

Maharaja Surajmal Brij University, Bharatpur



Syllabus

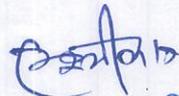
Session: 2025-29
(Semester Scheme 3/4 Year)

B.Sc. (Hons.)/ B.Sc.-M.Sc. Integrated Botany

(Under the National Education Policy 2020)

Effective from the Academic Year 2025-26

Department of Botany


प्रभारी अकादमिक प्रथम


Dr. Arctana Singh


Dr. Raney Kunalakpan


(Dr. Tripti Gupta)


(Dr. Vilas Pahal)

SEMESTER-WISE DETAILS OF B.SC. BOTANY COURSE (Hons.)
(First Year; Total Credits: 52 or 52+4*)

Sl. No.	Course category	Course Name	Course code	Credit	Delivery type			Total Hours	Weightage (%)			M.M
					L	T	P		CW	MTE	ETE	
					Semester-I							
1.	Major	Diversity of Plant Kingdom	BOT 20TH-101	4	L	T	-	60	10	10	80	100
2.	Major	Cell biology genetics and plant breeding	BOT 20TH-102	4	L	T	-	60	10	10	80	100
3.	Major/IDC	Fundamentals of Microbiology	AMC101T	4	L	T	-	60	10	10	80	100
4.		Practical I	BOT 20PH-101	2	-	-	P	30	10	-	40	50
5.		Practical II	BOT 20PH-102	2	-	-	P	30	10	-	40	50
6.		Practical III	AMC101P	2	-	-	P	30	10	-	40	50
7.	SEC	Mushroom and <i>Spirulina</i> cultivation	SEC 01	2	L	-	-	30	05	05	40	50
8.	AEC	Hindi	AEC 01A	2	L	-	-	30	05	05	40	50
9.	AEC	English	AEC 02A	2	L	-	-	30	05	05	40	50
10.	VAC	Value Added Course	-	2	L	T	-	30	05	05	40	50
Total				26				30	05	05	40	50
Semester-II												
1.	Major	Plant Biochemistry and physiology	BOT 20TH-201	4	L	T	-	60	10	10	80	100
2.	Major	Ecology and Plant Resource utilization	BOT 20TH-202	4	L	T	-	60	10	10	80	100
3.	Major/IDC	Clinical biochemistry	AMC202T	4	L	T	-	60	10	10	80	100
4.		Practical I.	BOT 20PH-201	2	-	-	P	30	10	-	40	50
5.		Practical II	BOT 20PH-202	2	-	-	P	30	10	-	40	50
6.		Practical III	AMC202P	2	-	-	P	30	10	-	40	50
7.	SEC	Quality control and Assurance in Microbiology	SEC 02	2	L	-	-	30	05	05	40	50
8.	AEC	Hindi	AEC 01B	2	L	-	-	30	05	05	40	50
9.	AEC	English	AEC 02B	2	L	-	-	30	05	05	40	50
10.	VAC	Value Added Course	-	2	L	T	-	30	05	05	40	50
Total				26				30	05	05	40	50
Total Credits of 1 year (Sem-I & II)				52								650
												1300

04 Credits Internship required for Exit.

** VAC: Students have choice to opt any one from the List of common VAC courses.
* Internal marks for SEC paper will be awarded according to Practical training/ Experiments performed by students during the academic semester.

Note: Students opting to conclude their studies after the first year will receive a **Certificate in Botany**, contingent upon achieving a **minimum of 52+4= 56 credits** with **additional 4 credits** (earned from vocational course or internship, during the summer break of the first year).

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Scheme of Examination (Common for all theory papers)

Midterm/Continuous assessment (20% weightage)
(End of Semester Examination) EoSE (80% weightage)

Each theory paper shall have two parts A & B.

Part A: 20 marks

Part A will be compulsory having 10 or 20 very short answer type questions (with a limit of 20 words) of two or one marks respectively.

Part B: 60 marks

Part B of question paper shall be divided into four units comprising question numbers 2-5. There will be two questions from each unit with internal choice. Each question will carry 15 marks.

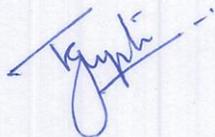




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BOT-20 TH-101 Paper-I
Diversity of Plant Kingdom

Objectives

- To understand microscopic to macroscopic view of the plants.
- To differentiate algal members from different class of the kingdom Algae.
- To understand structure and reproduction in bryophytes.
- To understand difference between Hepaticopsida, Anthocerotopsida and Bryopsida.
- To interpret structure, reproduction, life cycle and economic importance of Lichens.

