

BABA MASTNATH UNIVERSITY

B.Sc. Botany Syllabus
Choice Based Credit System (CBCS)
[w.e.f.: 2022]



Prepared by
Department of Botany
BABA MASTNATH UNIVERSITY
Asthal Bohar, ROHTAK, HARYANA-12400

Handwritten signatures: Nitesh, Seema, Anil, and R.H. Kapoor

Meaning of Terms Used in Course

Core Course (CC): Every semester consist of core courses. These courses are the core requirement and to be compulsory studied by a student to complete the requirement of Programme in a said discipline of study.

Discipline Specific (DS) Course: These courses are the core requirement for ability enhancement and to be compulsory studied by a student to complete the requirement of Programme in a said discipline of study.

Discipline Specific Elective (DSE) Course: These may be offered by the main discipline/subject of study. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study)

Skill Enhancement (SE) Course: SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. It is mandatory as per course curriculum.


Examination Pattern

Theory

- Each theory paper shall be of 40 marks and consist of four units.
- Duration of theory exam is 3 hours
- Nine questions shall be set in all
- Question No.1 shall be compulsory. It shall be objective / short question type covering the entire syllabus.
- The remaining eight questions shall be set with two questions from each unit.
- The candidate shall be required to attempt Question 1 and four more selecting one from each section.

Practical Exam:

- Practical exams shall be held semester wise and at the end of each semester.
- Each practical exam shall be of 3 hours and of 50 Marks.
- Odd semester exam shall be conducted internally and internal examiner shall be appointed by the University/ Department.
- For the even semester evaluation, examination shall be conducted by External +Internal Examiner as approved by the University/ Department.



SCHEME OF EXAMINATION OF B. Sc. (MEDICAL) BOTANY SYLLABUS

Year	Semester	Course type	CODE	Paper	Title	Marks			Credits
						Exam	IA	Total	
I	I	Core	BBOTBMU-01	I	Algae, Fungi and Microbial Diversity	40	10	50	03
		Core	BBOTBMU-02	II	Diversity of Archaeogoniates	40	10	50	03
			BBOTBMU-03		Practical –I	40	10	50	02
	II	Core	BBOTBMU-04	I	Study of Phanerogems	40	10	50	03
		Core	BBOTBMU-05	II	Plant Anatomy	40	10	50	03
			BBOTBMU-06		Practical –II			50	02
II	III	Core	BBOTBMU-07	I	Angiosperm taxonomy	40	10	50	03
		Core	BBOTBMU-08	II	Embryology of Angiosperms	40	10	50	03
			BBOTBMU-09		Practical –III			50	02
		Skill Enhancement Course	BBOTBMU-10		Gardening	40	10	50	02
	IV	Core	BBOTBMU-11	I	Plant physiology & Metabolism	40	10	50	03
		Core	BBOTBMU-12	II	Ecology and Environment	40	10	50	03
			BBOTBMU-13		Practical –IV			50	02

		Skill Enhancement Course	BBOTBMU-14		Organic Farming Practices	40	10	50	02
III	V	Discipline specific	BBOTBMU-15	1	Plant Biochemistry and Biotechnology	40	10	50	03
		Discipline specific Elective	BBOTBMU-16A	*II A	Plant Cell Biology	40	10	50	03
		Discipline specific Elective	BBOTBMU-16B	*IIB	Instrumentation and Techniques	40	10	50	03
			BBOTBMU-17		Practical –V			50	02
	VI	Discipline specific	BBOTBMU-18	I	Economic Botany	40	10	50	03
		Discipline specific Elective	BBOTBMU-19 A	*II A	Plant Genetics	40	10	50	03
		Discipline specific Elective	BBOTBMU-19B	*IIB	Biodiversity	40	10	50	03
			BBOTBMU-20		Practical –VI			50	02
Total							1050	52	

NOTE: Students shall choose one discipline specific elective paper out of IIA AND IIB IN V and VI Semester
Internal Assessment: Sessional exam+ Attendance+ Assignment/Test/Presentation/ Any other activity = 10 Marks

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DETAILS OF COURSES

Core Courses –Botany

1. Algae, Fungi and Microbial Diversity
2. Diversity of Archaeogoniatas
3. Study of Phanerogems
4. Plant Anatomy
5. Angiosperm taxonomy
6. Embryology of Angiosperms
7. Plant physiology & Metabolism
8. Ecology and Environment

- ### Discipline Specific Courses
1. Plant Biochemistry and Biotechnology
 2. Economic Botany

Discipline Specific Courses Elective Course-Botany (Any two)

1. Plant Cell Biology
2. Instrumentation and Techniques
3. Plant Genetics
4. Biodiversity

Skill Enhancement Courses

1. Gardening
2. Organic Farming Practices

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SEMESTER-I
PAPER –I Algae, Fungi and Microbial Diversity
Code: BBOTBMU-01

Internal Assessment:10
Max. Marks: 40
Time: 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Algae: General account: General characteristics, thallus organization, reproduction and economic importance, Classification (upto classes)

Important features and life-history of *Oedogonium* (Chlorophyceae), *Vaucheria* (Xanthophyceae), *Ectocarpus* (Phaeophyceae) and *Polysiphonia* (Rhodophyceae)

UNIT-II

Fungi: General characteristics, Outline of classification (Ainsworth, Economic importance General feature and life history of *Mucor* (Zygomycotina), *Rhizopus* (Zygomycota), *Penicillium* (Ascomycota), and *Puccinia* (Basidiomycota).

