

**SYLLABUS FOR
BACHELOR OF SCIENCE IN BOTANY (HONOURS)
UNDER CHOICE BASED CREDIT SYSTEM**

**ACADEMIC SESSION
w.e.f. 2020-2023**



**FOR
ALL CONSTITUENT/AFFILIATED COLLEGES UNDER
BINOD BIHARI MAHTO KOYALANCHAL UNIVERSITY,
DHANBAD**

Members of Board of studies of CBCS under Graduate Syllabus as per Guide lines of the Binod Bihari Mahto Koyalanchal University, Dhanbad.

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B.Sc. BOTANY (HONS.) CURRICULUM
FIRST SEMESTER

COURSE CODE	TITLE OF THE COURSE	CREDITS	LECTURES	DISTRUBUTION OF MARKS					TOTAL PASS MARKS
				INTERNAL EXAM	P.M	EXTERNAL EXAM	P.M.	TOTAL MARKS	
BOT-H-C-101-T	MICROBIOLOGY AND PHYCOLOGY	04	60	15	06	60	24	75	30
BOT-H-C-102-T	BIOMOLECULES AND CELL BIOLOGY	04	60	15	06	60	24	75	30
BOT-H-C-101-P& 102-P	BOT-H-C-101-P& 102-P	04	60	10	04	40	16	50	20
BOT-H-AECC-101-T	LANGUAGE (ENGLISH/HINDI /NH+MB)	02	30	10	04	40	16	50	20
BOT-H-GE-101-T	ZOOLOGY/ CHEMISTRY	04	60	15	06	60	24	75	30
BOT-H-GE-101-P	PRACTICAL BASED ON BOT-H-GE-101	02	30	05	02	20	08	25	10

SECOND SEMESTER

COURSE CODE	TITLE OF THE COURSE	CREDITS	LECTURES	DISTRUBUTION OF MARKS					TOTAL PASS MARKS
				INTERNAL EXAM	P.M	EXTERNAL EXAM	P.M.	TOTAL MARKS	
BOT-H-C-203-T	MYCOLOGY AND PHYTOPATHOLOGY	04	60	15	06	60	24	75	30
BOT-H-C-204-T	ARCHEGONIATE	04	60	15	06	60	24	75	30
BOT-H-C-203-T & 204-T	PRACTICAL BASED ON BOT-H-C- 203&204	04	60	10	04	40	16	50	20
BOT-H-AECC-202-T	ENVIRONMENTAL SCIENCE	02	30	10	04	40	16	50	20
BOT-H-GE-202-T	ZOOLOGY / CHEMISTRY	04	60	15	06	60	24	75	30
BOT-H-GE-202-P	PRACTICAL BASED ON BOT-H-GE-202	02	30	05	02	20	08	25	10

THIRD SEMESTER

COURSE CODE	TITLE OF THE COURSE	CREDITS	LECTURES	DISTRUBUTION OF MARKS					TOTAL PASS MARKS
				INTERNAL EXAM	P.M	EXTERNAL EXAM	P.M.	TOTAL MARKS	
BOT-H-C-305-T	ANATOMY OF ANGIOSPERMS	04	60	15	06	60	24	75	30
BOT-H-C-306-T	ECONOMIC BOTANY	04	60	15	06	60	24	75	30
BOT-H-C-307-T	GENETICS	04	60	15	06	60	24	75	30
BOT-H-C-305,306 & 307-P,	PRACTICAL BASED ON BOT-H-C-305,306 &307.	06	90	15	06	60	24	75	30
BOT-H-SEC-301-T	PLANTS AND HUMAN WELFARE	02	30	10	04	40	16	50	20
BOT-H-GE-303-T	ZOOLOGY / CHEMISTRY	04	60	15	06	60	24	75	30
BOT-H-GE-303-P	PRACTICAL BASED ON BOT-H-GE-303	02	30	05	02	20	08	25	10

FOURTH SEMESTER

COURSE CODE	TITLE OF THE COURSE	CREDITS	LECTURES	DISTRUBUTION OF MARKS					TOTAL PASS MARKS
				INTERNAL EXAM	P.M	EXTERNAL EXAM	P.M .	TOTAL MARKS	
BOT-H-C-408-T	MOLECULAR BIOLOGY	04	60	15	06	60	24	75	30
BOT-H-C-409-T	PLANT ECOLOGY AND PHYTOGEOGRA-PHY	04	60	15	06	60	24	75	30
BOT-H-C-410-T	SYSTEMATIC BOTANY	04	60	15	06	60	24	75	30
BOT-H-C-408,409 & 410-P	PRACTICAL BASED ON BOT-H-C-408,409&410	06	90	15	06	60	24	75	30
BOT-H-SEC-402-T	SCIENCE AND LIFE	02	30	10	04	40	16	50	20
BOT-H-GE-404-T	ZOOLOGY / CHEMISTRY	04	60	15	06	60	24	75	30
BOT-H-GE-404-P	PRACTICAL BASED ON BIO-H-GE-404	02	30	05	02	20	08	25	10