Course Outcomes:

At the completion of the course, the student would be able to:

Understanding To aware students, diversity of plants presents on various habitats.

- To understand microscopic to macroscopic view of the plants.
- To interpret amphibious to symbiotic relationship of the plants.

Memorizing

- Diagrammatic representation of the algae, bryophytes and lichens.
- Habit, habitat, thallus organization of various members.
- Typical type of Life cycles found in algae and bryophytes.

Applying

- Economic importance of algae, bryophytes and lichens.
- Microscopic identification of algae, bryophytes and lichens.

UNIT I

Algae: General characters, Classifications (Fritsch) upto classes. Diverse Habitat. Range of thallus structure. Reproduction. Type studies of: *Volvox*, *Chara*; *Vaucheria*; *Ectocarpus*; *Polysiphonia*. **15 hrs**

Lichens- General characters, habitat, morphology and reproduction.

Fungi: General characteristics; Thallus organization; types of fruiting bodies, Cell wall composition; Heterokaryosis and parasexuality; Nutrition; Classification (Alexopoulos); reproduction, economic importance. Type studies: *Phytophthora*, *Rhizopus*, *Peziza*, *Agaricus*.

UNIT II

Bryophytes: General characters, Origin, and evolution. Classification (Rothmaler). Study of Morphology, Anatomy, Reproduction of *Riccia*, *Marchantia* and *Funaria*. **15 hrs**

UNIT III

Pteridophytes: General characters, affinities, classification, economic importance. Study of life histories of fossil *Rhynia*. Type studies: *Selaginella*, *Equisetum*, *Pteris*, *Lycopodium*. **15hr**

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UNIT IV

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Gymnosperms: General characters, classification. Type studies: *Cycas* & *Pinus*, economic importance.

Angiosperms: General characters, Differences between Monocotyledons and Dicotyledons, Typical life cycle.

Suggested Laboratory Exercises:

- Visit Local Garden/field study of plants.
- Study, study of anatomy by making suitable temporary slides and study of permanent slides of *Volvox*, *Vaucheria*, *Chara*, *Ectocarpus*, *Polysiphonia* (Vegetative and Reproductive).
- Lichens: A study of growth forms of Lichens.
- Rhizopus: Study of asexual stage from temporary mounts and sexual structure through permanent slides. *Pezizia*: ascospores, *Agaricus*: Specimens of button stage and full grown mushroom; sectioning of gills of *Agaricus*.
- Bryophytes- Now see that morphology of vegetative and reproductive stages of *Riccia*, *Marchantia* and *Funaria*
- Pteridophytes- A study of vegetative and reproductive stages of *Selaginella* heterospory and seed habit. *Equisetum*, *Pteris*, *Lycopodium*.
- Study of vegetative and reproductive stages of *Cycas* and *Pinus* using temporary and permanent slides.
- Study of Monocot and dicot flower and seeds.

Suggested Readings:

- Pandey BP (2022) Algae, Bryophytes and Lichens, S.Chand Publication.
- Puri. P.: Bryophytes, Atmaram & Sons. Delhi, Lucknow, 1985.
- Kumar, H.D.: Introductory Phycology, Affiliated East-West Press Ltd. New York, 1988
- Gilbert, M.Simth: Cryptogamic Botany, Vol.I & II (2nd Ed.) Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1985.
- Vashihsta. B.R. Botany for degree students- Fungi, S. Chand & Co. New Delhi, 2001.
- Dube, H.C. :Fungi, Rastogi Publication, Meerut, 1989.
- Alexopoluos, C.J. and Mims, C.W.:Introductory Mycology, Jhon Willy & Sons, New York, 2000.

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BOT-20TH-102 **Paper II**
Cell Biology, Genetics and Plant breeding

Objectives

- To understand the structural organization of cells.
- To understand structure and functions of different organelles in the cell.
- To understand the concept of cell division, mutations and chromosomal aberrations.
- To understand basic laws of inheritance and variations.
- To understand various gene interactions.
- To understand basics of plant breeding methods and other crop improvement strategies.

Course Outcomes:

At the completion of the course, the student would be able to:

Understanding

- Learn, understand and develop skill and hands on training in basics of cell biology, genetics and plant breeding.
- The functions and structural properties of different types of cells and their organelles.
 - Cycle of cell division, gene interactions, DNA damage and repair mechanisms.