Lichens: General characteristics, types, structure, reproduction, ecological and economic importance, General idea about Mycorrhiza

UNIT-III

Bacteria: Discovery, General characteristics, cell structure, nutrition, reproduction (asexual and bacterial recombination (Conjugation, Transformation, Transduction) and economic importance of Bacteria; General account of cyanobacteria (with reference to *Nostoc*).

UNIT-IV

Viruses: Discovery, general account, structure of Viruses including structure of TMV and Bacteriophages, Replication of T4 Phage (Lytic, Lysogenic



SEMESTER-I

Internal Assessment:10

Max. Marks: 40

Time: 3 Hrs.

PAPER –II : Diversity of Archaeogoniates Code: BBOTBMU-02

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Bryophyta- General Characteristics, classification (upto classes), reproduction, ecological and economic Importance.

UNIT-II

Morphology, structure, reproduction, alternation of generations of *Marchantia* (Hepaticopsida), *Anthoceros* (Anthocerotopsida), *Funaria* (Bryopsida).

UNIT-III

Pteridophyta- General Characteristics, classification (upto classes), alternation of generations, economic importance; Relationship of Pteridophytes with Bryophytes

UNIT-IV

Structure and reproduction (excluding development) of *Rhynia* (Psilopsida), *Selaginella* (Lycopsida), *Equisetum* (Sphenopsida) and *Pteris* (Pteropsida).

Suggested Readings

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4th edition.
5. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
6. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.
7. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
8. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

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B.Sc. SEMESTER -I BOTANY PRACTICAL SYLLABUS

Code: BBOTBMU-03

Suggested exercises:

(Algae, Fungi and Microbial Diversity and Diversity of Archaeogoniaties)

1. Identify, classify and write short morphological notes giving well labelled relevant diagrams on the given specimens A, B, C, D, E and F(Two each from Algae, Fungi, Bryophytes and Pteridophytes).
2. Study of vegetative and reproductive structures of the following : a) Cyanobacteria: *Nostoc* and *Scytonema*. b) Algae: *Oedogonium*, *Ectocarpus*, *Polysiphonia*, c) Fungi: *Rhizopus*, *Penicillium* and *Puccinia* .
3. Study of viruses and bacteria using electron photo micrographs (TMV, Bacteriophage, HIV, Cocci,, Bacillus, Spirillum bacteria).
4. Gram staining technique.
5. Study of Plant disease symptoms caused by Bacteria (Citrus canker, leaf blight of rice, Angular leaf spot of Cotton) and viruses (TMV, Bhendi vein clearing and Leaf curl of Papaya),Fungi (Late blight of potato, Red rot of Sugarcane and Paddy blast).
6. Note-book, collection and collection report.
7. viva-voce.

PAPER – I PRACTICALS

Max. Marks: 50

Time: 3 Hrs.

PRACTICAL MODEL PAPER I

(Algae, Fungi and Microbial Diversity and Diversity of Archaeogoniaties)

- | | |
|---|----------|
| 1. Section cutting of material A
(Slide preparation, diagrams, Identification) | 9 Marks |
| 2. Section cutting of material B | 9 Marks |
| 3. Identification of spotters -D, E, and F marks | 3x4 =12 |
| 4. Record (submission compulsory) and | 20 marks |
| 5. Viva -voce | |

Nites *Seema* *Arif* *Maha* *R.H. Kapoor*

B. Sc. I (Botany) Syllabus

SEMESTER-II

PAPER –I

STUDY OF PHANEROGAMS

Code: BBOTBMU-04

Internal Assessment:10

Max. Marks: 40

Time: 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT- I

Gymnosperms: General characters, classification (up to classes), diversity of Gymnosperms and economic importance; Geological Time Table; Evolution of Seed Habit.

UNIT- II

Palaeobotany-Fossils and Fossilization (Meaning, processes involved, types of Fossils and importance of Fossils; Paleobotanical nomenclature, Reconstruction of the following fossil plants:

Lyginopteris, *Williamsonia* and *Cycadeoidea* (=Bennettites).

UNIT- III

Morphology and anatomy of root, stem leaf/leaflet and reproductive parts including mode of reproduction, life-cycle and economic importance of the following: *Cycas*, *Pinus*, *Gnetum*

UNIT- IV

General characters of primitive angiosperms (Amentiferae, Ranales, Magnoliales).

General characters of angiosperms, Relationship of Gymnosperms with Angiosperms, Life cycle of angiosperms

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SEMESTER-II PAPER –II PLANT ANATOMY

Code: BBOTBMU-05

Internal Assessment:10

Max. Marks: 40

Time: 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks. UNIT-

I

Diversity in plant forms-annuals, biennials and perennials.

Tissues – Meristematic and permanent tissues (simple, complex, secretory) Tissue systems–Epidermal, ground and vascular

UNIT-II

Meristems - Root and Shoot apical meristems and their histological organization, Anatomy of root, stem and leaf

Epidermis and epidermal appendages and their morphological types; Stomatal apparatus

UNIT-III

Cambium: Structure and functions

Secondary growth: Secondary growth in dicot stem; characteristics of growth rings; sap wood and heart wood, periderm

Characteristics of timber wood, Study of local timbers of economic importance-Teak, Rosewood, Red sanders and Arjun

UNIT-IV

Secondary growth in dicot root

Abnormal and Anomalous secondary structures, Anomalous secondary growth in *Achyranthes*, *Begonia* and *Dracaena*.

