic Interactions.

Unit – 2: Ecosystem Ecology: Ecosystem Concept, Structure & Function, Ecological Pyramids, Food Chain, Food Web, Trophic Level, Ecological Niche, Flow of Energy in an ecosystem, Productivity, Nutrient Cycling, Biogeochemical Cycle (Water, Oxygen, Carbon Nitrogen, Sulphur and Phosphorous Cycle)

Unit – 3: Autecology and population dynamics: definition, characteristics of population, population growth forms; Synecology and Community Dynamics: structure and classification of plant community, community characteristics, Analytic and Synthetic characters; Plant Succession: Concept, Types of Succession, causes of Succession, the Climax concept; Plant Adaptation: Hydrophytes, Xerophytes, Helophytes and Epiphytes

Unit – 4: Ecosystem Dynamics: Definition, Types, Structure and Function of Ecosystem, concept of

Energy Flow through Ecosystem; Nutrient Cycling and Biogeochemical Cycles with special reference to water, oxygen, carbon, nitrogen, sulphur and phosphorus cycles.

Unit -5: Habitat degradation: Pollution of air, water, soil and its impact on our environment; control of pollution with special reference to phytoremediation, public awareness and people's participation; Global Environmental Problems(Global Warming, Ozone Depletion, Acid Rain, Global Water Crisis), Concept on EIA.

Unit – 6: Conservation Ecology and Biodiversity: Definition and classification of Natural Resources, In-Situ & Ex-Situ Conservation in details; Biodiversity: Concept, origin, values, Hot-Spot of Biodiversity(Terrestrial & Marine), IUCN Red List Categories, Concept on Flagship, Keystone and Endemic Species, Biodiversity & Sustainable Development, Knowledge on WWF, IUCN,CITES,NBWL,NBA

Phytogeography: (8+2)=10

Unit –1:Principles of static and dynamic phytogeography; general idea of the distribution of plants over the globe (from tropical to arctic zones) with special reference to the Phytogeographical Regions of India.

Evolution (8+2)=10

Unit –1: Organic evolution: mechanism of organic evolution; theories of organic evolution (a general idea).

Unit –2: Modern concept of evolution and origin of life in the light of chemical evolution.

BOTANY MAJOR BOTMP- 508

Marks: 40(32 End+8 IA)

Plant Ecology:

11. Study of the common instruments (P^H meter, spectrophotometer, colorimeter, Muffle furnace, hot air oven, growth chamber, soil thermometer, maximum and minimum thermometer, hygrometer, psychrometer or dry and wet bulb thermometer, lux meter etc.) used in ecological investigation.
12. Study of floristic composition within the college campus / outside near to the college campus.
13. Determination of minimum sampling size (Species-area-curve) for vegetation study.
14. Determination of minimum number of samples to be taken for vegetation study (Species-area-curve).
15. Determination of abundance and density of herbaceous species in a study area.
16. Determination of percentage frequency of herbaceous species in a study area.
17. Determination of root – shoot ratio of herbaceous plants grown in different conditions.
18. Determination of Relative Growth Rate (RGR) of herbaceous species grown in different conditions.
19. Study of ecosystem structure by analyzing the producer, consumer, and decomposer (if possible) and preparation of food chain and food web of a particular locality to show the probable path (s) of energy transformation through the system.
20. Study of standing crop biomass and productivity of an ecosystem.

Phytogeography:

- Preparation of chart on the major biomes of the world / landscape with distribution of plants with reference to particular ecological condition (s).

Evolution:

- Study of permanent slides / fossil rocks having evolutionary significance.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks: 32

1. Ecology	10
a) Major Expt.	7
b) Minor expt.	3
2. Phytogeography and evolution	5
3. Practical record book	5
4. Viva-Voce	5
Total	32

**Topic of the Project work may be given in the Semester-V and report should have scientific investigation and outcome with statistical analysis of data (where necessary). The same have to be presented in the headings: Title, Introduction, Objective, Materials & Methods, Results, Conclusion and References. The project will be evaluated in Semester-VI with the paper BOTMP-605. Separate project preferably be given to each student.*

**BOTANY MAJOR
BOTMT- 601**

48 End+12 IA=60

Plant Physiology:

Objective of the course: The main objective of this course is to introduce the students with the basic knowledge on major physiological aspects of plants.