FIFTH SEMESTER

COURSE CODE	TITLE OF THE COURSE	CREDITS	LECTURES	DISTRUBUTION OF MARKS					TOTAL PASS MARKS
				INTERNAL EXAM	P.M	EXTERNAL EXAM	P.M.	TOTAL MARKS	
BOT-H-C-511-T	REPRODUCTIVE BIOLOGY OF ANGIOSPERMS	04	60	15	06	60	24	75	30
BOT-H-C-512-T	PLANT BIOTECHNOLOGY	04	60	15	06	60	24	75	30
BOT-H-C-511&512P	PRACTICAL BASED ON BOT-H-C-511 & 512	04	60	10	04	40	16	50	20
BOT-H-DSE-501A-T/ BOT-H-DSE-501B-T/ BOT-H-DSE-501C-T	PLANT BREEDING / RESEARCH METHODOLODY / STRESS BIOLOGY	04	60	15	06	60	24	75	30
BOT-H-DSE-502A-T/ BOT-H-DSE-502B-T/ BOT-H-DSE-502C-T	NATURAL RESOURCE MANAGEMENT / BIOINFORMATICS/ ANALYTICALS TECHNIQUES IN PLANT SCIENCES	04	60	15	06	60	24	75	30
BOT-H-DSE-501 A/B/C –P & 502A/B/C-P.	PRACTICAL BASED ON BOT-H-DSE-501 A/B/C –P & 502A/B/C-P.	04	60	10	04	40	16	50	20

SIXTH SEMESTER

COURSE CODE	TITLE OF THE COURSE	CREDITS	LECTURES	DISTRUBUTION OF MARKS					TOTAL PASS MARKS
				INTERNAL EXAM	P.M	EXTERNAL EXAM	P.M	TOTAL MARKS	
BOT-H-C-613-T	PLANT PHYSIOLOGY	04	60	15	06	60	24	75	30
BOT-H-C-614-T	PLANT METABOLISM	04	60	15	06	60	24	75	30
BOT-H-C-613 & 614-P	PRACTICAL BASED ON BOT-H-C-613 & 614	04	60	10	04	40	16	50	20
BOT-H-DSE-603A-T/ BOT-H-DSE-603B-T/ BOT-H-DSE-603C-T	ENVIRONMENTAL AND WASTE MANAGEMENT / BIostatISTICS / BIOFERTILIZERS	04	60	15	06	60	24	75	30
BOT-H-DSE-604A-T/ BOT-H-DSE-604B-T/ BOT-H-DSE-604C-T	INDUSTRIAL MICROBIOLOGY/ NURSERY AND GARDENING)/ HERBAL TECHNOLOGY	04	60	10	06	60	24	75	30
BOT-H-DSE-603A/B/C & 604A/B/C-P	PRACTICAL BASED ON BOT-H-DSE-603 A/B/C & 604 A/B/C	04	60	10	04	40	16	50	20

TOTAL NUMBER OF CREDITS IN SIX SEMESTERS = 140 (T= THEORY, P= PRACTICAL)

TOTAL MARKS=2400 (END SEM. 1920 AND MID SEM.480)

B.Sc. BOTANY
SEMESTER – I

BOT-H-C-101-T (MICROBIOLOGY AND PHYCOLOGY)

CREDITS-04 (THEORY)
FULL MARKS: 60

LECTURES: 60
TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

MICROBIOLOGY

UNIT-01- VIRUSES

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

UNIT-02-BACTERIA

Discovery, general characteristics, mycoplasma, cell structures and reproduction.

UNIT-03-APPLIED MICROBIOLOGY

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

PHYCOLOGY

UNIT-04-ALGAE

General characteristics; Classification proposed by Fritsch, 1955, Economic importance of algae.

UNIT-05-CYANOPHYTA

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

UNIT-06-CHLOROPHYTA

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

UNIT-07-CHAROPHYTA

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

UNIT-08-XANTHOPHYTA

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

UNIT-09-PHAEOPHYTA

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

UNIT-10-RHODOPHYTA

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

SUGGESTED READINGS

1. Vashishishta, B.R., Singh, V.P., and Sinha A.K.(2014) Botany for Degree Students (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, New Delhi.
7. Sharma,P.D.(2014) Microbiology. Rastogi Publication, Meerut

B.Sc. BOTANY

SEMESTER – I

BOT-H-C-102-T (BIOMOLECULES AND CELL BIOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

BIOMOLECULES

UNIT-01-Carbohydrates: Nomenclature and classification, Role of monosaccharides, disaccharides, oligosaccharides and polysaccharides.

UNIT-02-Proteins: Structures of amino acids; Protein structure–primary, secondary, tertiary and quaternary; biological roles of proteins.

UNIT-03-Lipids: Types and function.

UNIT-04-Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotide; types of nucleic acids; structure of B-DNA, A-DNA and Z- DNA; Types of RNA; structure of tRNA.

UNIT-05-ENZYMES; Definition, History of its discovery, Structure of enzyme: holoenzyme, apoenzyme. Prosthetic group, Cofactors, mechanism of enzyme action. Factors affecting enzyme activity.

CELL BIOLOGY

UNIT-06-THE CELL

Differences between prokaryotic and eukaryotic cell.

UNIT-07- CELL WALL, PLASMA MEMBRANE & NUCLEUS

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

UNIT-08- CELL ORGANELLES

Chloroplast, Mitochondria, Endoplasmic reticulum, Golgi Apparatus, Lysosomes, Glyoxysomes, Peroxisomes and Ribosome: Structure & Functions.

UNIT-09-CELL DIVISION Mitosis and Meiosis.

SUGGESTED READINGS

1. Campbell, 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.Freeman and Company.
5. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5th ed. 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 World of the cell, 7th edition, Pearson Benjamin Cummings Publishing, San Francisco.

