RADHA GOVIND UNIVERSITY, RAMGARH, JHARKHAND

MODIFIED CBCS CURRICULUM OF BOTANY HONOURS PROGRAMME
FOR UNDER GRADUATE COURSES UNDER RADHA GOVIND UNIVERSITY

Implemented from Academic Session 2018-2021

B.Sc. BOTANY (HONOURS) SYLLABUS
Under
CHOICE BASED CREDIT SYSTEM

SEMESTER	COURSE OPTED	COURSE NAME	Credits
I	**Ability Enhancement Compulsory Course-I**	English communications/ Environmental Science	2
	Core course-I	Microbiology and Phycology	4
	Core Course-I Practical	Microbiology and Phycology	2
	Core course-II	Biomolecules and Cell	4
	Core Course-II Practical	Biomolecules and Cell - Practical	2
	Generic Elective -1	GE-1	4
	Generic Elective -1 Practical	GE-1 Practical	2
II	**Ability Enhancement Compulsory Course-II**	English communications/ Environmental Science	2
	Core course-III	Mycology and Phytopathology	4
	Core Course-III Practical	Mycology and Phytopathology- Practical	2
	Core course-IV	Archegoniate	4
	Core Course-IV Practical	Archegoniate- Practical	2
	Generic Elective -2	GE-2	4
	Generic Elective -2 Practical	GE-2 Practical	2
III	**Core course-V**	Anatomy of Angiosperms	4
	Core Course-V Practical	Anatomy of Angiosperms- Practical	2
	Core course-VI	Economic Botany	4
	Core Course-VI Practical	Economic Botany- Practical	2
	Core course-VII	Genetics	4
	Core Course-VII	Genetics-	2

	Practical	Practical	
	Skill Enhancement Course-1	SEC-1	4
	Generic Elective -3	GE-3	4
	Generic Elective -3 Practical	GE-3 Practical	2
IV	**Core course-VIII**	Molecular Biology	4
	Course-VIII Practical	Molecular Biology- Practical	2
	Core course-IX	Plant Ecology and Phytogeography	4
	Core course-IX Practical	Plant Ecology and Phytogeography - practical	2
	Core course-X	Systematics	4
	Core course-X Practical	Systematics- Practical	2
	Skill Enhancement Course-2	SEC-2	4
	Generic Elective -4	GE-4	4
	Generic Elective - 4 Practical	GE-4 Practical	2
V	**Core course-XI**	Reproductive Biology of Angiosperms	4
	Core course-XI-Practical	Reproductive Biology of Angiosperms - Prcatical	2
	Core course-XII	Plant Physiology	4
	Core course-XII-Practical	Plant Physiology-Practical	2
	Discipline Specific Elective -1	DSE-1	4
	Discipline Specific Elective -1 Practical	DSE-1- Practical	2
	Discipline Specific Elective -2	DSE-2	4
	Discipline Specific Elective- 2 Practical	DSE-2- Practical	2
VI	**Core course-XIII**	Plant Metabolism	4
	Core Course-XIII Practical	Plant Metabolism-Practical	2
	Core course-XIV	Plant Biotechnology	4
	Core course-XIV-Practical	Plant Biotechnology-Practical	2
	Discipline Specific Elective -3	DSE-3	4
	Discipline Specific Elective -3 Practical	DSE-3 Practical	2

	Discipline Specific Elective-4	DSE-4	4
	Discipline Specific Elective -4 Practical	DSE-4 Practical	2
			Total: 140

Distribution of marks will be as follows:-

Each Theory paper will consists of 150 marks (two core papers of 75 marks each)consisting of 120 marks (60 each in both the core papers) from end semester, 30 marks (30 marks each in both the core papers) from mid semester and attendance.

Each practical paper will be of 50 marks (25 each in two core papers), out of which 40 marks (20 marks in both core papers) will be end semester and 10 marks (5 marks in each mid semester). The 5% marks on attendance in the subject concerned will be as per regulation (Theory & Practical).

SEMESTER – I

Core course I : Microbiology and Phycology
(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full Marks: 60 **Time: 03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: VIRUSES **(8 lectures)**

Discovery, living & non-living characterization, general structure with special reference to bacteriophage and TMV.

UNIT 2: BACTERIA **(8 lectures)**

Discovery, general characteristics, mycoplasma,cell structures and reproduction

UNIT 3: APPLIED MICROBIOLOGY **(4 lectures)**

Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).

UNIT 4: ALGAE **(8 lectures)**

General characteristics; Classification proposed by Fritsch.

UNIT 5: CYANOPHYTA **(5 lectures)**

General characteristics, morphology and life cycle of *Nostoc.*

UNIT 6: CHLOROPHYTA **(6 lectures)**

General characteristics; morphology and life cycle of *Volvox and Oedogonium*.

UNIT 7: CHAROPHYTA **(2 lectures)**

General characteristics; morphology and life cycle of *Chara.*

UNIT 8: XANTHOPHYTA **(3 lectures)**

General characteristics; morphology and life cycle of *Vaucheria.*

UNIT 9: PHAEOPHYTA **(6 lectures)**

General characteristics; morphology and life cycle of *Ectocarpus.*

UNIT 10: RHODOPHYTA **(6 lectures)**

General characteristics; morphology and life cycle of *Batrachospermum.*

UNIT 11: APPLIED PHYCOLOGY **(4 lectures)**

Economic importance of algae.

