

MARWARI COLLEGE, RANCHI
(AN AUTONOMOUS UNIT OF RANCHI UNIVERSITY FROM 2009)



DEPARTMENT OF BOTANY

SYLLABUS FOR BOTANY HONOURS

Number of Papers: 20
(14 Theory Papers & 6 Practical Papers)

Full Marks: 1600
Theory: 1200, Practical: 400

Number of Semesters: 6

B. Sc. Hons. Part - I: 400 Marks
(Theory: 300, Practical: 100)

B. Sc. Hons. Part - II: 400 Marks
(Theory: 300, Practical: 100)

B. Sc. Hons. Part - III: 800 Marks
(Theory: 600, Practical: 200)

DISTRIBUTIONS OF MARKS IN BOTANY HONS.

ACADEMIC YEAR	SEM	THEORY PAPER	PAPER NAME	FULL MARKS			PASS MARKS	DURATION	PRACTICAL PAPER	FULL MARKS	PASS MARKS	DURATION
				MSE	ESE	TOTAL						
FIRST YEAR	I	1	Thallophyta etc.	25	50	75	34	2½ HRS.	3	50	23	4 HRS.
		2	Microbiology	25	50	75	34	2½ HRS.				
	II	4	Bryophyta/ Pteridophyta	25	50	75	34	2½ HRS.	6	50	23	4 HRS.
		5	Plant Pathology	25	50	75	34	2½ HRS.				

DISTRIBUTIONS OF MARKS IN BOTANY HONS.

ACADEMIC YEAR	SEM	THEORY PAPER	PAPER NAME	FULL MARKS			PASS MARKS	DURATION	PRACTICAL PAPER	FULL MARKS	PASS MARKS	DURATION
				MSE	ESE	TOTAL						
SECOND YEAR	III	7	Gymnosperms	25	50	75	34	2½ HRS.	9	50	23	4 HRS.
		8	Embryology	25	50	75	34	2½ HRS.				
	IV	10	Development of Plnat, their utilization	25	50	75	34	2½ HRS.	12	50	23	4 HRS.
		11	Plant Anatomy	25	50	75	34	2½ HRS.				

DISTRIBUTIONS OF MARKS IN BOTANY HONS.

ACADEMIC YEAR	SEM	THEORY PAPER	PAPER NAME	FULL MARKS			PASS MARKS	DURATION	PRACTICAL PAPER	FULL MARKS	PASS MARKS	DURATION
				MSE	ESE	TOTAL						
THIRD YEAR	V	13	Plant Physiology	30	70	100	45	3 HRS.	16	100	45	6 HRS.
		14	Cytogenetics & Plant Breeding	30	70	100	45	3 HRS.				
		15	Biochemistry & Biotechnology	30	70	100	45	3 HRS.				
	VI	17	Molecular Biology	30	70	100	45	3 HRS.	20	100	45	6 HRS.
		18	Ecology	30	70	100	45	3 HRS.				
		19	Environmental Biology	30	70	100	45	3 HRS.				

BOTANY

PART-I

SEMESTER-I

Paper -1, Diversity, Classification of Plant Kingdom & Thallophyta [40 Lectures]

Instructions to Paper Setters

Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

1. Brief account of five kingdom classification by whittaker and 7 Kingdom classification by Mayr emphasizing on diversity in habitat, form, life span, nutrition and ecological status.
2. Origin, evolution and phylogeny of land plants.
3. General characters and classification of algae upto order
4. General characters and classification of fungi upto order.
5. Structure, life history, economic importance and evolutionary affinities of following genera.
 - a. **ALGAE:** *Nostoc, Gleotricha Spirulina, Chlamydomonas, Volvox, Spirulia, NOstoc, Anabaena, Nitella, Vaucheria, Ectocarpus, Polysiphonia.*
 - b. **FUNGI;** *Synchytrium, Albugo, Erysiphe, Aspergillus, Peziza, Ustilago, Puccinia, Alternaria, Cercospora, Agaricus, Mushroom Cultivation.*
 - c) **LICHEN:** *General Account, Classification, Economic Importance.*

Books Recommended:

