



Tripura University

(A Central University)

Suryamaninagar

West Tripura

Syllabus for

Four Years Undergraduate Programme

Subject: Fundamental Botany

(Interdisciplinary course)

(As per NEP-2020)

Year-2023



Tripura University
(A Central University)

Course Structure of Botany (UG Programme)
As per NEP-2020 under Tripura University

FUNDAMENTAL BOTANY
(Interdisciplinary Course)

Year	Semester/ Paper code	Paper	Credits	Marks	Unit-I	Unit-II	Unit-III	Unit-IV
1 st	1 st BT-101 ID	Paper-1 Theory	3	100 (IA=40 + ESE=60)	Microbiology	Algae	Fungi & Plant Pathology	Bryophyta & Pteridophyta
2 nd	3 rd BT-201 ID	Paper-2 Theory	3	100 (IA=40 + ESE=60)	Gymnosperms & Paleobotany	Floral Morphology	Taxonomy	Economic Botany
	4 th BT-202 ID	Paper-3 Theory	3	100 (IA=40 + ESE=60)	Plant Anatomy & Ecology	Cytogenetics	Molecular Biology	Plant Physiology

**Interdisciplinary Course: Fundamental Botany
SEMESTER-I
Paper-1 (Theory)**

BT-101 ID - Microbiology & Cryptogamic Botany

Total Marks = 100 (IA = 40 + ESE = 60)

(Credits = 03)

Unit-I: Microbiology

1. **Virus:** General properties of plant virus, Structure of Bacteriophage (T4 phage), Structure of RNA virus (TMV); Definition of Lytic and Lysogenic cycle.
2. **Bacteria:** General characters of bacteria; Morphological forms, Cell structure, Genetic recombination in bacteria-Transformation, Transduction and Conjugation; Economic importance of bacteria.

Unit-II: Algae

1. **Algae:** General characters, Thallus organization; Reproduction in algae – Vegetative, Asexual (spore types) and Sexual (concept of Isogamy, Anisogamy & Oogamy); Salient features of – Cyanophyceae, Chlorophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae; Economic importance of algae.

Unit-III: Fungi and Plant Pathology

1. **Fungi:** General characters including fungal mode of nutrition; Asexual spore forms and Sexual reproduction; General characters of- Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes; Economic importance of Fungi.
2. **Plant Pathology:** Definition of- Host, Pathogen, Pathogenicity, Pathogenesis, Infection, Incubation period, Inoculum, Inoculum potential, Symptom, Causal complex, Disease cycle, Endemic disease, Epidemic disease, Sporadic disease; Koch's postulates, Types of symptoms - Necrotic, Atrophic, Hypertrophic; Symptoms, Casual organisms, symptoms and Control measures of the following diseases: Late blight of Potato, Brown sport of Rice and Black stem rust of Wheat.

Unit-IV: Bryophyta and Pteridophyta

1. **Bryophyta:** General characters including amphibian nature; General idea of Life cycle of Bryophytes; Origin of Bryophytes; Distinctive features of classes – Hepaticopsida, Anthocerotopsida and Bryopsida.
2. **Pteridophyta:** Characteristic features of Pteridophytes; Concept of Homospory and Heterospory; Concept of Eusporangiate and Leptosporangiate pteridophytes; Lifecycle of Pteridophytes (general idea); General characters of the classes Psilophytopsida, Psilotopsida, Lycopsida, Sphenopsida and Pteropsida.

**Interdisciplinary Course: Fundamental Botany
SEMESTER-III
Paper-2 (Theory)**

BT-201 ID - Gymnosperms, Paleobotany, Taxonomy & Economic botany

Total Marks=100 (IA =40 + ESE= 60)

(Credits=03)

Unit-I: Gymnosperms and Paleobotany

1. **Gymnosperms:** General characters; Important characters of three classes- Cycadopsida, Coniferopsida, & Gnetopsida; Economic importance of Gymnosperms with reference to Wood, Resins, Essential oils, and Drugs; Distinctions and similarities between- Pteridophytes & Gymnosperms, Gymnosperms & Angiosperms; Distribution of species of *Cycas*, *Pinus* & *Gnetum* in India.
2. **Paleobotany:** Definition of Fossil; Types of fossils (Microfossil, Mega fossil and its types on the basis of nature of fossilization); Importance of fossil study; Geological time scale with dominant plant groups with ages.