Suggested readings

1. Vashishishta, B.R., Singh, V.P., and Sinha A.K.(2014) Botany for DegreeStudents (Algae) S.Chand& Company Ltd.
2. Gangulee,H.C. and Kar, A.K. 2012, College Botany Volume-II

3. Lee, R.E. (2008), Phycology, Cambridge university Press, Cambridge. 4th edition.
4. Prescott, L.M., Harley J.P., Klein D.A. (2005), Microbiology, McGraw Hill,India. 6th edition.
5. Kumar, H.D. (1999). Introductory Phyology, affiliated East-West Press,Delhi.
6. Pelczar, M.J, (2001) Microbiology, 5th edition, Tata McGraw-hill co, NewDelhi.
7. Sharma,P.D.(2014) Microbiology. Rastogi Publication, Meerut

THEORY **Core Courses II : Biomolecules and cell**
(Credits : Theory-4, Practical-2)

Lectures: 60

Full Marks: 60 **Time:3hrs**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

BIOMOLECULES **(22 lectures)**

Unit 1: Carbohydrates: Nomenclature and classification, Role of monosaccharides, disaccharides, oligosaccharides and polysaccharides.

Unit 2: Proteins : Structures of amino acids; Protein structure – primary, secondary, tertiary and quaternary; biological roles of proteins.

Unit 3:Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotide; types of nucleic acids; structure of B-DNA, Compare with Z- DNA; Types of RNA; structure of tRNA.

UNIT 4: ENZYMES **(6 lectures)**

Definition, History of its discovery, Structure of enzyme: holoenzyme, apoenzyme. Prosthetic group, Cofactors, mechanism of enzyme action. Factors affecting enzyme activity.

UNIT 5: THE CELL **(4 lectures)**

Ultra structure of prokaryotic and eukaryotic cell.

CELL WALL,PLASMA MEMBRANE&NUCLEUS **(8 lectures)**

Chemistry, Structure and Function of plant cell wall, Plasma Membrane and Nucleus.

CELL ORGANELLES **(12 lectures)**

Chloroplast, Mitochondria,Peroxisome, Endoplasmic reticulum, Golgi Apparatus,Lysosomes and Ribosomes: Structure & Functions.

UNIT 5: CELL DIVISION **(8 lectures)**

Mitosis, Meiosis and cancer.

Suggested Readings

1. Camphell, MK (2012) Biochemistry, 7th ed., published by Cengage Learning.
2. Camphell, PN and Smith AD (2011) Biochemistry illustrated, 4th ed.,Published by Churchill Livingstone.
3. Tymoezko JL, Berg JM and Stryer L (2012) Biochemistry; A short course,2nd ed. W.H.Freeman.
4. Berg JM, Tymoezko JL, and Stryer L (2011) Biochemistry, W.H.Freemanand Company.
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5thed. W.H. Freeman and Company.
6. Karp, G.(2010), Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
7. Hardin, J., Becker, G., Skliensmith, L.J, (2012), Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th edition.
8. Cooper, G.M, and Hausman, R.E. 2009 The Cell: A Molecular Approach, 5th edition, ASM Press & Sunderland, Washington, D.C, Sinauer Associates, MA.
9. Becker, W.M, Kleinsmith, L.J., Hardin, J. and Bertoni, G.P. 2009 The Worldof the cell, 7thedition, Pearson Benjamin Cummings Publishing, San Francisco.

PRACTICAL **F.M. – 40**

Microbiology

1. Structure of Bacteriophage and TMV by photographs.
2. Forms of Bacteria by slides/photographs.
3. Gram staining technique.

Phycology

4. Study of vegetative and reproductive structures of *Nostoc*, *Volvox*, *Oedogonium*, *Chara*, *Vaucheria*, *Ectocarpus* and *Batrachospermum* by preparing temporary slides and also by permanent slides.
5. Qualitative tests for carbohydrates and proteins.
6. Study of different stages of mitosis and meiosis by preparing temporary slides & also by permanent slides.

Examination **F.M.40** **Time- 3 hrs**

1. Preparation of temporary slides of any one algae included in the syllabus -10
2. Biochemical test of carbohydrates or protein - 5
3. Spotting 2x5 - 10
4. Viva -07
5. Class record & collection - 8

SEMESTER – II

CORE COURSE III: Mycology and Phytopathology(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full marks: 60 **Time:03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: INTRODUCTION TO TRUE FUNGI **(6 lectures)**

Definition, General characteristics and Classification by Ainsworth.

UNIT 2: MASTIGOMYCOTINA **(4 lectures)**

General account and Life cycle of *Synchytrium* and *Phytophthora*.

UNIT 3: ZYGOMYCOTINA **(2 lectures)**

Generalcharacteristics and Life Cycle of *Albugo*

UNIT 4: ASCOMYCOTINA **(10 lectures)**

General characteristics and life cycle of *Peziza.*

UNIT 5: BASIDIOMYCOTINA **(8 lectures)**

General characteristics and life cycle of *Puccinia*.

UNIT 6: ALLIED GROUP **(2 lectures)**

General characteristics of Slime molds.

UNIT 7: DEUTEROMYCOTINA **(4 lectures)**

General characteristics and Life cycle of *Alternaria and Cercospora***.**

UNIT 8: SYMBIOTIC ASSOCIATIONS **(4 lectures)**

Lichen – Occurrence; General characteristics; and types and Economic Importance.

UNIT 9: APPLIED MYCOLOGY **(10 lectures)**

Application of fungi in food industry (Fermentation, Organic acids, enzymes,antibiotics); IPM and Biopesticides.

UNIT10: PHYTOPATHOLOGY **(10 lectures)**

General symptoms; etiology and control of following diseases-

1. Citrus canker
2. Loose smut of wheat
3. Red rot of sugarcane
4. Early blight of potato
5. White rust of crucifer

Suggested Reading

1. Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K.
2. Alexopoulos, C.J., Mims, C.W, Blackwell, M.(1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore, 4th edition.
3. Webster, J. and Weber, R.(2007), Intoduction to Fungi, Cambridge University Press, Cambridge, 3rd edition.
4. Sethi, I.K. and Walia, S.K.(2011). Textbook of Fungi and their Allies,Macmillan Publishers India Ltd.
5. Sharma, P.D, (2011), Plant Pathology, Rastogi Publication, Meerut, India.