BOT-H-C-101-P& 102-P

**MICROBIOLOGY AND PHYCOLOGY AND
BIOMOLECULES AND CELL BIOLOGY**

PRACTICAL

F.M. – 40

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

- | | |
|------------------------------------------------------------------------------|------|
| 1. Preparation of temporary slides of any one algae included in the syllabus | - 05 |
| 2. Preparation of temporary slides of any stage of mitosis. | -05 |
| 3. Biochemical test of carbohydrates or protein | -05 |
| 4. Spotting 2x5 | - 10 |
| 5. Viva | -07 |
| 6. Class record & collection | -08 |

B.Sc. BOTANY

SEMESTER – II

BOT-H-C-203-T (MYCOLOGY AND PHYTOPATHOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

MYCOLOGY

UNIT-01- INTRODUCTION

Definition, General characteristics and Classification by Ainsworth (1973)

UNIT-02- MASTIGOMYCOTINA

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

UNIT-03- ZYGOMYCOTINA

General characteristics and Life Cycle of *Albugo*

UNIT-04- ASCOMYCOTINA

General characteristics and life cycle of *Peziza*.

UNIT-05- BASIDIOMYCOTINA

General characteristics and life cycle of *Puccinia*.

UNIT-06- DEUTEROMYCOTINA

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

UNIT-07- SYMBIOTIC ASSOCIATIONS

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

PHYTOPATHOLOGY

UNIT-08- 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.
2. Webster, J. and Weber, R.(2007), Intoduction to Fungi, Cambridge University Press, Cambridge, 3rd edition.
3. Sethi, I.K. and Walia, S.K.(2011). Textbook of Fungi and their Allies, Macmillan Publishers India Ltd.
4. Sharma, P.D, (2011), Plant Pathology, Rastogi Publication, Meerut, India.

B.Sc. BOTANY

SEMESTER – II

BOT-H-C-204-T (ARCHEGONIATE)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

ARCHEGONIATE

UNIT-01-BRYOPHYTES

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-02-PTERIDOPHYTA

- A) General characteristics of Pteridophytes.
- B) 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-03- GYMNOSPERMS

General characteristics of gymnosperms

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

1. *Pinus*
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, Tata McGraw Hill, Delhi.
5. Vander – poorteri 2009 Introduction to Bryophyta, COP.
6. Prasad, C. (2013) An Introduction to Pteridophyta, Emkay Publication, New Delhi, India.

BOT-H-C-203&204-P

MYCOLOGY AND PHYTOPATHOLOGY ARCHEGONIATE

PRACTICAL

F.M. 40 MARKS

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) | 2x2.5=10 |
| a). Name of disease | |
| b). Name of host | |
| c). Name of agent | |
| 3. Spotting | 5x2=10 |
| 4. Viva voce | 07 |
| 5. Class records, collection & models | 08 |

B.Sc. BOTANY

SEMESTER – III

BOT-H-C-305-T (ANATOMY OF ANGIOSPERMS)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

ANATOMY OF ANGIOSPERMS

UNIT-01- TISSUES; Classification of tissues: Simple and complex tissues and secretory tissues.

UNIT-02-STEM ; Types of vascular bundles: Structure of dicot and monocot stem.

UNIT-03-LEAF; Structure of dicot and monocot leaf.

UNIT-04-ROOT; Structure of dicot and monocot root.

UNIT-05-VASCULAR CAMBIUM; Structure, function and seasonal activity of cambium, anomalous secondary growth in *Boerhaavia* and *Dracaena*

UNIT-06-PERIDERM; Development and composition of periderm, Lenticels and rhytidome. Sapwood, Heartwood, early & late wood, tyloses.

UNIT-07-ADAPTIVE AND PROTECTIVE SYSTEMS; epidermal tissue system , cuticle , stomata, trichomes, Anatomical adaptation of xerophytes & hydrophytes.

SUGGESTED READINGS

1. Dickison, W.C.(2000). Integrative plant Anatomy. Harcourt Academic Press, 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.

B.Sc. BOTANY

SEMESTER – III

BOT-H-C-306-T (ECONOMIC BOTANY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

ECONOMIC BOTANY

Distribution, cultivation, botanical name, family and uses of-

UNIT-01-CEREALS; Wheat & Rice.

UNIT-02-LEGUMES; Arhar, Pea, Gram & Moong

UNIT-03-SPICES; Fennel, saffron, clove, black pepper.

UNIT-04-BEVERAGES; Tea

UNIT-05-OIL AND FATS; Groundnut, Linseed and Brassica and coconut.

UNIT-06-.DRUGS YIELDING PLANTS; *Rauvolfia, Azadirachta, Ocimum, Emblica, Aloe*

UNIT-07-PLANT DRUG ABUSE; *Opoids, Cocaine*

UNIT-08-.TIMBER PLANTS: Teak, Shisham & Sal.

UNIT-09-FIBRES; Cotton & Jute.

UNIT-10-SUGAR YIELDING PLANTS; Sugarcane.

SUGGESTED READINGS

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

B.Sc. BOTANY

SEMESTER – III

BOT-H-C-307-T (GENETICS)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

GENETICS

UNIT-01- MENDELIAN GENETICS & ITS EXTENSION

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

UNIT-02- EXTRACHROMOSOMAL INHERITANCE

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

UNIT-03- LINKAGE AND CROSSING OVER

Mechanism and significance of Linkage and crossing over

UNIT-04- VARIATION IN CHROMOSOME NUMBER & STRUCTURE

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

UNIT-05- GENE MUTATION

Types of mutations, Molecular basis of mutations, Mutagens– Physical and chemical, 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.

BOT-H-C-305-P, 306-P & 307-P

PRACTICAL

60 MARKS

1. Study of anatomical details of root, stems and leaf by preparing temporary slide and also by permanent slide or by photographs.
2. Study of anomalous structure of *Boerhaavia* stem and *Dracaena* stem by preparing 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 temporary slides.
5. Testing by chi-square method.
6. Botanical name ,family,economic importance of ten plants mentioned in the syllabus.

PRACTICAL EXAMINATION

F.M. 60

1. Prepare a temporary slide of *Boerhaavia* stem/ *Dracaena* stem

-20

Or

Prepare temporary slide of hydrophytes /xerophytes.