1. Smith, G.M. – Cryptogamic Botany, Vol. Algae & Fungi, Tata McGraw Hill Publishing Co. New Delhi.
2. Sharma, C.P. – Textbook of Thalophytes, Tata McGraw Hill Publishing Co. New Delhi.
3. Dube, H.C. – An Introduction to Fungi, Vikash Publishing House Pvt. Ltd. Delhi
4. Mandahar, C.L. – Introduction to Plant Viruses, S. Chand & Co. Ltd. New Delhi
5. Clifton, A. – Introduction to the Bacteria, McGraw Hill Co. New York

BOTANY
PART-I
SEMESTER-I
PAPER – 2, Microbiology [30 Lectures]
Instructions to Paper Setters
Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

1. Methods in micro-biology: basic principles of microscopy, micrometry, staining, sterilization methods, culture media, pure culture method methods for population estimation.
2. Modern concept about bacterial cell structure.
3. Bacterial reproduction: transformation, transduction, conjugation.
4. Structure & nature of TMV & Bacteriophage, their replication.
5. Role of microbes in nitrogen fixation, Organic matter decomposition.
6. Industrial importance of microorganisms.
7. General account of mycoplasma and diseases caused by them.

Books Recommended:

1. Mehrotra, R.S. & Aneja, K.R. – An Introduction to Mycology
2. Anr, K.R. – Experiments in Microbiology, Plant Pathology & Biotechnology
3. An Introduction to Microbiology – By P . Tauro , K. K. Kapoor , K. S. Yadav

PART-I
SEMESTER-I
PAPER – 3, Practical

Full Marks: 50

Time: 4 Hours

Pass Marks: 23

- | | |
|--|--------------|
| 1. Morphology and structural (anatomical, if needed) details in order to identify and classify the thallophytes prescribed in thge syllabus. (2 materials to be given) | (2 x 6 = 12) |
| 2. Gram staining of Bacteria | 6 |
| 3. Comment upon the spots 1 - 5 | (5 x 2 = 10) |
| 4. Viva Voce | 6 |
| 5. Field study Report/ | 5 |
| 6. Project Work/Model/Herbarium/Collection./Chart | 5 |
| 7. Class Record. | 6 |

BOTANY
PART-I
SEMESTER-II
PAPER – 4, Bryophyta & Pteridophyta [35 Lecture]
Instructions to Paper Setters

Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

Structure, life history, affinities and importance of the genera mentioned below:-

1. Bryophyta: *Marchantia*, *Plagiochasma*, *Anthoceros*, *Notothylas*, *Sphagnum*, *Polytrichum*, *Funaria*,
2. Pteridophyta: *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Ophioglossum*, *Marsilea*, *Azolla*, *Pteris*.
3. Fossil : *Rhynia*, *Lepidodendron*, *Calamites*.

Books Recommended:

1. Ranjan, S.S. – Introduction to Pteridophyta
2. Chopra, R.N. & Kumar, P.K. – Biology of Bryophytes
3. Smith, G.M. – Cryptogamic Botany Vol. II Bryophytes & Pteridophytes
4. Sharma, C.P. – Text Book of Pteridophytes
5. Vasista P.C.– Bryophyta
6. Pteridophyta by Vasishtha P.C.

BOTANY

PART-I

SEMESTER-II

PAPER – 5, Plant Pathology [30 lectures]

Instructions to Paper Setters

Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

Important Plant disease of Jharkhand: Etiology, symptoms and control of the following diseases:

- a. Late blight of potato
 - a. Downy Mildews
 - b. Loose smut of wheat
 - c. Red rot of sugar cane
 - d. Citrus canker (*Xanthomonas campestris* pv. *citri*)
 - e. Bacterial blight of paddy (*Xanthomonas campestris* pv. *oryzae*).
 - f. Tobacco mosaic virus
1. Pathogen attack and defense mechanisms: physical, physiological, biochemical and molecular aspects.
 2. Plant disease management: Chemical, biological, development of transgenic, biopesticides.