CORE COURSE IV :Archegoniate(Credits : Theory-4, Practical -2) THEORY

Lectures: 60

Full marks: 60 **Time: 03Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: BRYOPHYTES **(20 lectures)**

General characteristics and life cycle of

1. *Marchantia*
2. *Anthoceros*
3. *Sphagnum*
4. Evolution of Gametophyte and Sporophyte in Bryophytes.
5. Economic importance of bryophytes.

UNIT 2: PTERIDOPHYTA **(20 lectures)**

A) General characteristics of Pteridophytes

B) Classification, Morphology, Anatomy and Reproduction(developmental stages not included) of

1. *Rhynia*
2. *Lycopodium*
3. *Selaginella*
4. *Equisetum*

C) Apogamy and Apospory

D) Heterospory and Seed habit

E) Stelar evolution.

UNIT 3: GYMNOSPERMS (20 lectures)

General characteristics of gymnosperms

Morphology, Anatomy and Reproduction (Developmental details not to beincluded) of

1. *Pinus* and
2. *Gnetum*

Suggested Reading

1. Vashistha, P.C., Sinha, A.K.Kumar, A.(2010), Pteridophyta. S.Chand, Delhi,India.
2. Bhatnagar, S.P. &Moitra, A.(1996), Gymnosperms, New Age International (P) Ltd Publishers, New Delhi, India.
3. Parihar, N.S, (1991), An introduction to Embryophyta : Vol. 1. Bryophyta,Cental Book Deposit, Allahabad.
4. Raven, P.H., Johnson, G.B.Losos, J.B.,Singer, S.R. (2005), Biology, TataMeGraw Hill, Delhi.
5. Vander – poorteri 2009 Introduction to Bryophyta, COP.
6. Prasad, C. (2013) An Introduction to Pteridophyta, Emkay Publication, NewDelhi, India.

Practical **F.M. 40marks**

1. Study of All genus of fungi, Bryophyta, Pteridophytes and Gymnosperm (included in the syllabus) by preparing temporary slides and by permanent slides.
2. Study of different forms of lichen by photographs
3. Identification of disease (included in syllabus)

EXAMINATION **F.M. 40marks** **Time- 3hrs**

1. Preparation of temporary slides of any one genus (included in syllabus)-10
2. Disease identification (Any two disease included in syllabus)
   a. Name of disease
   b. Name of host
   c. Name of agent $2x\ 2^{1/2}$ - 05
3. Spotting – 5x2 -10
4. Viva - 07
5. Class records, collection & models - 08

SEMESTER - III

Core Course V : Anatomy of Angiosperms

(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full marks: 60 **Time:03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

INTRODUCTION AND SCOPE OF PLANT ANATOMY (2 lectures)

UNIT 1: TISSUES (14 lectures)

Classification of tissues: Simple and complex tissues and secretary time.

UNIT 2: STEM (8 lectures)

Types of vascular bundles: Structure of dicot and monocot stem.

UNIT 3: LEAF (6 lectures)

Structure of dicot and monocot leaf.

UNIT 4: ROOT (8 lectures)

Structure of dicot and monocot root.

UNIT 5: VASCULAR CAMBIUM (10 lectures)

Structure, function and seasonal activity of cambium, Anomalous secondarygrowth in *Boerhaavia* and *Dracaena*.

UNIT 6: PERIDERM (4 lectures)

Development and composition of periderm, Lenticels and rhytidome.Sapwood, Heartwood, early & late wood, tyloses.

UNIT 7: ADAPTIVE AND PROTECTIVE SYSTEMS (6 lectures)

Epidermal tissue system, cuticle, stomata, trichomes, Anatomical adaptation ofxerophytes & hydrophytes.

Suggested Readings

1. Dickison, W.C.(2000). Integrative plant Anatomy. Harcourt AcademicPress, USA.
2. Fahn. A.(1974), Plant Anatomy, Pergmon Press. USA
3. Mauseth, J.D.(1998), Plant Anatomy. The Berjammin/ Cummings Publisers,USA.
4. Esau. K.(1977). Anatomy of seed plants. John Wiley & Sons. Inc., Delhi.

Core Course VI :ECONOMIC BOTANY
(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full marks: 60 **Time: 03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: CEREALS **(6 lectures)**

Wheat & Rice.

Unit 2: LEGUMES **(6 lectures)**

Arhar, Pea, Gram &Moong

UNIT 3: SPICES **(8 lectures)**

Fennel, saffron, clove, black pepper.

UNIT 4: BEVERAGES **(6 lectures)**

Tea

UNIT 5: OIL AND FATS **(8 lectures)**

Groundnut, Linseed and Brassica and coconut.

UNIT 6: DRUGS-YIELDING PLANTS(6 lectures)

Rauvolfia, Azadiracta, Ocimum, Papaver, Emblica, Aloe

UNIT 7: PLANT DRUG ABUSE **(6 lectures)**

Opoids, & cocaine.

UNIT 8: TIMBER PLANTS **(6 lectures)**

Teak, Shisham& Sal.

UNIT 9: FIBRES **(6 lectures)**

Cotton & Jute.

UNIT 10: SUGAR YIELDING PLANTS **(2 lectures)**

Sugarcane.

Suggested Readings

1. Kochhar, S.L., (2012). Economic Botany in Tropics, MacMillan & Co. NewDelhi, India.
2. Wickens, GE. (2001), Economic Botany: Principles & Practices, KluwerAcademic Publishers, The Netherlands.
3. Chrispeels. M.J. and Sadava. D.E. (2003). Plants, Genes and Agriculture,Jones & Bartlett. Publishers.

