



**PROF. RAJENDRA SINGH (RAJJU BHAIYA) UNIVERSITY,
PRAYAGRAJ**

**Structure of Syllabus for the
Program: M.Sc. Subject: BOTANY**

Structure of Syllabus Developed by			
Name of BoS Convener/BoS Member	Designation	Department	College/ University
DR. KANCHAN LATA	CONVENOR	BOTANY	DDU GOVERNMENT PG COLLEGE SAIDABAD PRAYAGRAJ
DR. JUHI SINGH	MEMBER	BOTANY	DDU GOVERNMENT PG COLLEGE SAIDABAD PRAYAGRAJ
DR. SANTOSH KUMAR SINGH	MEMBER	BOTANY	MAHAMAYA GOVERNMENT COLLEGE DHANUPUR PRAYAGRAJ
PROF. ANUPAM DIXIT	MEMBER	BOTANY	ALLAHABAD UNIVERSITY
PROF. N. B. SINGH	MEMBER	BOTANY	ALLAHABAD UNIVERSITY
PROF. N. K. DUBEY	MEMBER	BOTANY	BHU VARANASI

Course Code		Course Title	Credits	T/P	Evaluation	
A	B	C	D	E	CIE	ETE
SEMESTER I (YEAR I)						
B040701T	CORE	Plant Virology and Bacteriology	5	T	25	75
B040702T	CORE	Mycology and Plant Pathology	5	T	25	75
B040703T	CORE	Limnology, Phycology, Lichenology and Bryophyta	5	T	25	75
B040704T	FIRST ELECTIVE (Select any one)	Microbiology	5	T	25	75
B040705T		History of Botany and Microtechnique				
B040706P	SECOND ELECTIVE (Select any one)	Practical based on core/Elective	4	P	50	50
B040707P		Practical/ Field Visit/ Project Presentation				
SEMESTER II (YEAR I)						
B040801T	CORE	Pteridophyta, Gymnosperms and Palaeobotany	5	T	25	75
B040802T	CORE	Plant Morphology, Plant Anatomy and Embryology	5	T	25	75

B040803T	CORE	Taxonomy of Angiosperm	5	T	25	75
B040804T	THIRD ELECTIVE (Select any one)	Plant Resource Utilization	5	T	25	75
B040805T		Medicinal Plants and Ethnobotany				
B040806P	FOURTH ELECTIVE (Select any one)	Practical based on core/Elective	4	P	50	50
B040807P		Practical / Industrial Training/ Project Presentation				
SEMESTER III (YEAR II)						
B040901T	CORE	Plant Physiology	5	T	25	75
B040902T	CORE	Plant Biochemistry	5	T	25	75
B040903T	CORE	Cytogenetics and Biostatistics	5	T	25	75
B040904T	FIFTH ELECTIVE (Select any one)	Ecology and Phytogeography	5	T	25	75
B040905T		Plant Breeding and Crop Improvement				
B040906P	SIXTH ELECTIVE (Select any one)	Practical based on core/Elective	4	P	50	50
B040907P		Practical/Project presentation				
SEMESTER IV (YEAR II)						
B041001T	CORE	Molecular Biology and Molecular Technique	5	T	25	75
B041002T	CORE	Plant Biotechnology	5	T	25	75
B041003T	SEVENTH ELECTIVE (Select any one)	Applied Phycology	4	T	25	75
B041004T		Advance Plant Pathology				
B041005R	RESEARCH PROJECT/ DISSERTATION	Major Research Project/ Dissertation	10	R	50	50

NOTE:

- Do not mark any Code/Information in Column-A, it will be indorsed by the University.**
- T/P** in Column-E stands for **Theory/Practical**.
- CIE** in Column-F stands for **'Continuous Internal Evaluation'** and depicts the maximum internal marks. Respective examination will be conducted by subject teacher.
- ETE** in Column-G stands for **'External Evaluation'** and depicts the maximum external marks. Respective Examination will be conducted by the University.
- Column-B defines the nature of course/CORE. The word **CORE** herein stands for **Compulsory Subject CORE**.
- Column-D depicts the credits assigned for the corresponding course/CORE.
- First Elective:** It will be a Subject Elective. Students may select one of the two subject COREs under this category.
- Second Elective:** It will designate a Practical CORE or equivalently a Field Visit or Project Presentation. In case of Field Visit, student is required to submit a detailed report of the visit for the purpose of evaluation. The report should include the observational features and benefits of the visit. In case of Project Presentation, the student may be assigned to go for a survey/practical or theoretical project/assignment or seminar with presentation.
- Third Elective:** It will be a Subject Elective. Students may select one of the two subject COREs under this category.