Books Recommended:

1. A Text Book of Modern Plant Pathology- By K.S. Bilgrani
2. Plant Pathology- By Singh
3. Experiments in Microbiology, Plant Pathology and Biotechnology – By K.R. Anyur

PART-I
SEMESTER-II
PAPER – 6, Practical

Full Marks: 50

Time: 4 Hours

Pass Marks: 23

1. Morphology and anatomical studies in order to identify and classify the bryophyte & Pteridophyte prescribed in the syllabus. (2 x 6 = 12)
2. Study the symptoms and identify the plant disease and its causal organism 6
3. Comment upon the spots 1 - 5 (5 x 2 = 10)
4. Viva Voce 6
5. Field study Report 5
6. Project Work/Model/Herbarium/Collection./Chart 5
7. Class Record. 6

BOTANY
PART-II
SEMESTER-III
PAPER – 7, Gymnosperms [35 Lecture]
Instructions to Paper Setters

Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

Group A

1. Comparative study of the morphological, anatomical, embryological and evolutionary features of the following genera: **Pinus, Taxus, Ginkgo, Gnetum.**

Group B

2. Paleobotany

- a) A brief idea about geological era.
- b) Fossil: Definition, process and condition of fossilization, Types of Fossils.
- c) Detailed study of Lyginopteris, Cycadeoidea and Pentoxylon.
- d) Significance of fossils in Raj Mahal

Books Recommended:

1. Bhatnagar, S.P. – Gymnosperms
2. Sporne, K.R. – Morphology of Gymnosperms
3. Stewari, W.M. – Palaeobotany & Evolution of Plants
4. Raghavan, V. – Embryogenesis in Angiosperms
5. Bhattacharjee, Majumdar & Gupta – A Text Book of Palynology (Basic Applications)

BOTANY
PART-II
SEMESTER-III
PAPER – 8, Embryology [20 lectures]
Instructions to Paper Setters
Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

1. Embryology, Basic concepts and methodology
2. Microsporogenesis. and Male gametophyte.
3. Megasporogenesis. and development
4. Female gametophyte, types of Embryo sacs.
5. Fertilization
6. Endosperm
7. Embryogeny
8. Polyembryony.
9. Experimental Embryology.

Books Recommended:

1. Singh, Pande & Jain – Embryology of Angiosperms
2. S.P. Bhatnagar – Embryology of Angiosperms

PART-II
SEMESTER-III
PAPER – 9, Practical

Full Marks: 50

Time: 4 Hours

Pass Marks: 23

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|--|--------------|
| 1. Identification of the gymnosperm material provided | 5 |
| a) Detailed morphological study | |
| b) Detailed anatomical study. | |
| 2. Pollen germination/embryo dissection/misotomy pollinia dissection | (4 x 2 =8) |
| 3. Identify & comment upon spots 1-5 | (5 x 2 = 10) |
| 4. Viva Voce | 6 |
| 5. Field study Report | 5 |
| 6. Project work/Model/ Herbarium/Collection/Chart | 10 |
| 7. Class Record | 6 |

PART-II

SEMESTER-IV

PAPER – 10, Development of plant; their utilization [55 lectures]

Instructions to Paper Setters

Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

Group A. Development of Plant.

1. Meristem; shoot apex organization ; initiation, structure & Function of cambium.
2. Periderm: Origin, structure and function.
3. Anomalous secondary growth in **Begonia, Nyctanthus, Boerhaavia, Tecoma and Dracaena**

Group B Economic Botany.

1. Use of plants as medicine and idea about important drug-yielding plants.
2. Agricultural & horticultural plants of Jharkhand and importance of their products in oil seeds, pulses, cereals, fruits, vegetables and timber.
3. Utilization of wastes and biogas resources.
4. Under utilized plants; future resources.

Book Recommended:

1. Economic Botany – By Bender / Kumar
2. Embryology of Angiosperms – Singh, pandey, Jain.
3. Economic Botany – By B. P. Pandey

PART-II
SEMESTER-IV
PAPER – 11, Plant Anatomy [50 lectures]
Instructions to Paper Setters

Full Marks: 50

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1 = 10)

Group B : Shall contain concept based questions -Five questions of two marks each (5 x 3 =15)

Group C : Long answer questions – two questions of twelve and half marks each (2 x 12½ = 25)
 Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 25 (MSE) + 50 (ESE) = 75

Time: 2½ Hours

Pass Marks: 34

Group A (Plant Anatomy)

1. Root stem transition.
2. Mechanical Tissues: Structure distribution & function
3. Organization of tissues in relation to environment (ecological anatomy): Hydrophytes, Xerophytes, Halophyte Epiphyte, Parasite.