Memorizing

- Principles of crop improvement strategies.
- The structural and functional aspects of cell and cellular organelles.
- Various stages of cell cycle and cell division.
- Inheritance and various types of gene interactions.
- Basics methods of plant breeding and crop improvement.
- Variations in functions of cell organelles.

Applying

- Concept of cell cycle, functions of cell membrane, chromosomal alterations.
- Possibilities of mutations and mutagens.
- Role of gene interactions in phenotype development.
- Implying of plant breeding methods for crop improvement.

UNIT I

15 hrs

Ultrastructure of Cell and Cell Organelles: Eukaryotic and Prokaryotic cell structure; Ultrastructure and functions of different cell organelles (Cell wall, Plasma membrane, Nucleus, Mitochondria, Chloroplast, Ribosome, Peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum); Basic idea of Mitochondrial and Chloroplast genome.

Gene and DNA: Genome, Gene, Double helical structure of DNA, DNA supercoiling, Gene structure.

Chromosome organization: chromatin Structure and chromosome organization, Chromosome Morphology, Specialized types of chromosomes: Sex chromosomes, Lambrush and Polytene chromosomes.

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UNIT II

Cell Division: Basic idea of Cell cycle; Different stages of mitosis; Different stages of Meiosis I and Meiosis II, synaptonemal complex, chiasmata formation and crossing over. **Structural and numerical aberrations in human chromosomes and ploidy in plants:** Deletion, Duplication, Translocation, Inversion, Aneuploidy and Polyploidy. **Genetic material:** DNA as genetic material, (Griffith's transformation experiment and Hershey and Chase blender experiment); structure of DNA (Watson and Crick Model); Structure and function of different types of RNA (rRNA, mRNA, tRNA, snRNA). **Mutations:** Types of Mutations, Spontaneous and induced Mutations, Physical and Chemical mutagens. **15 hrs**

UNIT III

Genetic inheritance: Mendel's laws of inheritance and their exceptions; allelic (incomplete dominance, co-dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes); Multiple allelism (ABO blood groups in men); Quantitative inheritance (Grain colour in wheat). **Cytoplasmic inheritance:** Plastid inheritance (different types of leaves in *Mirabilis jalapa*); Mitochondrial inheritance (Cytoplasmic male sterility in plants). **DNA damage and repair:** Causes of DNA damage and molecular mechanisms of repair excision repair system in bacteria, base excision, recombination repair systems and SOS repair. **Plant breeding:** History and objectives of plant breeding. Types of plant reproduction (vegetative, asexual and sexual); Modes of pollination (Self and Cross); relevance of mode of reproduction to plant breeding; their effect on generating and fixing genotypic variation. Types of crop plants for plant breeding (self-pollinated, cross-pollinated and vegetatively propagated crop plants). **15 hrs**

UNIT IV

Plant introduction and acclimatization: Purpose, Types (primary and secondary), Procedure, merits and demerits and achievements. Plant introduction agencies in India (NBPGR, FRI, BSI). Famous Indian and International plant breeders and their contributions. National and International agricultural research institutes. **Inbreeding:** Pure and inbred lines, methods of inbreeding, its genetic effects (inbreeding depression), its practical applications. **Hybridization:** Meaning, objectives, types, procedure, various methods of emasculation, genetic effects (hybrid vigor), its practical applications. Role of mutation and polyploidy in plant breeding (with examples). **Methods of plant improvement:** Selection (Pureline and mass selection); hybridization methods in self-pollinated plants (Pedigree and Bulk method) and in cross-pollinated crops (single and double cross); Interspecific hybridization. Plant breeding work done on wheat and rice in India, Green revolution. **15 hrs**

Suggested Laboratory Exercises:

- Study of cell structure from Onion, *Hydrilla* and *Spirogyra*.

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- Study of cyclosis in *Tradescantia* spp.
- Study of plastid for pigment distribution in *Lycopersicom*, *Cassia* and *Capsicum*.
- Study of electron microphotographs of eukaryotic cells for various cell organelles.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid, Dihybrid, Back cross and test cross.
- Permanent slides/photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes.
- Emasculation, bagging & tagging techniques.
- Permanent slides/photographs of different stages of mitosis and meiosis, sex chromosomes, Polytene chromosome and Lampbrush chromosomes.
- Genetic Problems on Monohybrid cross.
- Genetic Problems on Dihybrid cross.
- Genetic Problems on Non-Mendelian Interactions.
- Demonstration of Emasculation and hybridization.
- Study of Famous Indian and International plant breeders and their contributions.
- Study of National and International agricultural research institutes.