Core Course VII :GENETICS
(Credits : Theory-4, Practical -2)

THEORY
Lectures: 60

Full marks: 60 **Time: 03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: MENDELIAN GENETICS & ITS EXTENSION (18 lectures)

Mendel's laws of inheritance, Incomplete dominance and co-dominance, Epistatis, Complementary and Duplicate genes.

UNIT 2: EXTRACHROMOSOMAL INHERITANCE (8 lectures)

Cytoplasmic inheritance: Variation in four O'clock plant & infective heredity- Kappa particles in *Paramecium*.

UNIT 3: LINKAGE AND CROSSING OVER (12 lectures)

Mechanism and significance of Linkage and crossing over

UNIT 4: VARIATION IN CHROMOSOME NUMBER & STRUCTURE
(8 lectures)

Deletion, Duplication, Inversion, Translocation, Euploidy, Aneuploidy, origin of *Rhapho-brassica* & *Triticale.*

UNIT 5: GENE MUTATIONS (8 lectures)

Types of mutations, Molecular basis of mutations, Mutagens– Physical andchemical, Role of mutation in crop improvement.

Suggested Readings

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics. John Wiley & sons. India 8th edition.
2. Snustad, D.P. and Simmons, M.J. (2010) Principles of Genetics, John Wiley & Sons, Inc., India. 5th edition.
3. Klug, W.S., Cummings, M.R., Speneer. C.A. (2012). Concepts of Genetics. Benjamin Cummings, USA. 10th edition.
4. Griffiths, A.J.F, Wessler, S.R., Carroll, S.B., Doebley. I. (2010). Introduction to Genetic Analysis. W.H. Freeman and Co., U.S.A., 10th edition.

PRACTICAL **F.M. 40**

1. Study of anatomical details of root, stems and leaf by preparing temporaryslide and also by permanent slide or by photographs.
2. Study of anomalous structure of *Boerhaavia* stem and *Dracaena* stem bypreparing temporary slide and by permanent slide or by photographs.
3. Study of parenchyma, collenchymes, sclerenchyma and different components of Xylem and Phloem by photographs.
4. Adaptive anatomy- xerophytes and hydrophytes by preparing temporaryslides.
5. Testing good fit or not by chi-square method.

PRATICAL EXAMINATION **F.M. 40**

1. Prepare a temporary slide of *Boerhaavia* stem/ *Dracaena* stem -10
2. Identification of 5 plants of economic botany. (only botanical name andFamily Name) -10
3. Spotting 2x4 - 08
4. Viva-voice - 06
5. Record, collection & Models - 06

SKILL ENHANCING COURSE SEMESTER IIIPLANTS AND HUMAN WELFARE

FM- 60

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Utility of Plants in relation to human beings, General introduction & itsobjectives.

UNIT 2: Common name, scientific name, methods of Cultivation and Productionand uses of the following-

Cereals – Rice, Wheat, Maize

Pulses- Arhar, Moong, Lentil, Gram.

UNIT 3: Common name, scientific name, cultivation, along with the role ofclimatic factors and uses of the following-

Fibres- Cotton , Jute Wood-

Sal, Teak, Shisam

UNIT 4: Common name, scientific name, cultivation and uses of following-Spices-

Clove, Black peeper, Saffron, Coriander.

Medicinal plants- Neem, Amla, Tulsi, Turmeric, Garlic.

SEMESTER - IV

Core Course VIII : Molecular Biology(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full marks: 60 **Time:03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Nucleic Acids **(2 lectures)**

Historical perspective: DNA as the carrier of genetic information (Griffith'sHershey & Chase)

UNIT 2: Structure of DNA and RNA **(14 lectures)**

DNA structure, Watson and Crick Model of DNA, Types of DNA, Organization ofDNA of prokaryotes, RNA structure, nucleosome model, Chromatin structure – Euchromatine, heterochromatine – Constitutive & Facultative heterochromatic.

Polytene and Lampbrush chromosome.

UNIT 3: Replication of DNA **(8 lectures)**

Mechanism of DNA replication, Enzymes involved in DNA replication

UNIT 4: Central Dogma and Genetic Code **(6 lectures)**

General account of Central dogma and genetic code.

UNIT 5: Mechanism of Transcription **(8 lectures)**

Transcription in prokaryotes and transcription in Eukaryotes.

UNIT 6: Translation **(10 lectures)**

Process of translation in Prokaryotes & Eukaryotes, Proteins involved intranslation, Inhibitors of protein synthesis.

UNIT 7: Regulation of Gene expression (4 lectures)

Regulation of gene expression in Prokaryotes, Operon – inducible system – Lac operon, Repressible system, Tryptophan operon.

Core Course IX :Plant Ecology and Phytogeopgraphy(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full marks: 60 **Time: 03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Introduction (6 lectures)

Basic concept, levels of organization, Inter-relationship between the world and theenvironment.

Unit 2: Soil (6 lectures)

Importance, origin, formation, composition; Physical and Chemical and biologicalcomponents, Soil profile.

UNIT 3: Water (8 lectures)

Importance, States of water in Environment, Atmospheric moisture, Precipitationtypes (rain, fog, snow, hail, des), Hydrological cycle.

UNIT 4: Plant Communities (6 lectures)

Analytic and synthetic characters, Species diversity, index, Miche, Mechanism ofsuccessin – Hydrosere & Xerosere,

UNIT 5: Ecosystem (8 lectures)

Basic concept, component of ecosystem, types of ecosystem, Grass land and Pondecosystem, Food wave, Food chain and Ecological pyramid.

UNIT 6: Functional aspect of Ecosystem

Air pollution, Water pollution, noise pollution – Cause, effect & control, greenhouse effect.

Core Course X :Systematics
(Credits : Theory-4, Practical -2)

THEORY
Lectures: 60

Full marks: 60 **Time: 03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Taxonomic Aids (18 lectures)

Herbarium and botanical gardens, E-flora, Documentation, Flor monographs,journals, Single access & multi-access.