Group B (Angiosperm)

1. Principles of plant Taxonomy, Classification proposed by Bentham and Hooker, Engler & Prantle, Hutchinson.
2. Important rules of plant nomenclature with special referene to ICBN.
3. Modern trends in plant taxonomy; Taxonomy in relation to Embryology, Palynology, Cytology.
4. A comparative account of diagnostic features, relationship and economic importance of the following families: Ranunculaceae, Euporbiaceae, Rubiaceae, Verbenaceae, papaveraceae, Apocynaceae, Scrophulariaceae, Acanthaceae, Asclepiadaceae, Lamiaceae, Anacardiaceae, Cyperaceae, Poaceae, Orchidaceae, Comolrubceae.

Books Recommended:

1. Plant anatomy – A Fahn
2. Anatomy – By M. S. Tayal
3. Plant Group – By H. Mukerjee

PART-II
SEMESTER-IV
PAPER – 12, Practical

Full Marks: 50

Time: 4 Hours

Pass Marks: 23

- | | |
|--|-------------|
| 1. Description and identification of plant from the families prescribed in the syllabus. | 10 |
| 2. Internal anatomy of normal and anomalous stem structure of angiosperms | 8 |
| 3. Identify & comment upon spots 1-5 | 5 x 2 = 10) |
| 4. Viva Voce | 6 |
| 5. Field study Report | 5 |
| 6. Project work/Model/ Herbarium/Collection/Chart | 5 |
| 7. Class Record | 6 |

BOTANY
PART-III
SEMESTER-V
PAPER – 13, Plant Physiology [50 lectures]
Instructions to Paper Setters
Full Marks: 70

Paper setters shall set questions in three groups.

- Group A :** Shall contain multiple choice questions, fill in the blanks and true / false type questions (10 x 1½ = 15)
Group B : Shall contain concept based questions - Answer any three questions (5 x 3 = 15)
Group C : Long answer questions – Answer any two questions (2 x 20 = 40)
 Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 30 (MSE) + 70 (ESE) = 100

Time: 3 Hours

Pass Marks: 45

1. Plant water relations: Absorption of water, ascent of sap, transpiration, mechanism of stomatal movement.
2. Photosynthesis; photosynthetic apparatus, methods, pigments, Photochemical reaction, C₃ , C₄ and CAM pathways, photorespiration, warburg effect.
3. Transport of organic solutes: Path and Mechanism.
4. Respiration: Glycolytic and Direct(PPP) types, electron transport chain
5. Biological nitrogen fixation
6. Plant growth substances: History, types, structure and mechanism of action
7. Physiology of flowering, photoperiodism, vernalisation

Book Recommended:

1. Hopkins, W.G. – Introduction to Plant Physiology, John Wiley & Sons Inc. New York
2. Mohr, N. & Schopfer, P. – Plant Physiology, Springer –Verlag, Berlin, Germany
3. Datta, S.C. – Plant Physiology
4. Mukharjee, S. - Plant Physiology
5. Botany for Degree Students – By A.C. Dutta

BOTANY
PART-III
SEMESTER-V
PAPER – 14, Cytogenetics and Plant Breeding [45 lectures]
Instructions to Paper Setters
Full Marks: 70

Paper setters shall set questions in three groups.