10. **Fourth Elective:**It will accommodate a practical CORE or Industrial Training or Project Presentation. In case of Industrial Training, student may be allowed for the summer training and is required to submit a detailed training report including training certificate for the evaluation.
11. **Fifth Elective:**It will be a Subject Elective. Students may select one of the two subject COREs under this category.
12. **Sixth Elective:**It will be a Practical CORE or equivalently a Project Presentation based on Survey/ Seminar/ Assignment. In case of Project Presentation, student has to submit an exhaustive report on respective topic and to face an open presentation for the evaluation.
13. **Seventh Elective:**It will be a Generic Elective. The student may study or receive training of the any subject of his interest (depends on the availability in his institution of enrollment).
14. **Master Research Project:**It will be a Major Research Project or equivalently a research-oriented Dissertation on the allotted topic. The student will have to complete his/her research project under any supervisor. The supervisor and the topic for research project shall be allotted in second semester. The student straight away will be awarded 05 credits if he publishes a research CORE on the topic of Research Project or Dissertation.

SEMESTER I

CORE – I PLANT VIROLOGY AND BACTERIOLOGY

UNIT I

Morphology and Structure of Bacterial cell: Morphology of Bacterial cell based on size, shape and arrangement, fine structure of bacterial cell (of Gram positive and Gram negative bacteria)- Capsule, cell wall, cell appendages (Flagella, Fimbriae and pili), Structure of Plasma membrane, cytoplasmic inclusions- mesosomes, Chlorosome.

UNIT II

Morphology and Structure of Viruses: History, Discovery, General characteristics of Viruses, Biological status of Viruses, Morphology, Fine structure, Shape and Classification of viruses. Microphages, Viroids, Virusoids and Prions, Tobacco Mosaic Virus (TMV), T4 Bacteriophages and HIV- their fine structure, genome organization and multiplication, Bacteriophage therapy.

UNIT III

Microbial Nutrition: Microbial requirement, Nutritional forms (Autotrophic and Heterotrophic), Nutritional Classification of Microorganisms, Quorum sensing in Bacteria. Economic Importance.

UNIT IV

Some Important Diseases: Important Diseases caused by Bacteria, Viruses and mycoplasma. Citrus Canker, Tobacco Mosaic disease and yellow vein Mosaic of lady finger, Little leaf of brinjal.

Suggested Readings:

1. Matthew's Plant Virology, R. Hull, 4th edition, 2003, Elsevier.
2. Prescott (2000). Microbiology.
3. Dubey, R.C. and D.K. Maheshwari (2010). A Textbook of Microbiology. S. Chand and Co. Pvt. Ltd. New Delhi.
4. Singh, R.S. 2008. Plant Diseases, Oxford and IBH Publishing Co. Pvt Ltd.
5. Singh, R.S. 2008. Principles of Plant Pathology, Oxford and IBH Publishing Co. Pvt Ltd.

CORE II- MYCOLOGY AND PLANT PATHOLOGY

UNIT I

General characteristics of Fungi, Nutrition (Saprophytic, Symbiotic and biotrophic), Reproduction, Recent trends in Classification of Fungi. Heterothallism, Heterokaryosis, Parasexual cycle and sex hormones in Fungi, Phylogeny of Fungi, Economic Importance of Fungi. Symbiotic Association of Fungi, Mycorrhizae

UNIT II

Systematic study of Structure, Reproduction and life cycle, Phylogeny and affinities of main groups of Fungi with special reference to following: Myxomycetes (Trichiales, Stemonitales, Physarales), Plasmodiophoromycetes (Plasmodiophorales).

Oomycetes: Saprolegniales (Saprolegnia, Achyla), Peronosporales (Phytophthora, Peronospora)

Chytridiomycetes: Chytridiales, Blastocladales, Monoblepharidales.

Zygomycetes: Mucorales, Entomophthorales.

UNIT III

Systematic study of Structure, Reproduction and life cycle, Phylogeny and affinities of main groups of Fungi with special reference to following:

Ascomycetes: Protomycetales (Protomyces), Endomycetales (Saccharomyces), Taphrinales (Taphrina), Eurotiales (Aspergillus, Penicillium), Erysiphales (Erysiphe, Phyllactinia), Sphaeriales (Neurospora, Xylaria, Claviceps), Pezizales (Ascobolus, Peziza, Morchella).

Basidiomycetes: Uredinales, Ustilaginales, Auriculariales (Auricularia), Agaricales (Agaricus, Amanita), Lycoperdales (Lycoperdon),

Deuteromycetes: Moniliales (Cercospora, Helminthosporium, Alternaria, Fusarium), Melanconiales (Colletotrichum), Sphaeropsidales.