UNIT 2: Taxonomic Hierarchy (8 lectures)

Concept of species, Genes and family

UNIT 3: Botanical nomenclature (12 lectures)

Principles of International code of botanical nomenclature. Typification, anthercitation, valid publication.

UNIT 4: System of classification (8 lectures)

Bentham and Hooker's system of classification, Hutchinson's system of classification.

UNIT 5: Study of following families (8 lectures)

1. Ranunculaceue
2. Solanaceue
3. Apocyanaceue
4. Lamiaceae
5. Poaceae
6. verberaceeae

PRACTICAL **F.M.- 40**

6. Watson and Crick model of DNA, nucleosome model, polytene andLambrush chromosome by photographs
7. Study of DNA replication mechanism by photographs
8. Photographs establishing nucleic acid as a genetic material.
9. Study of pond-ecosystem, grass land ecosystem, Food wave, Food chain by photographs.
10. Studies of families included in the syllabus
11. Study of water; air and noise pollution by photographs.

PRATICAL EXAMINATION **F.M. 40**

6. Describe the floral characters of any one family with including floral formula & floral diagram. 10
7. Describe the Watson & Crick model of DNA by photographs. 08
8. Spotting (5 X 2) 10
9. Viva voce 06
10. Class record, collection, model 06

Semester: - IV (Skill Enhancement Course)

Nursery Technique F.M.- 60

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: **(6 lectures)**

Nursery – Definition, objectives and scope.

Unit 2: **(6 lectures)**

Cultivation of ornamental plants like cycas, palm, Aloe vera, Croton & Rhoco.

UNIT 3: **(8 lectures)**

Cultivation of Flowers like Rose, Hibiscus, Marigold, nerium, Chrysanthemum,Dahlia, orchid.

UNIT 4: **(6 lectures)**

Cultivation of vegetables like – Potato, onion, Bringal, Lady's finger, Carrot,Radish, Chilli. Storage and marketing procedures.

UNIT 5: **(8 lectures)**

Preparation of flower beds – Through simple illustrations.

Suggested Readings

5. Bose, T.K. and Mukharjeee.D. 1972 – Garderning in India, Oxford and IBHpublishing Co., New Delhi
6. Saudhu, m.K. 1989. Plant propagation, Wile Estern ltd. Bangalore.
7. Kumar, n. 1997 – Introduction to Horticulture, Ragalakshmi publication,Nagercoil.

Edmond Musser and Andres, Fundamentals of Horticulture, McGraw Hill BookCo., New Delhi

SEMESTER- V

Core Course XI: Reproductive Biology Of Angiosperms(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full Marks: 60 **Time:03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: ANTHER **(4 lectures)**

Anther wall: structure and function, microsporogenesis.

UNIT 2: POLLEN BIOLOGY **(8 lectures)**

Microgametogenesis & Palynology and scope (a brief account).

UNIT 3: OVULE **(10 lectures)**

Structure, Types, Female gametophyte- megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of *Polygonum* type; organization and structure of mature embryo sac.

UNIT 4: POLLINATION AND FERTILIZATION **(8 lectures)**

Pollination types and significance, path of pollen tube in pistil; double fertilization and triple fusion.

UNIT 5: ENDOSPERM **(6 lectures)**

Types, development, structure and functions.

UNIT 6: EMBRYO **(6 lectures)**

Development of dicot embryo and monocot embryo

UNIT 7: SEED **(4 lectures)**

Structure, importance and dispersal mechanisms.

UNIT 8: POLYEMBROYONY & APOMIXES **(6 lectures)**

Introduction, classification; causes & application.

Suggested Readings

1. Bhojwani, S.S and Bhatnagar, S.P.(2011). The Embryology of Angiosperms,Vikas Publishing House. Delhi 5th edition.
2. Shivanna, K.R. (2013). Pollen Biology and Biotechnology, Oxford and IBHPublishing Co. Pvt. Ltd. Delhi.
3. Raghavan, V.(2000). Development Biology of Flowering plants, Springer,Netherlands.
4. Johri, B.M. I(1984), Embryology of Angiosperms, Springer- Verlag, Netherlands.

Core Course XII: PLANT PHYSIOLOGY
(Credits : Theory-4, Practical -2)

THEORY

Lectures: 60

Full Marks: 60 **Time:03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: PLANT WATER RELATIONSHIP (14 lectures)

Water Potential, water absorption by roots, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation.Ascent of sap- cohesion-tension theory.Transpiration and factors affecting transpiration, antitanspirants, mechanism of stomatal movement.

UNIT 2: MINERAL NUTRITION (10 lectures)

Essential and beneficial elements macro and micronutrients, methods criteria for essentiality, mineral deficiency symptoms, roles of essential elements, Hydroponics.

UNIT 3: TRANSLOCATION IN THE PHLOEM (10 lectures)

Mechanism of Translocation in phloem.

UNIT 4: PLANT GROWTH REGULATORS (16 lectures)

Discovery, chemical nature (basic structure), roles of Auxin, Gibberellins, Cytokinins.

UNIT 5: PHYSIOLOGY OF FLOWERING (10 lectures)

Photoperiodism, florigen concept, vernalization, seed dormancy.

Suggested Readings

1. Hopkins, W.G. and Huner, A.(2008). Introduction to Plant Physiology. JohnWiley and Sons. U.S.A. 4th edition.
2. Taiz, L., Zeiger, E., Møller, I.M and Murphy, A (2015). Plant Physiologyand development. Sinauer Associates Inc. USA 6th edition.
3. Bajracharya D. (1999). Experiments in Plant Physiology-A LaboratoryManual, Narosa Publishing House, New Delhi.