- Group A :** Shall contain multiple choice questions, fill in the blanks and true / false type questions (10 x 1½ = 15)
Group B : Shall contain concept based questions - Answer any three questions (5 x 3 = 15)
Group C : Long answer questions – Answer any two questions (2 x 20 = 40)
 Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 30 (MSE) + 70 (ESE) = 100

Time: 3 Hours

Pass Marks: 45

1. Cell division, its regulation and significance; Mitosis and Meiosis
2. Morphology of chromosomes including lampbrush and polytene chromosomes.
3. Mendelism: History, concept, methods and deviations.
4. Cytoplasmic inheritance: Mitochondrial and plastid DNA
5. Alteration in genetic make-up changes at genetic level: spontaneous and induced mutations; mutagen types and mode of action; transition, transversions and frame shift mutations.
6. Alteration in genetic make up changes in chromosome structure; origin types and effects of duplications and deletions and inversions and translocations.
7. Alteration in genetic makeup changes in chromosome numbers: origin types and effects of auto and allopolyploidy; origin and meiosis in nullisomics, monosomics and trisomics.
8. Sex-determination and sex linked inheritance
9. Genetic code
10. plant breeding methods
11. Role of plant in crop-improvement.

Book Recommended:

1. Pawar, C.B. – Cell Biology
2. De Robertis – Cell & Molecular Biology
3. Rastogi, S.C. – Cell Biology
4. Rastogi, S.C. – Cell & Molecular Biology
5. Vijendra, L.D. & Das – Genetics & Plant Breeding
6. Ahleewalia, K.B. – Genetics
7. Sinha, V. & Sinha, S. – Cytogenetics, Plant Breeding & Evolution

PART-III
SEMESTER-V
PAPER – 15, Biochemistry and Biotechnology [50 lectures]
Instructions to Paper Setters
Full Marks: 70

Paper setters shall set questions in three groups.

- Group A :** Shall contain multiple choice questions, fill in the blanks and true / false type questions (10 x 1½ = 15)
Group B : Shall contain concept based questions - Answer any three questions (5 x 3 = 15)
Group C : Long answer questions – Answer any two questions (2 x 20 = 40)
 Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 30 (MSE) + 70 (ESE) = 100

Time: 3 Hours

Pass Marks: 45

1. Plant cell organelles and their roles: Mitochondria, Chloroplast, peroxisoms, glyosysomes, ribosomes and nucleus.
2. Amino Acids and Peptides, types
3. Enzymes: Nature, properties, types, classification, modes of action and factors of enzyme activities.
4. Lipids: Nature, types of fatty acids, biosynthesis of and metabolism of lipids.
5. Cell wall, cell membrane and their biochemical properties,
6. Role of plant tissue culture in agriculture, growth and differentiation, totipotency, organogenesis and embryogenesis.
7. Protoplast culture and somantic hybridization
8. Genetic engineering in plants and future of plant biotechnology.

Book Recommended:

1. Plant Breeding – L. D. Vigendra Das
2. Trehan, K. – Biochemistry
3. Rastogi, S.C., Sharma, V.N. & Tandan, Anuradha – Concepts in Molecular Biology
4. Okatone, R.O. – Basic Separation Techniques in Biochemistry
5. Srivastava, H.S. – Elements of Biochemistry
6. Rastogi, S.C. – Cell & Molecular Biology

PART-III
SEMESTER-V
PAPER – 16, Practical

Full Marks: 100

Time: 6 Hours

Pass Marks: 45

- | | |
|--|------------|
| 1. Perform Physiological experiments as given | 20 |
| 2. Mitosis/Meiosis (2 or more stages) | 20 |
| 3. Chi-Square test/emasculatation/hybridization | 10 |
| 4. Media preparation/ Snocceelalial for tissue | 10 |
| 5. Spotting | (5 x 2=10) |
| 6. Viva voce | 10 |
| 7. Field Report, Project work, Charts, Models etc. | 10 |
| 8. Class records | 10 |

PART-III
SEMESTER-VI
PAPER – 17, Molecular Biology [40 lectures]
Instructions to Paper Setters
Full Marks: 70

Paper setters shall set questions in three groups.