Structural modifications in roots- storage(*Beta*), Respiratory (*Rhizophora*), Epiphytic (*Vanda*), Nodulated roots (Leguminous plants)

Suggested Readings: -

Bhatnagar, S. and Moitra, A. 1996. Gynnosperms. New Age International - Limited, New Delhi. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperm Taxonomy, Oliver and Boyd, London.

Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.

Heywood, V.H. and Moore, D.M. (Eds.) 1984. Current Concepts in Plant Taxonomy. Academic Press, London.

Jeifrey, C. 1982. An introduction to Plant Taxonomy. Cambridge University Press, Cambridge, London.

Jones, S.B., Jr. Luchsinger, A.E. 1986. Plant Systematics (2nd edition). McGraw Hill Book Co. New York.

Maheshwari, J.K. 1963. Flora of Delhi. CSIR, New Delhi.

Radford, A.E. 1986. Fundamentals of Plant Systematics. Harper and Row, New York.

Singh, G. 1999. Plant Systematics: Theory and Practical. Oxford and IBH Pvt. Ltd., New Delhi.

Sporne, K.R. 1965. The Morphology of Gynnosperms. Hutchinson & Co. Ltd., London.

Stace, C.A. 1989. Plant Taxonomy and Biosystematics (2nd edition). Edward Arnold, London.

Stewart, W.M. Paleobotany and the Evolution of Plants. Cambridge University Press, Cambridge

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B.Sc. SEMESTER -II BOTANY PRACTICAL SYLLABUS
(Code: BBOTBMU-06)
(Study of Phanerogams and Plant Anatomy)

Suggested exercises

1. Morphology (vegetative and reproductive structures) , anatomy of the following :
a. Pinus, Cycas, Gnetum.
2. Preparation of slide of Root, stem, leaf of available Gymnosperms and Angiosperms by double staining technique.
3. To study Tissue organization in root and shoot apices using permanent slides
4. Study of Anomalous secondary structure of *Achyranthes, Boerhavia* and *Dracaena* through permanent slide
5. Field visits to local timber stores and prepare report

PAPER - PRACTICALS

B.Sc. SEMESTER –II PRACTICAL MODEL PAPER
(Study of Phanerogams and Plant Anatomy)

Max. Marks- 50
Time- 3 Hrs.

1. Identify, classify and write morphological notes on the given specimens A and B '(from Gymnosperms) 10
2. Cut Transverse Section and prepare a double-stained permanent mount of the given material (from angiosperms/gymnosperms). Identify giving reasons and show it to the examiner. 10
3. Identify, giving the important characters of identification, the spots 1 and 2 (one material/slide each from gymnosperms and Angiosperms). 10
4. Write morphological notes on the specimens E and F (from angiosperms).
5. Note-book, Collection and Collection Report. 10 6. Viva-voce 10

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SEMESTER-III
PAPER –I ANGIOSPERM TAXONOMY
Code: BBOTBMU-07

Internal Assessment:10
Max. Marks: 40
Time: 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Flower and its parts, Types of Inflorescence, Keys to identification of plants, Botanical Nomenclature- Principles and rules of ICBN (taxonomic ranks and names; principle of priority, binomial system; type method, author citation, valid-publication)

UNIT-II

Taxonomy and Systematics, fundamental components of taxonomy (identification, classification, description, and phylogeny). Generalised idea and role of chemotaxonomy, cytotaxonomy and molecular taxonomy

UNIT-III

Salient features of the systems of classification of angiosperms proposed by Bentham & Hooker and Engler & Prantl, merits and demerits.

Taxonomic resources: Herbarium- functions& important herbaria, Botanical gardens, flora; Brief idea about online taxonomic resources (The Plant List, Index Nominum Genericorum (ING) or any other)

UNIT-IV

Diversity of Flowering Plants: Diagnostic features and economic importance of the following families: Lamiaceae, Brassicaceae,, Ranunculaceae, Rutaceae,, Malvaceae, Euphorbiaceae, Fabaceae , Solanaceae , Asclepiadaceae, Asteraceae, Apiaceae , Liliaceae and Poaceae.



SEMESTER-III
PAPER-II EMBRYOLOGY OF ANGIOSPERMS
Code: BBOTBMU-08

Internal Assessment:10
Max. Marks: 40
Time: 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Flower: Floral parts and their function, Structure of anther and Microsporangium; Microsporogenesis, pollen tetrads, dehiscence mechanism, microgametogenesis, pollen grains, and pollen wall and its development, Male gametophyte and its development

UNIT-II

Pollination: Types, agents, characteristics of floral part according to pollination agents Pollen-pistil interaction; Pollen germination, Self-incompatibility.

UNIT-III

Structure of Megasporangium (ovule), its curvatures; Megasporogenesis and Megagametogenesis; Female gametophyte; Embryo sac (mono-, bi- and Tetrasporic); Double fertilization; Endosperm types and its biological importance.

UNIT-IV


Embryogenesis: Dicot and Monocot; Polyembryony. Seed:

Structure of Dicot and Monocot seed

Fruit: Types, dispersal mechanisms in fruits and seeds

Suggested Readings

- Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms. 4th revised and Enlarged Edition. Vikas Publishing House, Delhi.
- Cutter, E.G. 1969. Plant Anatomy Part-I, Cells and Tissues, Edward Arnold, London.
- Cutter, E.G. 1971. Plant Anatomy :Experiment and Interpretation. Part-II Organs, Edward Arnold London.
- Esau, K. 1977. Anatomy of Seed Plants, 2nd Edition. John Wiley & Sons, New York.
- Fageri, K. and Van der Pijl 1979. The Principles of Pollination Ecology. Pergamon Press, Oxford. □
- Fahn, A. 1974. Plant Anatomy, 2nd Edition. Pergamon Press, Oxford.
- Hartmann, H.T. and Kestler, D.E. 1976. Plant Propagation; Principles and Practices. 3rd Edition. Prentice Hall of India Pvt. Ltd. New Delhi.
- King. J. 1997. Reaching for the Sun: How Plants Work. Cambridge University Press, Cambridge, U.K.



- Mauseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Company Inc., Menlo Park, California, USA.
- Proctor, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London. Raven,
- P.H. Evert, R.F. and Eichhorn, S.E. 1999. Biology of Plants. 5th edition. W.R. Freeman and Co., Worth Publishers, New York.
- Thomas, P. 2000. Trees: Their Natural History. Cambridge University Press, Cambridge.

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B.Sc. SEMESTER –III PRACTICAL SYLLABUS
Code: BBOTBMU-09
(Angiosperm taxonomy and Embryology of Angiosperms)

Suggested Exercises

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus.
2. Demonstration of herbarium techniques.
3. Structure of pollen grains using whole mounts (*Catharanthus, Hibiscus, Acacia, Grass*).
4. Study of ovule types and developmental stages of embryo sac using permanent slides Photographs.
5. Structure of endosperm (nuclear and cellular)
6. Developmental stages of dicot and monocot
7. Embryos using permanent slides / Photographs
8. Isolation and mounting of embryo (using Mustard/ *Senna* / *Crotalaria* or any other seed)
9. Field visits.
10. Study of local flora and submission of Field Note Book.

PAPER -III PRACTICALS

B.Sc. SEMESTER –III PRACTICAL MODEL PAPER

Max. Marks- 50
Time- 3 Hrs.

Angiosperm taxonomy and Embryology of Angiosperms

1. Describe/compare the given flowers A and B in semi-technical language giving V.S. of flowers, T.S. of ovaries, Floral Diagrams and Floral Formulae. Identify and assign them to their respective families giving reasons. (Slide preparation, diagrams, Identification) 10
2. Dissect out the globular/heart-shaped embryo from the given material. 10
3. Identification of Spots from taxonomy/ Anatomy(any four) 10
4. Note-book, Collection and Collection Report. 10
5. Viva-voce. 10

10



B. Sc. III (Botany) Syllabus
SEMESTER-IV
Paper – I Plant Physiology and metabolism
Code: BBOTBMU-11

Internal Assessment-10
Max. Marks – 40
Time– 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit. Question No. 1 will be compulsory (short answer type). Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Plant-water Relations: Importance of water to plant life; physical properties of water; Imbibition, Diffusion, Osmosis and Plasmolysis; absorption and transport of water; transpiration-types, factors affecting and importance, Stomata: physiology of stomata

UNIT-II

Mineral Nutrition: Essential macro and micro elements and their role; mineral uptake; active and passive absorption; deficiency symptoms.

Techniques for nutrition studies: Water and sand cultures.

Transport of Organic Substances: Mechanism of phloem transport; Source-sink relationship; Factors affecting translocation, Comparison of xylem and phloem transport

UNIT-III

Plant movements; Photoperiodism; Physiology of flowering; florigen concept; Phytochromes and their discovery, physiological role and mechanism of action.

Plant hormones- Introduction, mechanism of action and applications of auxins, gibberellins, cytokinins

UNIT-IV

Photosynthesis: Introduction, factors affecting, significance; historical aspects; photosynthetic pigments; Nature of light; absorption and action spectrum concept of two photosystems; Z-scheme; photo-phosphorylation; Calvin cycle; Hatch and Slack pathway

Respiration: ATP–the biological energy currency; aerobic and anaerobic respiration; Krebs cycle; Electron transport mechanism (chemi-osmotic theory); redox -potential; oxidative phosphorylation; Pentose phosphate pathway; CAM plants; photorespiration.

Alto *Seems* *Amj* *Muf* *R.H. Kapoor*

Paper - II ECOLOGY AND ENVIRONMENT

Code: BBOTBMU-12

Internal Assessment: 10

Max. Marks: 40

Time— 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit.

Question No. 1 will be compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Introduction to Ecology: Definition; scope and importance; levels of organization.

Ecosystem: Structure (components) and functions (trophic levels, food chains, food webs, ecological pyramids and energy flow); Biomagnification

UNIT-II

Population Ecology: Basic concept; characteristics; biotic potential, growth curves; ecotypes and ecads.

Community Ecology: Concepts; characteristics (qualitative and quantitative-analytical and synthetic); Methods of analysis; Ecological succession.

Adaptations of plants to water stress and salinity (morphological and anatomical features of hydrophytes, xerophytes and halophytes).

UNIT-III

Environment: Introduction; environmental factors- climatic (water, humidity, wind, light, temperature), edaphic (soil profile, physico-chemical properties), topographic and biotic factors (species interaction).

Phyto-geography: Phyto-geographical regions of India; vegetation types of India (forests).

UNIT-IV

Biogeochemical Cycles: Nitrogen, carbon, water and sulphur and phosphorus cycle.