Unit –1: Plant water relationships: Diffusion, imhinition and Osmosis; water potential and chemical potential; absorption of water; mechanism of active and passive absorption; water holding and wilting co-efficient; co-efficient; transpiration, its mechanism and significant factors.

Unit –2: Ascent of sap: Definition; different theories related to ascent of sap; physiological effects of water deficit and stress physiology; Mineral nutrition in plants: Role of micro and macro elements; mineral deficiency symptoms in plant growth; Translocation of Organic Solutes: Transport of Photosynthates.

Unit –3: Nitrogen Metabolism: Nitrogen Fixation (Symbiotic and Non-Symbiotic), nif-gene and nitrification.

Unit –4: Photosynthesis: Historical background and significance; mechanism a) Light Reaction – Red Drop, Emerson Effect, Photosynthetic Pigments; two pigment systems; Cyclic and Non-cyclic Electron Transport; Photophosphorylation and production of Assimilatory Power, (b) Dark Reaction: Calvin Cycle (C3 pathway), Hetch-Slack Pathway (C4 pathway); differences between C3 and C4 cycle; Chotorespiration, Crassulacian Acid Metabolism (CAM) and Chemosynthesis; factors affecting photosynthesis.

Unit –5:Respiration: Glycolysis and TCA Cycle, Pentose Phosphate pathway; oxidative phosphorylation.

Unit – 6: Growth and Development: Definitions; Phases of Growth; Kinetics of Growth; Physiology of Seed Dormancy and Germination; Photoperiodism and Vernalisation; Phytohormones; Plant Movements –tropic and nastic.

**BOTANY MAJOR
BOTMP- 602**

Marks: 40(32 End+8 IA)

Properties of colloids: imbibition and absorption of water and solutes – Osmosis in plant tissues; determination of osmotic pressure and suction pressure; root plant tissues; determination of inorganic constituents of tissues and the experiments on transpiration, respiration, photosynthesis, growth and movement, ash analysis on transpiration, respiration, photosynthesis, growth and movement, ash analysis.

**SCHEME OF THE PRACTICAL EXAMINATION:
(End Semester)**

Time: 4 hrs.

Marks: 32

2. Experiment	
a)Major	14
b)Minor	8
2. Practical record book	5
3. Viva voce	5
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Total	32

BOTMT- 603

48 End+12 IA=60

Molecular Biology and Immunology:

Objective of the course: The main objective of this course is to introduce the students with the fundamentals of molecular biology and immunology.

Molecular Biology:

Marks: (32+8)=40

Unit –1: Nucleic Acids, DNA as genetic material, structure and functions of DNA & RNA, Watson & Crick Model of DNA, other forms of DNA (A & Z), Genome organization in prokaryotes and eukaryotes.

Unit–2: Replication of DNA- prokaryotes and eukaryotes, Transcriptions in prokaryotes and eukaryotes.

Unit–3: Features of genetic code wobble hypothesis, protein biosynthesis in prokaryotes and eukaryotes.

Unit–4: Recombination in Prokaryotes; Transformation, Conjunction and Transduction; , Concept of Transposons and Plasmids.

Unit –5: Regulation of Gene Expression in Prokaryotes- Operon concept (Lac)

Immunology:

Marks: (16+4)=20

Unit –1: Plant health management.

Unit –2: Immunity & resistant in mammals, principle of antigens and Antibodies reaction.

Unit–3: Interaction of plants with bacteria, virus and fungi; breeding for disease resistance, environment & immunity, laws in the distribution of immunity from infectious diseases in plants.

**BOTANY MAJOR
BOTMT-604**

48 End+12 IA=60

Biophysics and Bioinformatics:

Objective of the course: The main objective of this course is to introduce the students with the tools and techniques of physical and computer sciences used in biological study.

Biophysics

Marks: (24+6)=30

Unit –1: Scope and development of Biophysics. P^H and buffer solution in details.

Unit –2: Laws of Thermodynamics, Concept of Free Energy, Redox Potential and Bioenergetics(only high energy compound)

Unit–3: X-ray Crystallography (XRD), Chromatography, LASER and its biological applications, Fluorescences and its application, Basic concept of NMR and Ultra Sound

Unit –3:Isotopes, Types, their importance in biological studies, measure of radioactivity.