- Group A :** Shall contain multiple choice questions, fill in the blanks and true / false type questions (10 x 1½ = 15)
Group B : Shall contain concept based questions - Answer any three questions (5 x 3 = 15)
Group C : Long answer questions – Answer any two questions (2 x 20 = 40)
 Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 30 (MSE) + 70 (ESE) = 100

Time: 3 Hours

Pass Marks: 45

1. Nucleic acids: compositions of nucleic acids and synthesis of nucleotides: DNA structure; A, B and Z forms of DNA; denaturation and renaturation of DNA; Chromatin structure, DNA replication and recombination.
2. Gene structure, expression and regulation; gene organization in prokaryotes and eukaryotes, inducible, repressible, positive and negative gene regulation; interrupted genes in eukaryotes, RNA splicing, messenger RNA stability.
3. Recombinant DNA technology: Restriction Endonuclease, prokaryotic and eukaryotic cloning vectors, genomic and cDNA libraries, Southern and Northern analysis, various techniques gene mapping and DNA finger printing (RELP, RADP, AFLP)
4. Genetic Engineering: Vectors for gene delivery, selectable markers and reporter genes, methods of gene delivery, future of plant biotechnology.
 Agrobacterium: The fountain head of genetic engineering, Achievements and prospects.

Books Recommended:

1. Rastogi, S.C., Sharma, V.N. & Tandan, Anuradha – Concepts in Molecular Biology
1. Okatone, R.O. – Basic Separation Techniques in Biochemistry
2. Srivastava, H.S. – Elements of Biochemistry
3. Rastogi, S.C. – Cell & Molecular Biology

PART-III
SEMESTER-VI
PAPER – 18, Ecology [50 lectures]
Instructions to Paper Setters

Full Marks: 70

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions

(10 x 1½ = 15)

Group B : Shall contain concept based questions - Answer any three questions

(5 x 3 = 15)

Group C : Long answer questions – Answer any two questions

(2 x 20 = 40)

Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 30 (MSE) + 70 (ESE) = 100

Time: 3 Hours

Pass Marks: 45

1. Autecology and Synecology, biological spectrum, production ecology
2. Ecological factors: climatic, edaphic, topographical biotic factors.
3. Population ecology: Characteristics and equi-antance with population models.
4. Community structure, types of ecosystem, pyramids
5. Community dynamics, Succession: Xerosere & Hydrosere Concept of Climax Community.
6. Flow of energy and biogeochemical cycles
7. Ecological adaptations: Hydrophytes, Xerophytes Halophytes, Parasites.

Books Recommended:

1. Chopra, G. & Rishi, K.K. – Environmental Studies
2. Kumar, K. Vijaya – Env. Edn. And Solid Waste Management
3. De, Anil K. & De, Arnab K. - Environmental Studies
4. Sharma – Environmental Biology

BOTANY(H)
PART-III
SEMESTER-VI
PAPER – 19, Environmental Biology [50 lectures]

Instructions to Paper Setters

Full Marks: 70

Paper setters shall set questions in three groups.

Group A : Shall contain multiple choice questions, fill in the blanks and true / false type questions
(10 x 1½ = 15)

Group B : Shall contain concept based questions - Answer any three questions (5 x 3 = 15)

Group C : Long answer questions – Answer any two questions (2 x 20 = 40)

Altogether 5 questions have to be answered, where Groups A and B shall be compulsory.

Full marks: 30 (MSE) + 70 (ESE) = 100

Time: 3 Hours

Pass Marks: 45

1. Soil: types, formation, physicochemical nature, water holding capacity, soil profile and soil erosion and conservation
2. Non conventional source of energy
3. Biodiversity and its conservation
4. MAB programme, resource ecology and plant indicators
5. Environmental Pollution: air, water, sound, nuclear and their control measures.
6. Major vegetational belts of India
7. Environmental management of soil, water and air
8. Bio- indicators.

Books Recommended:

1. Chopra, G. & Rishi, K.K. – Environmental Studies
2. Kumar, K. Vijaya – Env. Edn. And Solid Waste Management
3. De, Anil K. & De, Arnab K. - Environmental Studies
4. Sharma – Environmental Biology

PART-III
SEMESTER-VI
PAPER – 20, Practical

Full Marks: 100

Time: 6 Hours

Pass Marks: 45

- | | |
|--|----|
| 1. Study of vegetation: number, frequency and density by Quadrant method | 15 |
| 2. Biochemical Test | 15 |
| 3. Ecological Anatomy | 15 |
| 4. Emasculation/Protein/Lipid/Hybridization | 15 |
| 5. Spotting | 10 |
| 6. Class Records | 10 |
| 7. Field Report, Project work, Chars, models etc. | 10 |
| 8. Viva voce | 10 |