Environmental Pollution: Soil and water pollution: Sources, types and control; Global warming and its impact on plant biodiversity

Suggested Readings:

- Odum, E.P. 1983: Basic Ecology, Saunders, Philadelphia.
- Kormondy, E.J. 1996: Concepts of Ecology, Prantice-Hall of India Pvt. Ltd., New Delhi.
- Mackenzie, A. et al. 1999: Instant Notes in Ecology, Viva Books Pvt. Ltd., New Delhi.
- Galston, A.W. 1989: Life Processes in Plants, Scientific American Library, Springer-Verlag, New York, USA.
- Hopkins, W.G., 1995: Introduction to Plant Physiology, John Wiley & Sons, Inc., New York, USA. □
- Mohr, H. and Schopfer, P. 1995: Plant Physiology. Springer-Verlag, Berlin Germany.
- Salisbury, F.B. and Ross, C.W. 1986: Plant Physiology. CBS Publishers and Distributors, New Delhi.
- Taiz, L. and Zeiger, E. 2003: Plant Physiology. Panima Publishing Corporation, New Delhi.

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Nitesh, Seema, Anil, Mohit, Rishi Kapoor

B.Sc. SEMESTER –IV PRACTICAL SYLLABUS (Code: BBOTBMU-13)
(Plant Physiology and Ecology and environment)

Suggested Exercises

Plant Physiology

1. Demonstration of phototropism, geotropism and hydrotropism.
2. Demonstration of Imbibition by plaster of Paris method.
3. Demonstration of Osmosis by potato osmoscope method.
4. Demonstration of Plasmolysis and Deplasmolysis
5. To study the Structure of stomata (Dicot & Monocot)
6. To study the Osmotic pressure of onion scale/ Rhoeo leaf peel by plasmolytic method.
7. Comparison of Stomatal and Cuticular Transpiration by four leaf /Cobalt chloride method.
8. Demonstration of transpiration by Ganong's/ Farmer's potometer.
9. Demonstration of Ascent of sap/Transpiration pull **Ecology and Environment**
 1. Determination of pH of soil and water samples by using Universal Indicator.
 2. Study of physical properties of soil-soil density, water holding capacity etc.
 3. Study of community structure by quadrat / line transact method.
 4. Determination of density, abundance and frequency of species by quadrat method.
 5. Morphological and anatomical features of hydrophytes, xerophytes and parasites in relation to their habitats.
 6. To prepare a report on local visit to an industry to identify the source and types of Pollutants.

B.Sc. SEMESTER –IV PRACTICAL MODEL PAPER

Paper-IV Practical

(Plant physiology & Ecology and environment)

Max. Marks – 50

Time- 3 hrs

1. Comment on the physiological/Biochemistry experiment(Specimen/ set-up / Model / Chart). 10
2. Identify and Classify spots 1, 2, 3, and 4 from the point of view of economic importance and morphology of the plant part used. 10
3. Ecological experiment/Ecological Specimens A & B (as per the list) 10
4. Note Book, Collection and field report. 5 + 5 = 10
5. Viva-voce. 10



SEMESTER-V

Paper – I PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

Code: BBOTBMU-15

Internal Assessment-10

Max. Marks – 40

Time– 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit.

Question No. 1 will be compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Lipid metabolism: Structure and functions of lipids; fatty acid biosynthesis; B-oxidation; saturated and unsaturated fatty acids; storage and mobilization of fatty acids.

Nitrogen metabolism: Biology of nitrogen fixation; importance of nitrate reductase and its regulation; ammonium assimilation

UNIT-II

Basics of Enzymology: Discovery and nomenclature; characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and co-factors; regulation of enzyme activity; mechanism of action.

UNIT-III

Genetic engineering and Biotechnology: Tools and techniques of recombinant DNA technology; cloning vectors; genomic and cDNA library; Introduction of genetic transformation: Principles, methods of genetic transformation; Transposable elements, biology of Agro-bacterium; vectors for gene delivery and marker genes

UNIT-IV

PTC: Introduction, aspects of plant tissue culture; media, sterilization techniques, cellular totipotency, differentiation and morphogenesis; idea about single cell culture, pollen culture, embryo culture

Suggested Readings:

1. Bhojwani, S.S. 1990: Plant Tissue Culture Applications and Limitations. Elsevier Science Publishers, New York, USA.
2. Lea, P.J. and Leegood, R.C. 1999: Plant Biochemistry and Molecular Biology, John Wiley & Sons, Chichester, England.
3. Nelson, D.L. and Cox, M.M. 2005: Lehninger Principles of Biochemistry. 4th Edition. W.H. Freeman and Company, New York.
4. Old, R.W. and Primrose, S.B. 1989: Principles of Gene Manipulation, Blackwell Scientific Publications, Oxford, UK.
5. Palmer, T. and Bonner, P. 2008: Enzymes-Biochemistry, Biotechnology, Clinical Chemistry (2nd Edition). East West Press Pvt. Ltd., New Delhi.
6. Raghavan, V. 1986: Embryogenesis in Angiosperms: A Developmental and Experimental Study, Cambridge University Press, New York, USA.
7. Rawn, J.D. 2004: Biochemistry. Panima Publishing Corporation, New Delhi.