2. Identification of 5 plants of economic botany. (Only botanical name and Family Name)

-10

Or

Testing goodness of fit by Chi-Square methods

3. Spotting

5x2=10

- 4.Viva-voice

- 08

- 5.Record, collection & Models

- 12

BOT-H-SEC-301-T

SEMESTER III

SKILL ENHANCING COURSE (SEC)

PLANTS AND HUMAN WELFARE

FM- 40

Time- 3hrs

Instructions:-

All questions will be of MCQ type.

Total questions 40.

Total marks = 40 x 1 = 40 marks.

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

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

Cereals – Rice, Wheat, Maize

Pulses- Arhar, Moong, Lentil, Gram.

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

Fibres- Cotton, Jute

Wood- Sal, Teak, Shisham

UNIT 4: Common name, scientific name, cultivation and uses of following Spices- Clove, Black pepper, Saffron, Coriander.

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

B.Sc. BOTANY

SEMESTER – IV

BOT-H-C-408-T (MOLECULAR BIOLOGY)

CREDITS-04 (THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

MOLECULAR BIOLOGY

Unit-01: Nucleic Acids:

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

Unit-02: Structure of DNA and RNA

DNA structure, Watson and Crick Model of DNA, Types of DNA, Organization of DNA of prokaryotes, RNA structure, nucleosome model, Chromatin structure – Euchromatine, heterochromatin – Constitutive & Facultative heterochromatic. Polytene and Lampbrush chromosome.

Unit-03: Replication of DNA

Mechanism of DNA replication, Enzymes involved in DNA replication

Unit-04: Central Dogma and Genetic Code

General account of Central dogma and genetic code.

Unit-05: Mechanism of Transcription:-Transcription in prokaryotes and eukaryotes

Unit-06: Translation

Process of translation in Prokaryotes and eukaryotes, Proteins involved in translation.

Unit-07: Regulation of Gene expression

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

B.Sc. BOTANY

SEMESTER – IV

BOT-H-C-409-T (PLANT ECOLOGY AND PHYTOGEOGRAPHY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT ECOLOGY

Unit-01: Introduction

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

Unit-02 : Soil

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

Unit-03 : Water

Importance, states of water in environment, atmospheric moisture, precipitation types (rain, fog, snow, hail.), hydrological cycle.

Unit-04: Plant Communities

Analytic and synthetic characters, Mechanism of succession – Hydrosere & Xerosere,

Unit-05: Ecosystem

Basic concept, component of ecosystem, types of ecosystem, Grassland and Pond ecosystem, Food chain , Food web, and Ecological pyramid.

Unit-06: Functional aspect of Ecosystem

Energy flow and biogeochemical cycle- Phosphorus, carbon and nitrogen.

Unit-07: Environmental pollution

Air pollution, Water pollution, noise pollution – Cause, effect & control, green house effect, biomagnifications, eutrophication, ozone hole, ozone depletion.

Unit-08: Phytogeography- Vegetation of India with special reference to Jharkhand.

B.Sc. BOTANY

SEMESTER – IV

BOT-H-C-410-T (SYSTEMATIC BOTANY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

SYSTEMATIC BOTANY

Unit-01: Taxonomic Aids

Herbarium and botanical gardens, E-flora, Documentation, Floral monographs.

Unit-02: Taxonomic Hierarchy

Concept of species, Genus and family

Unit-03: Botanical nomenclature

Principles of International code of botanical nomenclature. Typification, author citation, valid publication.

Unit-04: System of classification

Basic idea of Artificial, Natural & Phylogenetic system of classification, Bentham and Hooker's system of classification, Hutchinson's system of classification.

Unit-05: Study of following families-

1. Ranunculaceae
2. Solanaceae
3. Apocyanaceae
4. Lamiaceae

5. Poaceae
- 6.

BOT-H-C-408-P, 409-P& 410-P PRACTICAL

F.M. 60

01. Watson and Crick model of DNA, nucleosome model, polytene and Lambrush chromosome by photographs
02. Study of DNA replication mechanism by photographs
03. Photographs establishing nucleic acid as a genetic material.
04. Study of pond-ecosystem, grass land ecosystem, Food wave, Food chain by photographs.
05. Studies of families included in the syllabus
06. Determination of pH of soil and water.
07. Study of college vegetation (density and frequency) by quadrats.
08. Morphological adaptations of hydrophytes and xerophytes.

BOT-H-C-408-P, 409-P& 410-P

PRACTICAL EXAMINATION

F.M. 60

TIME-3 HRS

01. Describe the floral characters of any one family with floral Formula & floral diagram. 10
02. Morphological adaptations of hydrophytes or xerophytes.
Or
Estimation of density or frequency of college vegetation by quadrat. 10
03. Describe the Watson & Crick model of DNA by photographs. 08
04. Spotting (5 X 2)=10
05. Viva voce 06
06. Class record, collection, model 06

BOT-H-SEC-402-T (Skill Enhancement Course)

SEMESTER: - IV

SCIENCE AND LIFE

FM- 40

Time- 3hrs

Instructions:-

All questions will be of MCQ type.

Total questions 40.

Total marks = 40 x 1 = 40 marks.

B.Sc. BOTANY

SEMESTER – V

BOT-H-C-511-T (REPRODUCTIVE BIOLOGY OF ANGIOSPERMS)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

REPRODUCTIVE BIOLOGY OF ANGIOSPERMS

UNIT-01-ANTHER

Anther wall: structure and function, microsporogenesis.

UNIT-02-POLLEN BIOLOGY

Microgametogenesis & Palynology and scope (a brief account).