Suggested Readings:

- Albert B., Johnson A., Lewis J., Raff M., Roberts K. and Walter P. 2014. Molecular biology of the cell. Garland Sciences, 6th edition.
- Gupta P.K. 1999. A text book of cell and molecular biology, Rastogi publication, Meerut.
- Lodish and Darnell J. 2000. Molecular cell (4th edition). W.H. Freeman & Co. New York, USA.
- Cooper G. 2018. The Cell: A molecular approach. Sinauer Associates Inc, 8th edition.
- De Roberts E. D. P. and De Roberts E. M. F. 2010. Cell and Molecular Biology. Walters Kluwer, 8th edition.
- Karp G., Iwasa J. and Marshall W. 2018. Cell Biology. Wiley publication., 8th edition.
- Pierce, B. A. (2012). Genetics: a conceptual approach. Macmillan publication.
- Snustad, D. P., & Simmons, M. J. (2015). Principles of genetics. John Wiley & Sons.
- Gupta, P.K. (2010). Cytogenetics. Rastogi Publications, Meerut, India.
- Lewin, B., Krebs, J., Kilpatrick, S. T., & Goldstein, E. S. (2011). Lewin's genes X. Jones & Bartlett Learning.
- Singh, B. D.: Plant Breeding-Principles and methods, Kalyani Publishers, New Delhi (1990)
- Shukla, R.S. and Chandel, P.S.: Cytogenetics, Evolution and Plant Breeding, S. Chand & Co. Ltd., New Delhi (2000).
- Singh, R. B.: Text Book of Plant Breeding, Kalyani Publishers, Ludhiana (1999).
- Lodish, HF. Berk, A. Kaiser, CA, Krieger, M. Bretscher, A. Ploegh, H. Aman, A. Martin, K. (2016). Molecular Cell Biology (8th Ed.). New York.

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Course objectives:

- (i) to learn the basics of microbiology including, historical events
- (ii) to understand about the types of microscopy and intricate details of the bacterial cell.
- (iii) to appreciate various methods of sterilization employed to ensure aseptic conditions in microbiology works and
- (iv) lastly to know about the types of culture media employed to isolate the microorganisms.

Course Outcome:

Upon successful completion of the course the candidate will

- be familiar with the history and development of Microbiology with the broad perspective of the scope of Microbiology.
- understand the principles and applications of the different microscopes and staining methods.
- have gained knowledge on the ultrastructure of bacteria.
- be acquainted with different methods of sterilization and preservation of cultures.
- understand the different types of media used for the cultivation of microbes.

UNIT I

History and scope of microbiology, spontaneous generation – biogenesis theory – contributions of Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Paul Ehrlich and Fleming. **15hr**

UNIT II

Microscope– principles and application – simple and compound microscope – dark field – phase contrast, fluorescent microscope, SEM and TEM. Types of staining – simple, differential (Gram's, AFB), special – capsular staining (negative), spore, LPCB, KOH mount. **15hr**

UNIT III

Ultrastructure of bacteria, cell envelope, cell wall– Gram positive and Gram negative bacterial cell wall, slime, flagella, capsule, pili. **15hr**
Sterilization and disinfection – principles – methods of sterilization – physical methods – dry heat –moist heat – radiation– filtration (membrane and HEPA)– chemical sterilization – chemical agents – mode of action. Preservation and maintenance of culture.

UNIT IV

Culture and media preparation – solid and liquid. Types of media –semi synthetic, synthetic, enriched, enrichment, selective and differential media. Pure culture techniques – tube dilution, pour, spread, streak plate. Anaerobic cultivation of bacteria. **15hr**

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Suggested Laboratory Exercises:

Microbiology Good Laboratory Practices and Biosafety- Preparation of culture media and cultivation of bacteria & fungi- microscopic observation of bacteria and fungi - Microbial preservation techniques - Isolation and Identification of bacteria and fungi.