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SEMESTER-V

PAPER –*IIA PLANT CELL BIOLOGY

Code: BBOTBMU-16A

Max. Marks - 40+10

Time- 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Cell: Introduction; **Eukaryotic cell components:** Endoplasmic Reticulum, Golgi Apparatus, Endoplasmic Reticulum, Lysosomes, Peroxisomes and Vacuoles, structure and function of ribosomes; Ultra structure and functions of cell membrane and nucleus

UNIT-II

Plant cell wall: Structure, Principle layers (Middle lamella, primary and secondary wall), Formation of cell wall, special structures of cell wall (Primary pits, pit fields), Brief idea about chemical nature of cell wall (cellulose, pectin, mucilage, cutin, suberin waxes etc.) Formation of intercellular spaces (Schizogenous and Lysogenous), General idea about plasmodesmata **UNIT-III**

Plastids: Proplastids, chloroplast Structure and function (Thylakoids, grana, frets), leucoplasts, amyloplasts, Chromoplasts, Etioplasts and Prolamellar Bodies

UNIT-IV

Cell Division: Cell cycle, Mitosis and Meiosis division, comparison of plant and animal cell division, **General idea about Signal transduction in plants** (Definition, Components, pathway and examples)

SUGGESTED READINGS

1. Power C.B., 1984, Cell Biology, Himalaya Publishing Co. Mumbai
2. De. Robertis and De Robertis, 1998, Cell and Moleceular Biology, K.M. Verghese and Company.
3. Smith, G.M. 1971. Cryptogamic Botany. Vol.I. Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.
4. Sharma, P.D. 1991. The Fungi. Rastogi & Co., Meerut.
5. Dube, H.C. 1990. An Introduction to Fungi, Vikas Publishing House Pvt.Ltd., Delhi.
6. Clifton, A. 1958. Introduction to the Bacteria: McGraw Hill & Co., New York.
7. Alberts, B.Bray, D.Lewis, J., Raff, M., Roberts, K. and Watson. I.D. 1999. Molecular Biology of Cell. Garland Publishing Co., Inc., New York, USA.
8. Atherly, A.G. Girton, J.R. and McDonald, J.F. 1999. The Science of Genetics, Saunders College Publising , Fort Worth, USA.
9. Gupta, P.K. 1999. A text book of Cell and Moleclular Biology. Rastogi Publications, Meerut, India.
10. Kleinsmith, L. J and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd edition) Harper Collins College Publishers, New York, USA.
11. Lodish, H., Berk, A., Zipursky, S.L., Matsudaria, P., Baltimoe, D. and Darnell, J. 2000. Molecular, Cell Biology, W.H. Freeman and Co., New York., USA.
12. Russel, P.J. 1998. Genetics, The Benjamin/Cummings Publishing Co. Inc., USA.

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SEMESTER-V

PAPER –IIB* INSTRUMENTATION AND TECHNIQUES

Code: BBOTBMU-16B

Internal Assessment: 10

Max. Marks: 40

Time– 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit.

Question No. 1 will be compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

Unit –I

Principles and applications of microscopy; Light microscopy; Fluorescence microscopy; Electron Microscopy; ; Transmission and Scanning electron microscopy

Unit- II

pH meter, Centrifuge: principle involved ; types of centrifuge, types of rotors ; Fluorescence, UV, Visible, NMR and ESR spectroscopy

Unit- III

Chromatographic techniques: Generalised idea and applications of Column , thin layer , paper, affinity , Gas and High performance liquid chromatography techniques

Unit IV

Understanding the details of Molar, Molal and normal solutions. Technique of handling micropipettes; Knowledge about common toxic chemicals and safety measures in their handling; laminar air-flow

Suggested Readings:

1. Dawson, C. (2002). Practical research methods. UBS Publishers, New Delhi.
2. Bajpai, P.K. 2006. Biological Instrumentation and methodology. S. Chand & Co. Ltd.
3. K. Wilson and KHGoulding. 1986. Principles and techniques of Practical Biochemistry. (3 edn) Edward Arnold, London
4. K. Wilson and J. Walker Eds. 2005. Biochemistry and Molecular Biology. Cambridge University Press.
5. 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.
6. Ruzin, S.E. (1999). Plant micro technique and microscopy. Oxford University Press, New York, U.S.A.

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B.Sc. SEMESTER –V PRACTICAL SYLLABUS (Code: BBOTBMU-17)

Suggested Exercises

Biochemistry

1. Determination of peroxidase activity.
2. Simple tests for the detection of Carbohydrates (Monosaccharides, Disaccharides and Starch); Proteins and Fats.
3. To separate of photosynthetic pigments by thin layer/paper chromatography
4. To study the rate of photosynthesis under varying CO₂ concentration using Wilmott's bubbler.
5. To study the effect of light intensity on oxygen evolution during photosynthesis using Wilmott's bubbler.
6. Demonstration of aerobic respiration.
7. Demonstration of anaerobic respiration.
8. To study the evolution of heat during respiration
9. Demonstration of Manometric determination of R. Q.

Cell Biology & Instrumentation and Techniques 1.

1. Stages of Mitosis from Material (Onion-root tips).
2. Stages of Meiosis from Material (Flower buds)
3. To study Light microscopy
4. Principle and measurement of microscopic objects under low power and high power.
5. To study principle and working of phase contrast microscope
6. To Study principle & operation of Centrifuge.
7. Preparation of normal, molar, and percent solution and knowledge about ppm/ppb by serial dilutions
8. To prepare standard acid and alkali and their standardization
9. pH meter and Measurement of pH of lemon juice, soft drinks, milk etc,
10. Study of principle of Chromatography and separation of amino acids mixture
11. Demonstration of Spectrophotometer
12. Demonstration of TLC, Paper Chromatography

B.Sc. SEMESTER –V PRACTICAL MODEL PAPER

Paper-III Practical: Plant Biochemistry and Biotechnology, Cell Biology and Instrumentation

Max. Marks – 50

Time- 3 hrs. 1. Devise an experiment to demonstrate the Biochemical process (as per the list).
Perform it and show it to the examiners. Or 10

2. Comment on the Instrument/Biochemistry experiment/ Cell Biology (Specimen/ set-up / Model / Chart/ Slide). 10

3. Prepare the root smear and find out two different stages of Mitosis/Meiosis. Identify and show it to the examiners. Also give characters of identification. 5
4. Test for carbohydrates / Proteins / Fats / Peroxidase activity/ Slide preparation. 5
5. Note Book, Collection and field report. 10
6. Viva-voce. 10

Note Scems Q.1 Q.2 Marks R.H. Kapoor
Q.1 Q.2 Marks R.H. Kapoor

SEMESTER-VI

Paper – I ECONOMIC BOTANY

Code: BBOTBMU-18

Internal Assessment-10

Max. Marks – 40

Time – 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit. Question No. 1 will be compulsory (short answer type). Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Origin, distribution, botanical description, brief idea of cultivation and uses of the following:

Food plants- Cereals (Wheat , Rice, Oat and Maize).