UNIT-03-OVULE

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

UNIT-04-POLLINATION AND FERTILIZATION

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

UNIT-5-ENDOSPERM

Types, development, structure, morphological nature and functions.

UNIT-6-EMBRYO

Development of dicot embryo and monocot embryo.

UNIT-7-SEED

Structure, importance and dispersal mechanisms.

UNIT-8- POLYEMBROYONY

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 IBH Publishing 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.

B.Sc. BOTANY

SEMESTER – V

BOT-H-C-512-T (PLANT BIOTECHNOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT BIOTECHNOLOGY

UNIT 1

Introduction, history, Infrastructure & Organization of plant tissue culture laboratory – General & aseptic laboratory, different work areas, equipments & instruments required, other requirements.

Culture Medium – Nutritional requirements of the explants, PGR's & their in vitro roles, Media preparation.

UNIT 2

Cellular Totipotency, micro propagation

Organ culture technique –

Introduction, principle, protocol factors affecting w.r.t.root tip culture, leaf culture, shoot tip , meristem culture.

UNIT 3

Anther & pollen culture technique – Introduction, principle, protocol, factors affecting;

Protoplast – protoplast isolation, protoplast culture.

UNIT 4

Somatic hybridization – Protoplast fusion techniques, selection of hybrids, production of symmetric & asymmetric hybrids cybrid production.

UNIT-5-Genetic transformations

Agrobacterium mediated transformations,

Direct DNA transfer methods –electroporation, microprojectile bombardment, microinjection,

Use of marker genes, integration & expression of foreign DNA

UNIT-06-Recombinant DNA Technology

Introduction, definition, steps of Gene cloning, Basic tools used for Gene cloning. Restriction endonucleases, types, nomenclature, Recognition sequences,

Cloning vectors in prokaryotes; -. pBR 322,Cosmids, Phagemid,

Cloning vectors in eukaryotes;- Yeast vectors, *Agrobacterium* – Ti plasmid , Ri-plasmid,

Hybridization techniques (Northern, southern, western blotting), PCR

UNIT-07- Application Of Biotechnology

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

SUGGESTED READING

1. Bhojwani, S.S. and Razdan 2004 Plant Tissue Culture and Practice.
2. Brown, T. A. Gene cloning and DNA analysis: An Introduction. Blackwell Publication.
3. Gardner, E.J. Simmonns, M.J. Snustad, D.P. 2008 8th edition Principles of Genetics. Wiley India.
4. Raven, P.H., Johnson, GB., Losos, J.B. and Singer, S.R. 2005 Biology. Tata MC Graw Hill.
5. Reinert, J. and Bajaj, Y.P.S. 1997 Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Narosa Publishing House.
6. Russell, P.J. 2009 Genetics – A Molecular Approach. 3rd edition. Benjamin Co.
7. Sambrook & Russel. Molecular Cloning: A laboratory manual. (3rd edition)
8. Slater, A., Scott, N.W. & Fowler, M.R. 2008 Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press.

BOT-H-C-511-P & 512-P PRATICAL

F.M.- 40

1. Embryo Dissection
2. Study of structure of anthers, types of ovules, structure of a mature embryo sac by photographs.
3. Preparation of culture media
4. Process of surface sterilization and inoculation of explants
5. Study of anther, embryo, endosperm, micropapagation and somatic hybridization through photographs.

PRATICAL EXAMINATION

F.M.- 40

Time- 3 hrs

01. Embryo Dissection of (dicot embryo)	10
02. Process of surface sterilization and inoculation of explants	08
03. Spotting	(2x5) = 10
04. Class records, charts, models.	06
05. Viva-voice	06

B.Sc. BOTANY

SEMESTER – V

BOT-H-DSE-501A-T (PLANT BREEDING)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT BREEDING

UNIT 1: Introduction and objectives.

Unit 2:- Methods of Crop Improvement, Introduction, Selection, Hybridization.

UNIT 3:- Inbreeding, Inbreeding Depression, Heterosis.

Unit 4:- Role of Mutation, Polyploidy, Distant Hybridization, Role of Biotechnology in crop improvement.

SUGGESTED READING

1. Singh, B.D (2005), Plant breeding; principles and Methods, Kalyani Publishers, 7th edition.

B.Sc. BOTANY

SEMESTER – V

BOT-H-DSE-501B-T (RESEARCH METHODOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

RESEARCH METHODOLOGY

Unit 1: Basic concepts of research

Research-definition and types of research (Descriptive vs analytical; applied vs fundamental; quantitative vs qualitative; conceptual vs emperical).Research methods vs methodology. Literature-review and its consolidation; Library research; field research; laboratory research.

Unit 2: General laboratory practices

Common calculations in botany laboratories. Understanding the details on the label of reagent bottles. Molarity and normality of common acids and bases.Preparation of solutions. Dilutions. Percentage solutions. Molar, molal and normal solutions.Technique of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling.

Unit 3: Data collection and documentation of observations

Maintaining a laboratory record; Tabulation and generation of graphs. Imaging of tissue specimens and application of scale bars. The art of field photography.

Unit 4: Overview of Biological Problems

History; Key biology research areas, Model organisms in biology (A Brief overview): Genetics, Physiology, Biochemistry, Molecular Biology, Cell Biology, Genomics, Proteomics-Transcriptional regulatory network.

Unit 5: Methods to study plant cell/tissue structure

Whole mounts, peel mounts, squash preparations, clearing, maceration and sectioning; Tissue preparation: living vs fixed, physical vs chemical fixation, coagulating fixatives, non-coagulant fixatives; tissue dehydration using graded solvent series; Paraffin and plastic infiltration; Preparation of thin and ultrathin sections.