PRATICAL **40 marks**

1. Embryo Dissection
2. Determination of water potential of given tissue (potato tuber) by weightmethod.
3. Calculation of stomatal frequency from the two surfaces of leaves of amesophyte.
4. Study of structure of anthers, types of ovules, structure of a mature embryosac by photographs.
5. To determine the rate of transpiration by Farmer's and Ganong's potometer.

PRATICAL EXAMINATION **F.M.- 40** **Time- 3 hrs**

1. To determine the rate of transpiration by Farmer's photometer/ Ganong'spotometer.
   OR
   Embryo Dissection (of dicot embryo) -10
2. Draw a well labeled diagram of a typical mature embryo sac 10
3. Spotting (2x5) -10
4. Class records, charts, models. 08
5. Viva-voice -07

DISCIPLINE SPECIFIC ELECTIVE (DSE)

PAPER- BIOFERTILIZER

Full Marks:60

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: GENERAL ACCOUNT ABOUT THE MICROBES ASBIOFERTILIZER:-

(12 lectures)

a. Rhizobium- Isolation, Identification, mass multiplication
b. Azotobacter: Isolation, Identification, and mass multiplication

UNIT 2: Cyanobacteria (blue green algae), Azolla and Anabaena association, Nitrogen fixation, Factors affecting growth.

(16 lectures)

UNIT 3: Mycorrhizal association – a brief account, colonization of VAM, its influence on crop plants. Mycorrhiza as biofertilizer. **(14 lectures)**

UNIT 4: Organic farming: Green manuring and Organic fertilizers, Recycling ofbiodegradable, municipal ,agricultural and industrial wastes,Biocomposting,Method of Vermicomposting – field application.

(18 Lectures)

Suggested Readings:-

1. Dubey, R.C. – 2005, Atext book of Biotechnology – S.Chand Co, New Delhi.
2. Kumaresan , V-2005, - Biotechnology, Saras publication, New delhi.
3. John Jothi Prakash, E. 2004, Outline of Plant –Biotechnology, New Delhi.
4. Sathe, T.V- 2004, Vermiculture and organic –Farming- Daya publication
5. Subha Rao, N.S. – 2000, Soil Microbiology – Oxford and IBH publishers,New Delhi.
6. Vayas, S.C. Vayas, S.Modi, H.A. 1998- Biofertilizer and Organic farming-Akta Prakashan- Nadiad.

Natural Resource Management

FULL MARKS:60

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Natural resources, Definition, types. Sustainable utilization- Concept,approaches, (Economical, Socio- cultural, Ecological).

(14 lectures)

UNIT 2: Land- Soil degradation and management- Water- Fresh waterestuaries, wet lands, threats, and management strategies. **(12 lectures)**

UNIT 3: a. Biological Resource - Biodiversity- Definition and types,Significance, threat and management. Forest- Definition, Importance and management.

(14 Lectures)

UNIT 4: Energy- Renewable and Non renewable sources. **(10 lectures)**

UNIT 5: National and International efforts in resource management.

(10 Lectures)

PRACTICALS (DSE- I & II) F.M.- 40

1. Isolation technique of Rhizobium & Azotobacter
2. Cyanobacteria- study with the help of Photographs.
3. Methods of Organic farming through illustrations (Project work)
4. Identification of Plants included in syllabus with reference to scientific nameand preparation of flower bud.

EXAMINATION – FULL MARKS- 40

1. Isolation technique of *Rhizobium/ Azotobacter* -	10
2. Study of Cyanobacteria (with Photographs) –	05
3. Spotting- 5 specimens for identification- with scientific names.	5X2= 10.
4. Viva- Voice	07
5. Records/ projects	08

SEMESTER- VI

Core Course XIII: PLANT METABOLISM
(Credits : Theory-4, Practical -2)

THEORY
Lectures: 60

Full Marks: 60 **Time:03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: CONCEPTS OF METABOLISM (6 lectures)

Introduction, anabolic, catabolic and amphibolic pathway.

UNIT 2: CARBON ASSIMILATION (14 lectures)

Historical background, photochemical reactions, photosynthetic electron transport, PSI, PSII, CO_2 reduction, red drop Emerson effect, Quantum Yield, C_3, C_4 Cycle, photorespiration, photophosphorylation.

UNIT 3: CARBON OXIDATION (10 lectures)

Glycolysis, oxidative decarboxylation of pyruvate, TCA Cycle, anaerobic reactions, mitochondrial electron transport.

UNIT 4: ATP- SYNTHESIS (8 lectures)

Mechanism of ATP synthesis, substrate level phosphorylation, (oxidative and photophosphorylation).

UNIT 5: LIPIDS METABOLISM (8 lectures)

Introduction, saturated & unsaturated fatty acid, β-oxidation.

UNIT 6: NITROGEN METABOLISM (8 lectures)

Biological nitrogen fixation , Reductive amination& Transamination.

Suggested Readings

1. Hopkins, W.G. and Huner, A.(2008). Introduction to Plant Physiology. JohnWiley and Sons.

2. Taiz, L., Zeiger, E., Møller, I.M and Murphy, A (2015). Plant Physiologyand development. Sinauer Associates Inc. USA 6th edition.
3. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. NewYork.

Core Course XIV : Plant Biotechnology
(Credits : Theory – 4, Practical -2)

THEORY
Lectures : 60
Full Marks : 60 **Time : 03 Hrs.**

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

1. **Plant Tissue Culture** (20 Lectures)
   Histtory : Basic requirement of tissue culture, Technique, Prospect and application , Totipotency, Organogenesis, Embryogenesis, Protoplast Isolation ,micropropagation, Somatic hybridization, anther culture, pollen culture, Cyropreservation , Germplasm Conservation.