Pulses- (Gram, Arhar and Pea).

Unit II

Vegetables- (Potato, Tomato and Onion).

Fibres Idea about types of fibres and usage; Surface fibres: Cotton; Soft fibre: Jute and Hemp **Oils-** Sunflower, Groundnut, Mustard and Olive.

UNIT-III

Brief idea of cultivation and uses of the following:

Spices- From root (Asafetida); from underground stem (Ginger and Turmeric), from bark (Indian Cassia, Cinnamon)

Medicinal Plants- General categories of drug plants, Morphology and uses of: *Terminalia arjuna*, *Adhatoda vasica*, *Atropa*, *Opium*, *Cinchona*, *Cannabis*, Neem, Spiny Bamboo. **UNIT-IV**

Botanical description and processing of:

Rubber- *Hevea*.

Beverages- Tea and Coffee **Sugar-** Sugarcane.

General idea about wood, its sources and properties; Food adulteration **Suggested**

Readings:

2. Kocchar, S.L. 1998: Economic Botany in Tropics, 2nd edition, MacMillan India Ltd., New Delhi.
3. Sambammurthy, A.V.S.S. And Subramanyam, N.S. 1989: A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi.
4. Sharma, O.P. 1996: Hills Economic Botany (Late Dr. A.F. Hill adapted by O.P. Sharma), Tata McGraw Hill Co. Ltd., New Delhi.
5. Simpson, B.B. and Conner-Ogorzaly, M. 1986: Economic Botany- Plants in our World, McGraw Hill, New York.

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PAPER –IIA** PLANT GENETICS

Code: BBOTBMU-19A

Internal Assessment:10

Max. Marks: 40

Time: 3 Hrs.

Note: Attempt five questions in all, selecting two questions from each unit.

Question No. 1 is compulsory (short answer type).

Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

UNIT-I

Genetic Material: DNA: General idea, DNA structure and replication; General idea about Genetic Code; Satellite and Repetitive DNA, Mitochondrial and Plastid DNA

Genetics: Beginning of plant genetics, differences between plant and animal genetics, plant specific genetics, brief idea about experimental model plants: *Arabidopsis thaliana* and *Brachypodium distachyon*

UNIT-II

Mendelism: Discussion on Mendel's paper, Laws of segregation and Independent Assortment

Linkage: concept, complete and incomplete linkage, coupling and repulsion; Linkage Analysis; Allelic and non-allelic interactions.

UNIT-III

Genetic Variations: Mutations- spontaneous and induced; micro and macro mutations, brief idea about mutagenic agents in plant mutation, application of plant mutagenesis

Transcription and Translation: Modern concept of gene; Types of RNA (mRNA, tRNA, rRNA), their structure and function, Transcription and Translation

UNIT-IV

Polyploidy: Brief idea about polyploidy (autopolyploids and allopolyploidy) and its role in crop breeding

Overview of Plant Genetic Resources (PGR); Meaning, objectives and purposes

SUGGESTED READINGS:

1. Atherly, A.g. Girton, J.R. and McDonald, J.F. 1999. The Science of Genetics, Saunders College Publishing, Fort Worth, USA.
2. Gupta, P.K. 1999. A text book of Cell and Molecular Biology. Rastogi Publications, Meerut, India
3. Kleinsmith, L.J. and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd edition). Harper Collins College Publishers, New York, USA.
4. Lodish, H., Berk, A., Zipursky, S.L., Matudaria, P., Baltimore, D. and Darnell, J. 2000. Molecular, Cell Biology, W.H. Freeman and Co., New York, USA.
5. Russel, P.J. 1998. Genetics, The Benjamin/Cummings Publishing Co. Inc., USA.
6. Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics. John Wiley and Sons, Inc. USA.
7. Smith, G.M. 1971. Cryptogamic Botany, Vol.II, Bryophytes & Pteridophytes. Tata McGraw Hill Publishing Co., New Delhi.
8. Sharma, O.P. 1992. Text Book of Thallophytes, McGraw Hill Publishing Co.
9. Sharma, O.P. 1990. Text Book of Pteridophyta, Mc Millan India Ltd.
10. Puri, P., 1980, Bryophyta, Atma Ram & Sons, Delhi.

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****II B PAPER II BIODIVERSITY**

Code: BBOTBMU-19B

Internal Assessment-10

Max. Marks-40

Time- 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit.