Unit 6: Plant microtechniques

Staining procedures, classification and chemistry of stains. Staining equipment. Reactive dyes and fluorochromes (including genetically engineered protein labeling with GFP and other tags). Cytogenetic techniques with squashed plant materials.

Unit 7: The art of scientific writing and its presentation

Numbers, units, abbreviations and nomenclature used in scientific writing. Writing references. Powerpoint presentation. Poster presentation. Scientific writing and ethics, Introduction to copyright-academic misconduct/plagiarism.

PRACTICAL

Marks -20

1. Experiments based on chemical calculations.
2. Plant microtechnique experiments.
3. The art of imaging of samples through microphotography and field photography.
4. Poster presentation on defined topics.
5. Technical writing on topics assigned.

SUGGESTED READINGS

1. Dawson, C. (2002). Practical research methods. UBS Publishers, New Delhi.
2. Stapleton, P., Yondeowei, A., Mukanyange, J., Houten, H. (1995). Scientific writing for agricultural research scientists – a training reference manual. West Africa Rice Development Association, Hong Kong.
3. Ruzin, S.E. (1999). Plant microtechnique and microscopy. Oxford University Press, New York, U.S.A.

B.Sc. BOTANY

SEMESTER – V

BOT-H-DSE-501C-T (STRESS BIOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

STRESS BIOLOGY

Unit 1: Defining plant stress ; Acclimation and adaptation.

Unit 2: Environmental factors

Water stress; Salinity stress, High light stress; Temperature stress; Hypersensitive reaction; Pathogenesis– related (PR) proteins; Systemic acquired resistance; Mediation of insect and disease resistance by jasmonates.

Unit 3: Stress sensing mechanisms in plants; Calcium modulation, Phospholipid signaling.

Unit 2: Developmental and physiological mechanisms that protect plants against

environmental stress; Adaptation in plants; Changes in root: shoot ratio; Aerenchyna development; Osmotic adjustment; Compatible solute production.

Unit 3: Reactive oxygen species–Production and scavenging mechanisms

PRACTICAL

Marks - 20

1. Quantitative estimation of peroxidase activity in the seedlings in the absence and presence of salt stress.
2. Superoxide activity in seedlings in the absence and presence of salt stress.
3. Zymographic analysis of peroxidase.
4. Zymographic analysis of superoxide dismutase activity.
5. Quantitative estimation and zymographic analysis of catalase.
6. Quantitative estimation and zymographic analysis of glutathione reductase.
7. Estimation of superoxide anions.

SUGGESTED READINGS

1. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and sons. U.S.A. 4th edition.
2. Taiz, L., Zeiger, E., Møller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.

B.Sc. BOTANY

SEMESTER – V

BOT-H-C-502A-T (NATURAL RESOURCE MANAGEMENT)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

NATURAL RESOURCE MANAGEMENT

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

UNIT 2: Land- Soil degradation and management- Water- Fresh water estuaries, wet lands, threats, and management strategies.

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

Forest- Definition, Importance and management.

UNIT 4: Energy- Renewable and Non renewable sources.

UNIT 5: National and International efforts in resource management.

B.Sc. BOTANY

SEMESTER – V

BOT-H-C-502B-T (BIOINFORMATICS)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

BIOINFORMATICS

Unit 1. Introduction to Bioinformatics

Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics.

Unit 2. Databases in Bioinformatics

Introduction, Biological Databases, Classification format of Biological Databases, Biological Database Retrieval System.

Unit 3. Biological Sequence Databases

National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST), Nucleotide Database, Protein Database, Gene Expression Database.

EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools.

DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ.

Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIR, Data Retrieval in PIR.

Swiss-Prot: Introduction and Salient Features.

Unit 4. Sequence Alignments

Introduction, Concept of Alignment, Multiple Sequence Alignment (MSA), MSA by CLUSTALW, Scoring Matrices, Percent Accepted Mutation (PAM), Blocks of Amino Acid

Substitution Matrix (BLOSUM).

Unit 5. Molecular Phylogeny

Methods of Phylogeny, Software for Phylogenetic Analyses, Consistency of Molecular Phylogenetic Prediction.

Unit 6. Applications of Bioinformatics

Structural Bioinformatics in Drug Discovery, Quantitative structure-activity relationship (QSAR) techniques in Drug Design, Microbial genome applications, Crop improvement

PRACTICAL

Marks - 20

1. Nucleic acid and protein databases.
2. Sequence retrieval from databases.
3. Sequence alignment.
4. Sequence homology and Gene annotation.
5. Construction of phylogenetic tree.

SUGGESTED READINGS

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell.
3. Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings.

B.Sc. BOTANY

SEMESTER – V

BOT-H-C-502C-T (ANALYTICALS TECHNIQUES IN PLANT SCIENCES)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

ANALYTICALS TECHNIQUES IN PLANT SCIENCES

Unit 1: Imaging and related techniques

Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

Unit 2: Cell fractionation

Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.

Unit 3: Radioisotopes

Use in biological research, auto-radiography, pulse chase experiment.

Unit 4: Spectrophotometry

Principle and its application in biological research.

Unit 5: Chromatography

Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Unit 6: Characterization of proteins and nucleic acids

Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

Unit 7: Biostatistics

Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.

Practical

Marks -20

1. Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
2. Demonstration of ELISA.
3. To separate nitrogenous bases by paper chromatography.
4. To separate sugars by thin layer chromatography.
5. Isolation of chloroplasts by differential centrifugation.
6. To separate chloroplast pigments by column chromatography.
7. To estimate protein concentration through Lowry's methods.
8. To separate proteins using PAGE.
9. To separation DNA (marker) using AGE.
10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
11. Preparation of permanent slides (double staining).