2. **Recombinant DNA Technology** **(** 25 Lectures)
   Tools, Restriction endonucleases Eco-RI Bam H1, Sal-1, Plasmid, Cloning Vectors; Properties, ($_{P}$BR-322, Cosmid, Lambda phage, Shuttle vector YEP), Ti- Plasmid, Process and application of r-DNA technology, genomic and c-DNA library, PCR technology, Blotting – Northern and southern, DNA – finger printing .
3. **Application of Bio- technology** (15 lectures)

Pest resistant (Bt-cotton), Transgenic crops with improved quality traits(*Flavr savr* tomato, Golden rice), Impact of transgenic crops on society.

Practical

Full Marks : 40 Time : 03 Hrs.

1. Separation of Pigments by Chromatography method.
2. Experiment Showing O_2 is evolved during photo synthesis
3. Experiment Showing that light is essential for photo synthesis. -
4. Experiment Showing that light is essential for photo synthesis.
5. Study of anther, embryo, endosperm culture, micro propagation and somatichybridization through photographs.
6. Photographs from biotechnology

Practical exam F.M.- 40 Time- 3hrs

1. Effect of CO_2 or light is essential for photo synthesis or O_2 is evolved during photo synthesis -10
2. Study of biotechnological experiments related to the syllabus throughphotographs - 05
3. Spotting -2x5 -10
4. Viva voce -07
5. Practical record and Model -08

SUGGESTED READINGS

1. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture : Theory andPractice. Elsevier Science Amsterdam. The Netherlsands.
2. Gilick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology – Principlesand Applications of recombinant DNA. ASM Press, Washington.
3. Bhojwani, S.S. and Bhatnagar, S.P. (2011)., The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi, 5th edition.

4. Snustad, D.P. and Simmons, M.J (2010). Principles of Genetics. John Wileyand Sons, U.K. 5TH edition.
5. Stewart, C.N. Jr. (2008). Plant Biotechnology &Genetics : Principles,Techniques and Applications. John Willey & Sons Inc. U.S.A.

DISCIPLINE SPECIFIC ELECTIVE SEMESTER VI ENVIRONMENTAL EDUCATION & WASTE MANAGEMENT

FM- 60

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Understanding Ecosystems, Population, Community, Components ofEcosystems.

UNIT 2: Destruction of Ecosystem due to changing pattern of land use, Migration, Transportation, Urbanization, Industrialization, Environmental ImpactAssessment.

UNIT 3: Need for management of waste, safe disposal of waste.

UNIT 4: a. World Conservation strategy

b. Legal Provisions for waste management

c. Swacchh Bharat Abhiyaan- Your Suggestions.

UNIT 4: a. Global warming, Green house effects

b. Consequences of climate change

SUGGESTED READINGS:-

1. Ecology & Environment
Sharma , P.D.- Rastogi Publication- Meerut.

DISCIPLINE SPECIFIC ELECTIVE (DSE)
INDUSTRIAL ENVIRONMENTAL MICROBIOLOGY

FM- 60

In all eight questions of equal value (15 marks each) will be set, out of which examinee shall have to answer four questions. Q. No. 1 will be compulsory,consisting of eight very short answer type questions, each of three marks, out of these short questions, examinee shall have to answer any five short questions.

UNIT 1: Biogas- Process & Importance- Need, Merit & scope

UNIT 2: Bioremediation, Role of microbes in waste maqnagement, Bioremediation of a) Hydrocarbons b) Industrial wastes c) Xenobiotics,Biomining, Bioreactors.

UNIT 3: Microbial flora of water- water pollution, sewage, algal bloom. BOD, COD, Eutrophication.

UNIT 4: a) Microbes in Agriculture Biological fixation, Mycorriza, Isolation of root nodule bacteria.

b) Microbial products of Industrial value- Organic acids, Alcohols, Antibiotics, Downstream processing & uses.

UNIT 5: Bioleaching – General account.

SUGGESTED READINGS:-

1. Pelzar. M.J. JR. Chen E.C.S. Krieg, N.R (2010) Microbiology- An application based approach, Tata MC Graw Hill Education pvt. Ltd. New Delhi
2. Tortora, G.J. Funke, B.R. Case, C.L. (2007), Microbiology, Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition
3. Dubey, R.C. – 2015, A. Text book of Biotechnology S. Chand & Co. Pvt. Ltd- New Delhi.

4. Ramawat, K.G. & Goyal, Shaily- 2015, Comprehensive Biotechnology-S.chand & Co. N ew Delhi.

PRACTICAL – FM-40

1. Study of Plant Community/ Vegetation of College Campus, by Quadratemethod, Measurement of frequency and density.
2. Study of microbial flora of water samples.
3. Project on Waste management for clean, green Campus.
4. Principles and functioning of instrument in Microbiology Laboratory (anytwo)
5. Sterilization technique & Preparation of culture media.

EXAMINATION – F. M.- 40 Time- 3 hrs

1. Study of Plant Community by Quadrat method- frequency & density	15
2. Description of one Instrument of Microbiology- Laboratory.	05
3. Spotting – 2 photographs (from syllabus)	05
4. Viva voice	05
5. Records/ Project	10

GENERIC ELECTIVE
SEMESTER-I
Paper-1 BIODIVERSITY (Microbiology, Algae, Fungi and Archegoniate)
(Credits: Theory-4, Practical-2)
THEORY

Time: 03 Hrs. **Marks: (Exter. 60: Intr.15)** **(04 Credits, 60 Lec.)**

Three shorts and five long questions, each carrying 20 marks, are to be set covering the whole syllabus out of which four questions are to be answered.

Unit-1: MICROBES

Viruses- Discovery, general structure & nature
Bacteria- Discovery, general characteristics cell structure and Economic importance.

Unit-2: ALGAE

General characteristics, Morphology and life- cycle of *Nostoc, Chlamydomonas, Chara, Batrachospermum*.