Unit-II: Floral Morphology

1. **Floral morphology:** Inflorescence – Racemose & Cymose; Definition of Peduncle & Flower; Flower types, Floral parts-Calyx (types & modifications), Corolla(types & forms), Aestivation; Androecium - Stamen, Union of stamens; Gynoecium – Carpel (Apocarpous & Syncarpous), Ovary (superior & inferior), Placentation types; Process of double fertilization; Endosperm–Nuclear, Cellular and Hellobial types.

Unit-III: Taxonomy

1. **Taxonomy:** Definition of Taxonomy & Systematics, Definition of Identification, Nomenclature & Classification, Definition and example of Artificial, Natural and Phylogenetic system of classification; Principles of ICN; Herbarium and its function, Botanical Gardens and its importance; Important Herbaria and Botanical Gardens of India and world (3 each); Diagnostic characters and economically important plants of the families – Poaceae, Orchidaceae, Magnoliaceae, Solanaceae, Cucurbitaceae, Leguminosae, Compositae.

Unit-IV: Economic Botany

1. Scientific name, family, part used, and uses of following plants: **Cereal**–Rice, Wheat; **Pulses**–Moong and Lens; **Beverages**– Tea and Coffee; **Fruits**– Mango, Citrus and Papaya; **Drug yielding**–Rauwolfia, Digitalis and Andrographis; **Spices**– Ginger, Cumin and Clove; **Oil yielding**–Mustard and Groundnut; **Vegetables**–Potato, Radish and Cabbage; **Fibre yielding**– Cotton and Jute; **Timber yielding**–Teak and Sal; **Sugar yielding**– Sugarcane.
2. **Cultivation of- Rice (conventional method) and Rubber.**

Interdisciplinary Course: Fundamental Botany
SEMESTER-IV
Paper- 3 (Theory)

BT-202 ID - Anatomy, Ecology, Genetics, Molecular Biology & Plant physiology

Total Marks = 100 (IA = 40 + ESE = 60)

(Credits = 03)

Unit-I: Plant Anatomy and Ecology

- 1. Plant Anatomy:** Chemical composition and gross structure of Cell wall; Meristematic tissue – Classification on the basis of position, origin and function; Simple permanent tissues – Structure, distribution and function of parenchyma, collenchyma and sclerenchyma; Cell types of Xylem and Phloem; Vascular bundle types; General anatomical characters of monocot stem and root, Dicot stem and root.
- 2. Ecology:** Basic ecological concepts of-Trophic levels, Food chain, Food web, Ecological pyramids, Energy flow; Habitat and Ecological Niche; Definition of- Population, Community and Ecological succession; Adaptations of Hydrophytes, Xerophytes and Halophytes.

Unit-II: Cytogenetics

- 1. Cell Biology:** Cell cycle - various phases and events, Cell division – Mitosis and Meiosis; Structure and function of cell organelles–Plasma membrane, Nucleus, Mitochondria, Chloroplast and Ribosome; Chromosome morphology, Nucleosome concept, Euchromatin and Heterochromatin.
- 2. Genetics:** Mendelian genetics - Principles of segregation and independent assortment; Concept of Dominance, Incomplete dominance & Codominance; Dominant epistasis; Linkage - Definition of complete and incomplete linkage; Crossing over, Definition of Aneuploidy, Euploidy & Polyploidy.

Unit-III: Molecular Biology

- 1. Molecular Biology:** Nucleoside and Nucleotide, Watson and crick model of DNA structure; Prokaryotic DNA replication (General properties), Central dogma of molecular biology, Prokaryotic Transcription, Genetic code (properties) and Translation (prokaryotic).