SUGGESTED READINGS

1. Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGraw-Hill Publishing Co. Ltd. New Delhi. 3rd edition.
2. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York.
3. Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.
4. Zar, J.H. (2012). Biostatistical Analysis. Pearson Publication. U.S.A. 4th edition.

PRACTICALS (BOT-H-DSE-501A & 502 A)

40 MARKS

1. Hybridization techniques:
Emasculation and bagging.
2. Study of Cyanobacteria- Study with the help of Photographs.
3. Study of Biodiversity of the college campus.

EXAMINATION

FULL MARKS- 40

- | | |
|---------------------------------------------------------------|--------|
| 1. Hybridization techniques:
Emasculation and bagging. | 10 |
| 2. Study of Cyanobacteria- Study with the help of Photographs | |
| or | |
| Study of Biodiversity of the college campus | 08 |
| 3. Spotting | 5x2=10 |
| 4. Records/ projects | 06 |
| 5. Viva- Voice | 06 |

B.Sc. BOTANY

SEMESTER – VI

BOT-H-C-613-T (PLANT PHYSIOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT PHYSIOLOGY

UNIT-01-PLANT WATER RELATIONSHIP

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

UNIT-02-MINERAL NUTRITION

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

UNIT-03-TRANSLOCATION IN THE PHLOEM

Mechanism of Translocation in phloem.

UNIT-04-PLANT GROWTH REGULATORS

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

UNIT-05-PHYSIOLOGY OF FLOWERING

Photoperiodism, florigen concept, vernalization, seed dormancy.

SUGGESTED READINGS

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

B.Sc. BOTANY

SEMESTER – VI

BOT-H-C-614-T (PLANT METABOLISM)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

PLANT METABOLISM

UNIT-01-CONCEPTS OF METABOLISM

Introduction, anabolic, catabolic and amphibolic pathway.

UNIT-02-CARBON ASSIMILATION

Historical background, photochemical reactions, photosynthetic electron transport, PSI, PSII, red drop Emerson effect, Quantum Yield, CO₂reduction, Photophosphorylation, C₃, C₄ Cycle, photorespiration.

UNIT-03-CARBON OXIDATION

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

UNIT-04-LIPIDS METABOLISM

Introduction, saturated & unsaturated fatty acid, β -oxidation of fatty acids/lipids.

UNIT-05-NITROGEN METABOLISM

Biological nitrogen fixation, Reductive amination & Transamination.

SUGGESTED READINGS

1. Hopkins, W.G. and Huner, A.(2008). Introduction to Plant Physiology. John Wiley and Sons.
2. Taiz, L., Zeiger, E., Møller, I.M and Murphy, A (2015). Plant Physiology and development. Sinauer Associates Inc. USA 6th edition.
3. Harborne, J.B. (1973). Phytochemical Methods. John Wiley & Sons. New York.

BOT-H-C-613-P & 614-P

(PLANT PHYSIOLOGY AND PLANT METABOLISM)

01. Determination of water potential of given tissue (potato tuber) by weight method.
02. Calculation of stomatal frequency from the two surfaces of leaves of a mesophyte.
03. To determine the rate of transpiration by Farmer's and Ganong's photometer.
04. Separation of pigments by chromatography method.
05. Experiment showing that O_2 is evolved during photosynthesis.
06. Experiment showing that light is essential for photosynthesis.

Practical exam

F.M.- 40

Time- 3hrs

01. Experiment showing that O_2 is evolved during photosynthesis. -10

Or

Separation of pigments by chromatography method.

02. To determine the rate of transpiration by Farmer's and Ganong's photometer 08
03. Spotting 5x2=10
04. Records/ projects 06
05. Viva- Voice 06

B.Sc. BOTANY

SEMESTER – VI

BOT-H-DSE-603A-T (ENVIRONMENTAL AND WASTE MANAGEMENT)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

ENVIRONMENTAL AND WASTE MANAGEMENT

1. Understanding Ecosystems, Population, Community, Components of Ecosystems.
2. Destruction of Ecosystem due to changing pattern of land use, Migration, Transportation, Urbanization, Industrialization, Environmental Impact Assessment.
3. Environmental impact assessment-
4. Sources, classification of waste
5. Impact of waste accumulation.
6. Need for management of waste.
7. Safe disposal of waste.
8. Legal provision of waste management.
9. Swacchh bharat Abhiyaan- Your suggestions

SUGGESTED READINGS

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

B.Sc. BOTANY

SEMESTER – VI

BOT-H-DSE-603B-T (BIOSTATISTICS)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

BIOSTATISTICS

Unit 1:Biostatistics

Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.

Unit 2:Collection of data primary and secondary

Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.

Unit 3:Measures of central tendency

Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co- efficient of variations.

Unit 4:Correlation

Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression.

Unit 5:Statistical inference

Hypothesis - simple hypothesis - student 't' test - chi square test.

BOT-H-DSC-603B-P (BIostatISTICS) PRACTICAL

Marks – 20

- 1) Calculation of mean, standard deviation and standard error
- 2) Calculation of correlation coefficient values and finding out the probability
- 3) Calculation of 'F' value and finding out the probability value for the F value.

SUGGESTED READINGS

1. Biostatistic, Danniell, W.W., 1987. New York, John Wiley Sons.
2. An introduction to Biostatistics, 3rd edition, Sundarrao, P.S.S and Richards, J. Christian Medical College, Vellore
3. Statistical Analysis of epidemiological data, Selvin, S., 1991. New York University Press. 4. Statistics for Biology, Boston, Bishop, O.N. Houghton, Mifflin.
5. The Principles of scientific research, Freedman, P. New York, Pergamon Press.
6. Statistics for Biologists, Campbell, R.C., 1998. Cambridge University Press.