Bioinformatics:

Marks: (24+6)=30

Unit-1: Fundamentals of bioinformatics: introduction, history and scope of bioinformatics; sources of information, internet world wide web and web browsers.

Unit-2: Biological database: introduction, basic concepts of primary and secondary databases; Nuclie acid and protein sequence database (NCBI, gene bank and SWISS-PROT); Data mining and data mining tools (ENTREZ).

Unit-3. Database search and sequence alignment, Tools of sequence alignment – FASTA and BLAST; methods of sequence alignment.

Unit-4: Phylogenetic analysis: basic concept, steps in evaluation of phylogeny and constructing phylogenetic trees.

**BOTANY MAJOR
BOTMP- 605**

Marks: 80(52End+13IA), Project work 15

C. Molecular Biology and Immunology

4. Preparation of ball and stick model of Nucleolides.
5. Detection/Estimation of RNA/DNA
6. Study of antimicrobial activity (inhibition zone) of various plant extract of economic importance.

D. Biophysics and Bioinformatics:

1. Application of different microscopes in biological studies.
2. Separation techniques.
3. Different e-resources and database search.
4. Similarity search in sequence such as BLAST / FASTA.
5. Submission of charts and models etc.

*****PROJECT WORK:** **Topic of the Project work may be given in the Semester-V and report should have scientific investigation and outcome with statistical analysis of data (where necessary). The same have to be presented in the headings: Title, Introduction, Objective, Materials & Methods, Results, Conclusion and References. The project will be evaluated in Semester-VI with the paper BOTMP-605. Separate project preferably be given to each student.*

SCHEME OF THE PRACTICAL EXAMINATION:

Time: 6 hrs.	Marks: 52+15=67
7. Molecular Biology	12
8. Immunology	8
9. Biophysics	10
10. Bioinformatics	10
11. Practical record book	7
12. Viva-Voce	5
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	Total 52
***Project	15

	67

BOTANY MAJOR BOTMT- 606

48 End+12 IA=60

Agrotechnology and Sustainable Utilization of Plants:

Objective of the course: The main objective of this course is to provide students comprehensive knowledge of usefulness of plant resources for human welfare.

Unit -1: Origin of cultivated plants, Vavilov's centre of origin of crop plants; ethnobotany and its importance in Indian context, Knowledge on Indigenous Knowledge System (IKS)

Unit – 2: Agrotechnology of rice, wheat, mustard, sunflower, sesume, groundnut, soyabean, gram, mung, pea, tea, coffee, potato, cabbage, cauliflower, tomato and their economic utilization

Unit – 3: Agrotechnology of Chilli, turmeric, zinger, cardamom, black piper, jute, cotton, ramie, bamboo, teak, sal, sisoo, ajar, nahar and their economic utilization.

Unit – 4: Medicinal importance of sarpagandha, ashwagandha, kalmegh, satmul, bos, giloi (Tinospora), bhot jalakia, amlakhi, arjun, silikha and their economic utilization .

Unit – 5: Aromatic and Petrocrops (Cultivation and economic utilization) of patchouli, citronella, vitivar, sasi, jatropa, era.

Unit – 6: Domestication of Plants; Germplasm Collection & Conservation, Importance of Germplasm of Wild Species: Gene Library, Gene Bank; Concept of , Biofertilizers, biopesticides and Organic farming; Useful aspect of Lower Group of Plants: Algae, Fungi, Lichen.

BOTANY MAJOR

BOTMP- 607

Marks: 40(32End+8IA)

5. Determination of soil pH , Soil Moisture, Water Holding Capacity (WHC) of different soil samples collected from different habitats and soil physical properties.
6. Study of botanical characteristics, useful part (s), and products.
7. Determination of protein, fat, oil content of certain materials.
8. Collection of useful plants/plant parts.

SCHEME OF THE PRACTICAL EXAMINATION:

(End Semester)

Time: 4 hrs.	Marks:32
1. Soil analysis	10
2. Spot identification of useful plant / plant part(s) of different categories with distinguishing characters to be selected by the External Examiner.	12
4. Practical record book	5
5. Viva-Voce	5
Total	32

Books Recommended (including text books):

Cryptogamic Botany Vol I & II: Smith, Tata McGraw Hill.