Unit-IV: Plant Physiology

- 1.** Definition of water potential, osmosis, diffusion and plasmolysis; transpiration and antitranspirants.
- 2. Photosynthesis:** Light reaction– PSI & PSII, Cyclic and Non-cyclic photophosphorylation; CO₂ fixation - C₃ cycle, C₄ cycle.
- 3. Respiration:** Glycolysis and TCA cycle.
- 4. Photoperiodism:** Photoperiodic responses and classification of plants.
- 5. Physiological roles of:** IAA, Gibberellin and Cytokinin.
- 6. Biological Nitrogen fixation:** Root nodule formation, role of Nitrogenase and leg haemoglobin.

SUGGESTED BOOKS AND REFERENCES

General studies

1. Ganguli, H.C., Das, K.S & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency.
2. Ganguli, H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency.
3. Hait, G., Ghosh, A. and Bhattacharya, K. A Text Book of Botany (Vols. I, II & III), 2007, New Central Book Agency.
4. Lock, A.J., & Evans, D.E., Plant Biology, 2001, Viva Books.
5. Mitra, J. N., Mitra, D. and Chaudhuri, S. K. Studies in Botany (Vol-I), Moulik Library.
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7. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency.
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Microbiology

1. Dubey, R. C. and Maheshwari, D. K. (2007), A textbook of Microbiology, S. Chand and Co., New Delhi.
2. Hogg, S. (2013), Essential Microbiology, 2nd Edition, Wiley-Blackwell.
3. Pelczar, M.J. (2001), Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
4. Prescott, L.M., Harley J.P. and Klein D. A. (2005), Microbiology, 6th Edition, McGraw Hill, India.
5. Sharma P. D. (1999), Microbiology and Plant Pathology, Rastogi Publications, Meerut, UP.

Phycology

1. Kumar, H.D. (1999), Introductory Phycology, 2nd edition, Affiliated East-West Press, Delhi.
2. Lee, R.E. (2008), Phycology, 4th edition, Cambridge University Press, Cambridge.
3. Sahoo, D. and Seckbach, J. (2016), The Algae World, Springer.
4. Sharma, O.P. (2011), Algae, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
5. Vashista B. R., Singh A.K. and Singh V.P. (2005), Botany for Degree Students-Algae, S. Chand and Co., New Delhi.

Mycology

1. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. (1996), Introductory Mycology, 4th edition, John Wiley & Sons (Asia), Singapore.
2. Deacon, J. W. (2006), Fungal Biology, 4th Edition, Blackwell Publishing Ltd.
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4. Vashista, B. R., Singh, A.K. and Singh, V.P. (2005), Botany for Degree Students-Fungi, S. Chand and Co., New Delhi.
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6. Webster, J. and Weber, R. (2007), Introduction to Fungi, Cambridge University Press, Cambridge.

Bryophyta

1. Parihar, N.S. Introduction to Embryophyta (Vol. 1 Bryophyta), Central Book Distributors.
2. Shaw, A. Jonathan and Goffinet Bernard, Bryophyte Biology, 2009, Cambridge University Press
3. Rashid, A. An Introduction to Bryophyta, 1998, Vikas Publishing House
4. Chopra, R.N. & Kumar, P.K. Biology of Bryophyta, Latest Ed., Wiley Eastern
5. Puri, P. Bryophyte, Latest Ed., Atmaram & Sons.
6. Vashista, B.R. Bryophyta, Latest Ed., S. Chand & Company.

Pteridophyta

1. Spore, K.R. The Morphology of Pteridophyte, Latest Ed. , Hutchinson & Co. Ltd.
2. Rashid, A. An Introduction to Pteridophyte, Latest Ed., Vani Educational Books.
3. Vashista, P.C. Pteridophyta, Latest Ed., S. Chand & Company Pvt. Ltd.
4. Gifford, E. M. & Foster, A. S. Morphology & Evolution of Vascular Plants (3rd ed.), 1998, Freeman and Co.