UNIT IV

Plant Pathology: General Principle, Classification of Plant disease, Symptoms of Fungal, Bacterial and viral disease. Disease Management, Forecasting and Defence mechanism. Principle of Plant disease control (Chemical and Biological).

Fungal Disease: White rust of crucifers, Late blight of potato, Early blight of potato, Powdery mildew of pea, Black rust of wheat and Red rot of sugarcane.

Suggested reading:

1. Gangulee, H.C. & Kar, A.K. College Botany Vol. II (Algae + Fungi + Bryophyta + Pteridophyta), New Central Book Agency, Kolkata
2. Singh, Pande, Jain, 2010, A Text Book of Botany (Algae + Fungi + Bryophyta + Pteridophyta) Pub. Rastogi Publication, Meerut
3. Agrios, G.N., 1998. Plant Pathology, Academic Press.
4. John A Lucas, 1998. Plant Pathology and Plant Pathogens, Wiley-Blackwell, CRC Press.
5. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. 1996, Introductory Mycology, Wiley
6. Cathie, M.J., Watkinson S.C. and Booday, G.W., 2001, The Fungi, Academic Press
7. Maheshwari, R., 2012, Fungi: Experimental Methods in Biology, CRC Press, Boca Raton, Florida.

CORE-III LIMNOLOGY, PHYCOLOGY, LICHENOLOGY AND BRYOPHYTA

UNIT –I

Limnology: Introduction to limnology, General study of morphological and reproductive feature of micro and macrophytes growing in sea water with special reference to their adaptation. General account of abiotic and biotic factors influencing the growth of fresh water and marine water flora. Physical factors: Light, Temperature Heat and Stratification. Chemical factors: DIC, Oxygen in lakes, effect of DOC and BOD. Size spectrum of planktonic organisms, Human impact on lake ecosystem.

UNIT- II

Algae in diversified habitats (terrestrial, freshwater and marine), Thallus organization, cell ultra structure, reproduction, Classification of algae, cell wall composition, reserve food material, Flagellation and Heterocyst. Symbiotic algae, algal bloom, Ecological and economic importance of algae. A comparative study of range of thallus organization, cell structure, reproduction (asexual & sexual), of flowing class: Cyanophyceae (Scytonema, Spirulina), Chlorophyceae (Chlamydomonas, Volvox, Chara, Nitella, Acetabularia), Phaeophyceae (Laminaria, Dictyota), Bacillariophyceae (Navicula), Xanthophyceae (Vaucheria, Botrydium), Rhodophyceae (Batracospermum, Gelidium).

UNIT –III

Lichens – A general account classification and distribution of Lichens. A comparative study of thallus organization, cell structure, physiology and reproduction. Economic importance of lichens.

UNIT-IV

Bryophyta: General introduction, classification, Origin and evolution of bryophytes, Fossil history of Bryophytes, Ecological significance and economic importance of Bryophytes. Characteristic features, criteria of classification, range of gametophytic and sporophytic organization(morphology, anatomy and their distribution in India) in various orders/families of the class: Marchantiales (Plagiochasma, Targionia, Cyathodium), Sphaerocarpaceae (Sphaerocarpus, Riella), Calobryales (Calobryum), Metzgeriales (Riccardia), Jungermanniales (Porella, Frullania), Anthocerotales (Anthoceros, Notothylus), Sphagnales (Sphagnum), Polytrichales (Polytrichum, Pogonatum), Buxbaumiales (Buxbaumia), Bryales (Funaria).

Suggested reading:

1. Dodson, S. (2005). Introduction to Limnology. New York. McGraw-Hill.
2. Moss, B. (1998). Ecology of fresh waters: man and medium, past to future. Oxford, Blackwell Science.
3. Horne, A. J. and C. R. Goldman (1994). Limnology. Toronto, McGraw-Hill.
4. Lee, Robert Edward, 2008, Phycology, Fourth edition, Cambridge University Press
5. Graham Robin South and Alan Whittick, 1998, Introduction to Phycology, Blackwell Scientific Publication
6. Bold, H.C. and Wynne, M.J., 1985, Introduction to the Algae, 2nd Edition, Prentice-Hall Inc.
7. Dixon, R. , Biology of Rhodophyta, Kock Science Publisher, West Germany
8. Fritsch, F.E., Structure and Reproduction of Algae, Vol. 1 & II, Cambridge University Press, Cambridge
9. Smith A. L.(1921) Lichens, Cambridge university Press
10. Orange A, James PW and White FJ (2001) Microchemical methods for identification of lichens. British Lichen Society.
11. Parihar N. S. 1965, An Introduction to Embryophyta- Bryophyta. Central Book Depot. Allahabad.
12. Kashyap S. R. 1972, Liverworts of the Western Himalayas & the Punjab Plains. Part 1 & 2.
13. Richardson D. H. 5, The Biology of Mosses.
14. Janice. M. Glime, 2006, Bryophyte Ecology.
15. GoffmetB.&Shaw.A.J.2008,BryophyteBiology.