Introduction to lower plants: Round, Bultherworth.

Morphology of Gymnosperms: Coulter & Chamberlein.

Plant Anatomy: Basu, Willey.

Introduction to Embryology: P. Maheswari.

Introduction to Plant Taxonomy: Jeffrey, Churcil.

Int. to Plant Physiology: Meyer & Anderson, East West.

A Class Book of Botany: A.C. Dutta.

Modern Concept of Ecology: Kumer, Vikash.

Cell Biology: S.C. Rastogi, Rastogi Publication.

General Microbiology Vol. I & II: Power & Daginaqala, Himalayan Publishing House.

Economic Botany: Hill, McGraw Hill.

Genetics: Winchester, Oxford & IBH.
 Fungi & Plant Diseases: Mundkar, Macmillan.
 Int. to Plant Physiology: Curtis & Clarke, McGraw Hill.
 Plant Pathology: Butter & Jones, Macmillan.
 Taxonomy of Vascular Plants: Lawrener, Macmillan.
 An Int. to Gymnosperms: S.C. Dutta, Asia Publishing House.
 The Primitive Land Plants: Bower, Macmillan.
 Fundamentals of Ecology: Odum, W.B. Saunders.
 Elements of Cytology: Cohen, Harcourt.
 Morphology and Taxonomy of Fungi: Bessey, Vikash.
 Morphology of Vascular Plants: Eames, Tata McGraw Hill.
 Introductory Mycology: Alexopolous, Willey.
 Plant Physiology Vol. I & II: Steward, Academic Press.
 Families of Flowering Plants Vol. I & II: Hutchinson, Macmillan.
 Plant Diseases: R.S. Singh, Oxford Hill.
 Fundamentals of Biostatistics: Prasad, Emkay Publication.
 An Int. to Taxonomy of Angiospers: Shukla & Mishra, Vikash.
 College Botany Practical Vol. I & II: Santra, Chatterjee & Das, Central Book.
 College Botany: Das Ganguly, Central Book.
 Economics Botany in tropics: Kochar, Macmillan.
 Concepts of Cell Biology: Verma & Agarwal, H. Chand.
 Industrial Microbiology: Patel, Macmillan.
 Principles of Soil Science: Rai, Macmillan.
 Text Book of Pteridophytes: Sharma, Macmillan.
 Genetic Engineering: Mitra, Macmillan.
 Genetics: Ahluwalia, Willey.
 Elementary Principles of Plant Breeding: Chaudhury, Oxford & IBH.
 Plant Breeding: Chopra, Oxford & IBH.
 Genetics: Gardener.
 Principles of Genetics: Stickberger.
 Essentials of Genetics and Biotechnology: A.C.Gogoi
 Molecular Cytogenetics: Sinnoll, Dunne & Donbzhosky.
 A Text Book of Plant Ecology: R. S. Amharst.
 Population Ecology: M. Begon & M. Mortimer.
 Fundamentals of Ecology: M.C. Dogh.
 The Reproductive capacity of plants: E.J. Salisbury.
 Introduction to Environmental Management: Nag Choudhury.
 Environmental Biology: Trivedi & Raj.
 Microbiology: N.J. Pelczar et. al.
 General Microbiology: R.Y. Stainer et. al.
 Soil Microbiology: N. Walker.
 Molecular Viscosity: G.A. Knight.
 Petroleum Microbiology: R.M. Atlas.
 Agricultural Microbiology: Rangaswamy and Bhagyaraj.
 Biotechnology: Trichan.
 Microbial Genetics: Treifelder.
 Modern concept of Ecology: Verma & Agarwala
 Handbook of Agriculture: ICAR
 Economic Botany: Pandey
 A Handbook of Medicinal Plants: Prajapati; Sharma, Kumar, Purohit
 Medicinal Plants of N.E. India: NEDFI

Cultivation of Medicinal Plants: Purohit & Vyas.

Essentials of Genetics and Biotechnology:A.C.Gogoi, Anuradha Publication, Jorhat

Fundamentals of Cell and Molecular Biology: Arvind K. Misra, Panima Publishing Corpn. New Delhi/Bangalore