Unit-3: FUNGI

General characteristics, Morphology and life cycle of *Albugo, Puccinia alteronatia*, Lichens- General account.

Unit 4: BRYOPHYTES

General characteristics, Morphology, anatomy and reproduction of *Marchantia* and *Funaria*.

Unit 5: PTERIDOPHYTES

General characteristics, Morphology, anatomy and reproduction of *Selaginella, Pteris*, stellar evolution

Unit-6: GYMNOSPERMS

General characteristics, Morphology, anatomy and reproduction of *Pinus* and its Economic importance

G.E.-1P (PRACTICAL)
Marks (Ext. 20: Intr.05)

Duration: 1 1/2Hrs. **(02 Credits)**

1. Models of Viruses
2. Types of Bacteria from slides/ Photographs
3. Study of vegetative and reproductive structures by preparation of temporary slides from 2 to 6 units- 09
4. Spotting- **05**

5.	Record	**04**
6.	Viva-Voce	**02**

GENERIC ELECTIVE
SEMESTER-II
PAPER-2 PLANT ECOLOGY AND TAXONOMY
(Credits: Theory-4, Practical-2)
THEORY

Time: 03 Hrs. **Marks: (Exter. 60: Intr.15)** **(04 Credits, 60 Lec.)**

Three shorts and five long questions, each carrying 20 marks, are to be set covering the whole syllabus out of which four questions are to be answered.

Unit 1: Ecology

1. Introduction-
2. Ecological adaptation- Hydrophytes, Xerophytes
3. Plant Communities- Succession- Process & Types
4. Eco-system structure, types- Pond, Grassland, Energy flow, Trophic organisation, Food Chain, Food web, Ecological pyramid.
5. Pollution- Air & Water- Cause & Control.

Unit 2: Taxonomy

1. Introduction, Identification, Classification, Nomenclature.
2. Taxonomic aids- Herbarium & Botanical Gardens.
3. Taxonomic hierarchy
4. Principles & Rules of ICBN
5. Classification – Benthom & Hooker and Hutchinson's system
6. Study of following families
   Apocynaceae, Solanaceae, Poaceae

G.E.-2P (Practical)
Marks (Ext. 20: Intr.05)

Duration: 1 1/2Hrs. **(02 Credits)**

1. Study of Morphological adaptations of hydrophytes and xerophytes **03**
2. Determination of minimal quadrate size for the study of herbaceous vegetation in the college campus by species area curve method. **06**
3. Study of vegetative and floral characters of the families included in syllabus with floral diagram, floral formula and systematic position.
4. Spotting **05**
5. Record **04**
6. Viva-Voce **02**

GENERIC ELECTIVE
SEMESTER-III
PAPER-3 PLANT ANATOMY, EMBRYOLOGY, ECONOMIC BOTANY
(Credits: Theory-4, Practical-2)
THEORY

Time: 03 Hrs. **Marks: (Exter. 60: Intr.15)** **(04 Credits, 60 Lec.)**

Three shorts and five long questions, each carrying 20 marks, are to be set covering the whole syllabus out of which four questions are to be answered.

Unit1: ANATOMY

1. Meristematic Tissues- apical, lateral, intercalary meristem & simple complex tissues
2. Anomalous secondary growth in Boerhavia & Dracaena

Unit 2: EMBRYOLOGY

1. Outlines of life cycle of an angiospermic plant
2. Types of ovules
3. Types of Embryo sacs, Development of Polygonum type
4. Double Fertilzation
5. Endosperm & Polyembryony

Unit 3: ECONOMIC BOTANY
Morphology & Uses of following

1. Cereal- Wheat
2. Legumes- Gram
3. Fibre- Cotton
4. Timber- Seeshum, Teak
5. Oil- Mustard, Sunflower
6. Medicinal – Tulsi, Neem & Amla.

G.E.-3P (Practical)
Marks (Ext. 20: Intr.05)

Duration: 1 1/2Hrs. **(02 Credits)**

1. Identification of Tissues (Parenchyma, Collenchymas and Sclerenchyma)
2. Temporary mounts of section of anatomical specimens 04
3. Embryo dissection/ Photograph of Ovules 02
4. Plant Identification of uses 03
5. Spotting 05
6. Record 04
7. Viva- voce 02

GENERIC ELECTIVE
SEMESTER-IV
PAPER-4 PLANT PHYSIOLOGY, CYTOLOGY & GENETICS, BIOTECHNOLOGY
(Credits: Theory-4, Practical-2)
THEORY

Time: 03 Hrs. **Marks: (Exter. 60: Intr.15)** **(04 Credits, 60 Lec.)**

Three shorts and five long questions, each carrying 20 marks, are to be set covering the whole syllabus out of which four questions are to be answered.

1. **Transpiration -** Mechanism & Significance
2. **Ascent of Sap**- Root Pressure transpiration pull theory.
3. **Photosynthesis-** Photophosphorylation , C3, C4 cycle
4. **Respiration-** Glycolysis, TCA Cycle
5. **Growth Hormone-** Auxin, Gibbrelline.
6. **Structure of Cytoplasmic Cell Organelles-** Mitochondria, Chloroplasts, Ribosome.
7. **Cell Division-** Mitosis, Meiosis
8. **Principles of Inheritance-** Mendal's Law.
9. Complementary Genes & Epistasis
10. **Gene-** Mutation & Polyploidy
11. **Plant Tissue Culture-** History , Requirement, Technique & Applications

G.E.-4P (Practical)
Marks (Ext. 20: Intr.05)

Duration: 1 1/2Hrs. **(02 Credits)**

1.	To perform physiological Experiment of syllabus.	**04**	
2.	Cytological slide preparation.	**03**	
3.	Photographs from biotechnology.	**02**	
4.	Spotting	**05**	
5.	Record		**04**
6.	Viva –voce	**02**	