B.Sc. BOTANY**SEMESTER – VI****BOT-H-DSE-603C-T (BIOFERTILIZERS)****CREDITS-04(THEORY)****FULL MARKS: 60****LECTURES: 60****TIME: 03 HRS.**

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

BIOFERTILIZERS

Unit 1:General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.

Unit 2:*Azospirillum*: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms.*Azotobacter*: classification, characteristics – crop response to *Azotobacter* inoculum, maintenance and mass multiplication

Unit 3:Cyanobacteria (blue green algae), *Azolla* and *Anabaena azollae* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation

Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

Unit 5:Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.

SUGGESTED READINGS

1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.
2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.

4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
6. Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

BOT-H-DSE-603C-P (BIOFERTILIZERS) PRACTICAL

MARKS -20

01. Isolation and identification technique of *Rhizobium*
02. Biocomposting methods and types
03. Process of vermicomposting
04. VAM isolation.

B.Sc. BOTANY

SEMESTER – VI

BOT-H-DSE-604A-T (INDUSTRIAL MICROBIOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

INDUSTRIAL MICROBIOLOGY

UNIT-01-Biogas- Process & Importance- Need, Merit & scope.

UNIT-02-Bioremediation, Role of microbes in waste management, Bioremediation of
a) Hydrocarbons b) Industrial wastes c) Xenobiotics, Biomining, Bioreactors.

UNIT-03-Microbial flora of water- water pollution, sewage, algal bloom. BOD, COD, Eutrophication.

UNIT-04-Microbes in Agriculture Biological fixation, Mycorrhizae, Isolation of root nodule bacteria.

UNIT-05-Microbial products of Industrial value- Organic acids, Alcohols, Antibiotics, Downstream processing & uses.

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 BiotechnologyS.chand & Co. New Delhi.

B.Sc. BOTANY

SEMESTER – VI

BOT-H-DSE-604B-T (NURSERY AND GARDENING)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

NURSERY AND GARDENING

Unit 1: Nursery: definition, objectives and scope and building up of infrastructure for nursery, planning and seasonal activities - Planting - direct seeding and transplants.

Unit 2: Seed: Structure and types - Seed dormancy; causes and methods of breaking dormancy - Seed storage: Seed banks, factors affecting seed viability, genetic erosion – Seed production technology - seed testing and certification.

Unit 3: Vegetative propagation: air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings - Hardening of plants – green house - mist chamber, shed root, shade house and glass house.

Unit 4: Gardening: definition, objectives and scope - different types of gardening – landscape and home gardening - parks and its components - plant materials and design – computer Applications in landscaping - Gardening operations: soil laying, manuring, watering, Management of pests and diseases and harvesting.

Unit 5: Sowing/raising of seeds and seedlings - Transplanting of seedlings - Study of cultivation of different vegetables: cabbage, brinjal, lady's finger, onion, garlic, tomatoes, and carrots - Storage and marketing procedures.

SUGGESTED READINGS

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
4. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
5. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
6. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.

BOT-H-DSC-604B-P (NURSERY AND GARDENING) PRACTICAL

MARKS -20

01. Study of vegetative propapagation
 - a. Natural method- In bryophyllum,
 - b. Artificial methods- cutting (china rose), grafting(mango), layering (rose) , “gootee” (lemon)
02. Study of seed dormancy.
03. Computer applications in landscaping.

B.Sc. BOTANY

SEMESTER – VI

BOT-H-DSE-604C-T (HERBAL TECHNOLOGY)

CREDITS-04(THEORY)

FULL MARKS: 60

LECTURES: 60

TIME: 03 HRS.

Instructions to Question setter- There will be two groups of questions. Five questions to be answered out of nine questions. Group A is compulsory and will contain two questions. Question no. 1 (A) will be MCQ of 1 mark each (six questions). Question No.1 (B) will be short answer type to be answered in about 50 words of 3 marks (2 questions). Group B will contain descriptive type eight questions of twelve marks each, out of which any four questions are to answer. Each question carries 12 marks.

HERBAL TECHNOLOGY

Unit 1:Herbal medicines: history and scope - definition of medical terms - role of medicinal plants in Siddha systems of medicine; cultivation - harvesting - processing - storage - marketing and utilization of medicinal plants.

Unit 2:Pharmacognosy - systematic position m edicinal uses of the following herbs in curing various ailments; Tulsi, Ginger, Fenugreek, Indian Goose berry and Ashoka.

Unit 3: Phytochemistry - active principles and methods of their testing - identification and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on nervous system), *Clerodendron phlomoides* (anti-rheumatic) and *Centella asiatica* (memory booster).

Unit 4:Analytical pharmacognosy: Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)

Unit 5:Medicinal plant banks micro propagation of important species (*Withania somnifera*, neem and tulsi- Herbal foods-future of pharmacognosy).

SUGGESTED READINGS

1. Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.
2. The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.
3. Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.
4. Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.
5. Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.
6. Principles of Ayurveda, Anne Green, 2000. Thomsons, London.
7. Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

BOT-H-DSE-604C-P (HERBAL TECHNOLOGY) PRACTICAL

MARKS -20

01. Culture of any medicinal plant mentioned in the syllabus.
02. Determination of secondary metabolites by TLC methods.
03. Systematic positioned uses of tulsi, ginger, fenugreek and Indian goose berry

**BOT-H-603A & 604A (ENVIRONMENTAL AND WASTE MANAGEMENT
& INDUSTRIAL MICROBIOLOGY PRACTICAL)**

FM-40

1. Study of Plant Community/ Vegetation of College Campus by Quadrat method, 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 (any two)

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 |