Question No. 1 will be compulsory (short answer type). Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

Biodiversity: Definition, types, levels, Idea about measurement of biodiversity: Economic and ecological values of biodiversity; Global concern and global status on biodiversity, Threats to biodiversity, Idea about Megadiverse Countries

Unit II

Conservation: Reasons of loss of biodiversity, Need of conservation, Conservation strategies and different methods of biodiversity conservation; Idea about NBA and Biodiversity Boards **Unit III**

Forests: Types of forests, Ecological and economic importance of forests, General idea about desertification, afforestation, reforestation, deforestation and social forestry; Energy plantation **Unit IV**

Environmental Pollution: Pollution: Soil, air, water and noise pollution: Definition, causes, Harmful effects, Control measures; Ozone depletion and its effect on plant diversity

SUGGESTED READINGS:

1. Palaniappan SP & Anandurai K. 1999. Organic Farming—Theory and Practice. Scientific Publishers, Jodhpur
2. Joshi, M. 2014. New Vistas of Organic Farming 2nd Ed. Scientific Publishers, Jodhpur.
3. Farming system : Theory and Practice - S.A.Solaimalai
4. Organic Farming: Theory and Practice- S.P.Palaniappan and K.A. Annadurai
5. A hand book of Organic Farming by A.K.Sharma
6. Oosting, H.G. (1978): Plants and Ecosystem Wadworth Belmont.
7. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.,) New Delhi, Bombay, Calcutta-226pp., 9.
Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
8. Kumar H.D. (2000): Biodiversity & Sustainable Conservation Oxford & IBH Publishing a. Co Ltd. New Delhi.
9. Newman, E.I. (2000): Applied Ecology Blackwell Scientific Publisher, U.K.
10. Chapman, J.L.&M.J. Reiss (1992): ecology (Principles & Applications). Cambridge University Press, U.K.
11. Cain, S.A . (1944): Foundations of Plant Geography Harper & Brothers, N.Y.
12. Mani, M.S (1974): Ecology & Biogeography of India Dr. W. Junk Publishers, The Hague
13. Good, R. (1997): The Geography of flowering Plants (2nd Edn.) Longmans, Green & Co., Inc., London & Allied Science Publishers, New Delhi

Notes *Scenes* *Quiz* *Ques* *Mid* *R.H. Kapoor*

B.Sc. SEMESTER –VI PRACTICAL SYLLABUS

(Code: BBOTBMU-20)

Suggested Exercises Economic

Botany

1. Study of plant parts / products from the point of view of economic importance (as per theory syllabus).
2. To prepare any one of the tissue culture medium.
3. To prepare the slants and Petri plates for plant tissue culture.
4. Study of techniques of sterilization, culturing and sub-culturing of cell, tissues and organs.
5. Demonstration of another culture, protoplast isolation and culture using suitable models /charts / photographs etc.
6. Brief introduction to the components and working of the instruments

Genetics and Biodiversity

1. Experiments on Monohybrid and Dihybrid ratios.
2. Numerical regarding Genetics (Mendelian Inheritance or Gene Interaction) as per syllabus.
3. Gene Interactions and modified Dihybrid ratios
4. To study about Biodiversity management committee
5. Study of plants included in agro forestry 6. Study of plant included in social forestry.
7. To locate the hotspots in the map of India
8. Study of endangered plants species, critically endangered plants species, vulnerable plant
9. species and monotypic endemic genera of India with the help of Field visit/ Herbarium, Photographs etc,
10. To study information about Floras, Red data book

Abhishek *Seema* *Chiranjeev* *Mukesh* *Rishi Kapoor*

SKILL ENHANCEMENT COURSE

SEMESTER III GARDENING

Code: BBOTBMU-10

Internal Assessment-10

Max. Marks-40

Time- 3 Hrs.

Unit I

Introduction, definition, objectives, different components of garden, Types and scope of gardening, layout Plan for garden and lawns, Famous gardens of India

Unit II

Gardening operations: General idea about garden tools & implements, identification of ornamental/ vegetable/ fruit plants , selection of garden crop plants

Unit III

Soil preparation and laying, preparation of nursery bed and seedlings, Nutrition requirement: manuring and fertilizer ; watering; Maintaining cleanliness in gardens

Unit IV

Preparation of pot mixtures, potting and repotting of plants. Idea about Airlayering, cutting, selection of cutting, season of propagule collecting, cutting rooting medium, planting of cuttings General idea about Cacti and succulents. Brief idea about Indoor gardening and Bonsai.

Abhishek *Seema* *Chiranjeev* *Mukesh* *Rishi Kapoor*

**SKILL ENHANCEMENT COURSE
SEMESTER IV**

ORGANIC FARMING PRACTICES

Code: BBOTBMU-14

Internal Assessment-10

Max. Marks-40

Time- 3 Hrs.

Note: Five questions to be attempted in all, selecting two questions from each unit.

Question No. 1 will be compulsory (short answer type). Nine questions are to be set spread over the entire syllabus. All questions carry equal marks.

Unit I: Introduction about organic farming:

Introduction about Farming and organic farming, Historical perspective about organic farming, Conventional versus organic farming, Principles and approaches to organic farming, practices of organic farming; Idea about Agencies and institutions linked to organic farming,

Unit II Scope and requirements of organic farming

Scope of organic farming (Local, national and international), Requirements of organic farming: Crop selection, Choice of Varieties, Land preparation and Mulching; Nutrient management: Green manure, farm yard manure, compost and vermicompost, Biofertilizers, Agro Industrial waste, minerals etc., Idea about Biodynamic preparations

Unit-III: Management Practices

Water management; Crop planning Plant protection: Weed management: Preventive methods, Physical and biological methods

Insect pest management: Cultural, mechanical, biological pesticides methods

Unit IV Integration of organic farming

Integration of animal husbandry in organic farming

Idea about Apiculture, sericulture and mushroom cultivation

Subh *Seema* *Arif* *Maha* *R.H. Kapoor*