Gymnosperm

1. Bhatnagar, S.P. & Moitra, A. Gymnosperm, 1997, New Age International
2. Biswas, C. & Johri, P.M. The Gymnosperm, 1997, Narosa Publishing House.
3. Dutta, S.C. An Introduction to Gymnosperms (3rd ed.), 1984, Kalyani Publishers.
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5. Karkar, R.K. & Karkar, R. The Gymnosperms, Latest Ed.
6. Sporne, K.R. The Morphology of Gymnosperms, Latest Ed., Hutchinson & Co. Ltd.
7. Vashishta, P.C. Gymnosperm, Latest Ed., S. Chand & Company Pvt.

Paleobotany & Palynology

1. Agashe, S.N. Paleobotany, Latest Ed., Oxford & IBH.
2. Bhattacharya, K., Majumdar, M.R. & Gupta Bhattacharya, S. A Text Book of Palynology, 2006, New Central Book Agency.
3. Nair, P.K. Pollen Morphology of Angiosperms, Latest Ed., Scholar Publications.
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Evolution

1. Futuyma, D. J. and Kirkpatrick, M. (2017), Evolution, 4th edition, Sinauer Associates, USA.
2. Rastogi, V. B. (2018), Organic Evolution, Pub: Medtech, New Delhi.
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4. Strickberger, M. W. (2000), Evolution, 3rd edition, Jones & Bartlett Publishers.
5. The Princeton Guide to Evolution (2014), Princeton University Press.

Phytopathology

1. Agrios, G.N. (1997), Plant Pathology, 4th edition, Academic Press, Cambridge, U.K.
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Angiosperm Morphology

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Embryology

1. Bhojwani, S.S. & Bhatnagar, S.D. (1989), The Embryology of Angiosperms (4th ed.), Publishing House.
2. Lersten, N. R. (2004), Flowering Plant Embryology with Emphasis on Economic Species, Blackwell Publishing.
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4. Raghavan, V. (1997), Molecular Embryology of Flowering Plants, Cambridge University Press.

Plant Anatomy

1. Beck, C. B. (2010), An Introduction to Plant Structure and Development – Plant Anatomy for the Twenty – First Century, 2nd edition, Cambridge University Press.
2. Crang, R., Sobaski, S. L. and Wise, R. (2018), Plant Anatomy – A Concept Based Approach to the Structure of Seed Plant, Springer.
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Taxonomy

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2. Jeffrey, C. An Introduction to Plant Systematics, Latest Ed., Allied Publishers Pvt. Ltd.
3. Lawrence, G.H.M. Taxonomy of Vascular Plants Ed., Oxford & IBH.
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Plant Ecology, Biodiversity & Phytogeography

1. Ambasht, R.S. & Ambasht, N.K. A Text Book of Plant Ecology, Latest Ed., CBS Publication & Distributors.
2. Cain, Bowman, Hacker. Ecology. 2014. 3rd Ed. Sinauer Associates.
3. Huggett, R. J. Fundamentals of Biogeography (2nd Ed), 2004, Routledge.
4. Krishnamurthy, K.V. An Advanced Text Book on Biodiversity, 2003, Oxford & IBH Publishing Co. Ltd.
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10. Verma, P.S. & Agarwal, U.K. Concept of Ecology, Latest Ed., S. Chand & Company.

Biochemistry, Plant Physiology & Plant Developmental Biology

1. Buchanon, Gruissen and Jones. Plant Physiology & Biochemistry: Biochemistry and Molecular Biology of plants, 2000, I.K. International.
2. Chaudhuri, D., Kar, D.K., and Halder, S.A. Handbook of Plant Biosynthetic Pathways, 2008, New Central Book Agencies.
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Cell Biology, Genetics & Molecular Biology

1. Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts and Peter Walter, Molecular Biology of the Cell (6th Ed), 2015, Garland Science.
2. Cooper, G.M. The Cell, A Molecular Approach (4th Ed), 2007, ASM Press.
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12. Weaver, R.F. Molecular Biology (5th Ed), 2012, McGraw Hill.

Plant Tissue Culture & Biotechnology

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Economic Botany

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Plant Breeding & Biometry

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Horticulture & Floriculture

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Pharmacognosy

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Industrial Microbiology, Algal Biotechnology & Applied Mycology

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Intellectual Property Rights (IPR)

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