FIRST ELECTIVE - MICROBIOLOGY

UNIT- I

General account of Microorganisms: History of microbiology, characteristic features of Bacteria and actinomycetes, classification of microorganisms- Three domain classification, Bergey's classification. Morphology of Bacterial cells, capsule, cell wall, cell appendages (flagella, fimbriae and pili). Methods of isolation and culture of microorganisms, measurement of microbial growth, microbial genetics.

UNIT- II

Role of microorganisms: Root nodules, nif gene organization, role of microorganisms in soil (decomposition and nutrient cycling), water and air; role in industry- production of antibiotics, bio-fertilizers and bio-pesticides.

UNIT-III

Microbial Ecology and Environmental Microbiology of air, water and soil. Microbiology of Solid waste, Sewage and Industrial waste, Bioleaching and Biomining. Microbiology of food, Milk and dairy products.

UNIT- IV

Infection and Diseases: Human Diseases caused by Fungi, Bacteria and Viruses, their diagnostics and managements.

Suggested Readings:

1. Madigan, M.T., Martinko, J.M., Dunlap, P.V., Clark, D.P., 2011. Brock Biology of Microorganisms. 13th edition, Pearson Education Inc.
2. Stanier, R.Y., Ingraham, J L Wheelis, M.L., Painter, P.R., 1987. General Microbiology. Fifth edition. MacMillan.
3. Dubey, RC and Malieshwari. DK. 1999. A Textbook of Microbiology. S. Chand & Company Ltd.
4. Atlas, RM. 1995. Principles of Microbiology. Mobsy.
5. Lim, DV. 2003. Microbiology. Kendall/Hunt.
6. Boundless.2013. Microbiology. Boundless Learning, Incorporated.
7. Comelissen, CN, Harvey, RA and Fisher, BD. 2012. Microbiology. Lippincott Williams & Wilkins,
8. Talaro, K.P., Chess, B. 2011, Foundations in Microbiology. 8th edition. McGraw-Hill.
9. Tortora, G.I., Funke, B.R., Case, C.L. 2003, Microbiology: An Introduction. Benjamin Cummins
10. Willey, J.M., Sherwood, L., Woolverton, C.J., 2010. Prescott's Microbiology. 8th edition, McGraw-Hill.

FIRST ELECTIVE- HISTORY OF BOTANY AND MICROTECHNIQUE

UNIT- I

A brief introduction of major discoveries in Botany and contribution of renowned Indian Scientist: Prof. Birbal Sahni, Prof. Panchanan Maheshwari, Prof. Shiv Ram Kashyap, Prof. M.O.P. Iyenger, Prof. P.N. Mehra, Prof. Divya Darshan Pant, Prof. K.C. Mehta, Prof. R.N. Singh, T.V. Desikachary, Prof. Ramdeo Mishra and K.S. Bhargava.

UNIT-II

A brief introduction of major discoveries in Botany and contribution of renowned scientists: Pier Antonio Micheli, Melvin Kelvin, Sir Hans A. Krebs, Kary Bank Mullis, E.J. Butler, F.E. Fritsch, Prof. T.H. Morgan, Sir Charles Darwin, Sir George Bentham, Sir Joseph Dalton Hooker, Carlous Linnaeus.

UNIT-III

Microscopy: Optical, Electron, Scanning probe, Ultraviolet, Infrared, Fluorescence. Staining techniques: Gram staining and Acid Fast staining. Reagents used for the microscopic examinations eg. Methylene Blue, Fast Green, Phloroglucin/HCl, Safranin, Hematoxylin, Lugol's solution, Retenium red, Cotton Blue and eosin.

UNIT-IV

Chromatography: Basic concept, GC, TLC, HPLC, HPTLC, Affinity chromatography, Ion Exchange chromatography. Spectroscopy: Basic concept, Mass Spectroscopy, X-Ray Diffraction. Gel Electrophoresis: AGE, PAGE, SDS-PAGE, 2D Electrophoresis, IEF.

Suggested reading:

1. Wilson, K. And Walker, J., 2000. Practical Biochemistry: Principles & techniques (5th Edition), Cambridge University Press.

SECOND ELECTIVE

PRACTICAL- I : Lab work based on Core/Elective OR

PRACTICAL/FIELD VISIT/PROJECT PRESENTATION

(The Candidate are required to choose only one elective)