Suggested Readings:

- Willey J.M., Sandman K.M. and Wood D.H. (2023). Prescott's Microbiology, 12th Edn., McGraw Hill, p. 1024.
- Madigan, M.T., Bender K.S. Buckley D.H., Sattley W.M. and Stahl D.A (2021). Brock Biology of Microorganisms, 16th Global Edn., Pearson Education Ltd., p.1129.
- Reference Books
- Chess B. (2024). Talaro's Foundations in Microbiology; 12th Edn., McGraw Hill, p.993.
- Tortora G.J., Funke B.R., Chase C.L., Bair W.B. and Weber D. (2024). Microbiology: An Introduction, 14th Edn. Pearson-Benjamin Cummings.
- Brown A. and Smith H. (2016). Benson's Microbiological Applications: Laboratory Manual concise version, 14th Edn. McGraw-Hill Companies.

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SEMESTER II

BOT-20TH-201

Paper-IV Plant Biochemistry and Physiology

Objectives:

- ▶ Provide learning experiences to instill interests in plant biochemistry and physiology.
- ▶ Develop balanced knowledge of biomolecules and biochemical concepts.
- ▶ Equip students with analytical skills to tackle issues in biochemistry.
- ▶ Understand nutrient uptake, photosynthesis, respiration and nitrogen metabolism.
- ▶ Understand effects of factors on plant growth and development.

Course Outcomes:

At the completion of the course, the student would be able to:

Understanding

- ▶ Disciplinary knowledge of biochemistry.
- ▶ Understand various physiological life processes.

Memorizing

- ▶ Explain biological mechanisms and metabolism.
- ▶ Importance of water and physiological processes.

Applying

- ▶ Ability to formulate and solve biochemistry related problems.
- ▶ Identify mineral deficiency in plants and their management.

UNIT I

Overview of Biochemistry: Scope and significance. **Properties of water:** Molecular structure, physio-chemical properties, water potential. **Proteins:** Amino acids, electrochemical properties, peptide bonds, classification, enzyme structure and regulation. 15 hrs

UNIT II

Carbohydrates: Nomenclature, classification, structure of mono, di and poly saccharides. 15 hrs
Lipids: Classification, structure, functions, Alpha and Beta oxidation.
Nucleic acids: DNA composition (Watson and Crick model), RNA types and structures.

UNIT III

Plant-water relations: Absorption, Ascent of sap, Transpiration. **Mineral nutrition:** Essential elements, active and passive transport. 15 hrs
Photosynthesis: Pigments, light reaction, C3 and C4 cycles.
Respiration: Aerobic and anaerobic, Kreb's cycle, ETS.

UNIT IV

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Nitrogen metabolism: Nitrogen fixation, nitrate and ammonia assimilation.

Plant growth regulators: Auxins, gibberellins, cytokinins, ABA, ethylene.

Phases of growth: Seed dormancy, Biological clock, Photoperiodism & vernalisation.

Suggested Laboratory Exercises:

- Separate amino acids by paper chromatography.
- Prepare standard curve of protein.
- Tests for proteins in unknown samples.
- Demonstrate enzyme activity (Catalase, peroxidase, amylase).
- Tests for carbohydrates and lipids.
- Conductometric titrations.

Qualitative analysis of biomolecules

- Carbohydrate tests (Molisch, Benedict's, etc.).
- Protein and amino acid colour reactions.
- Lipid tests (solubility, acrolein).
- Determine osmotic potential by plasmolytic method.
- Separate chloroplast pigments.
- Bioassay of growth hormones.
- Photosynthesis and Respiration experiments.

Suggested Readings:

- Buchanan, B., Gruissem, G. and Jones, R. (2000). Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, USA.
- Davies P J. (2004). Plant Hormones: Biosynthesis, Signal Transduction, Action. 3rd Edition, Kluwer Academic Publisher, Dordrecht, The Netherlands.
- Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley and Sons, U.S.A. 4th Edition.
- Nelson, D.L., and Cox, M.M. (2008). Lehninger Principles of Biochemistry (5th ed.). W.H. Freeman & Co., New York.
- Parashar, A. N. and Bhatia, K. N.: Plant physiology. Trueman Book Company, 1985.
- Verma, S. K. and Verma, M.: A textbook of plant physiology, biochemistry and biotechnology. S. Chand Ltd., 2000.
- Biochemistry by U. Sathyanarayana Books and Allied (P) Ltd. Kolkata, ISBN 0-87893-214-3, (2014).
- Text book of Biochemistry by J.L Jain (2016). Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
- Taiz, L., Zeiger, E., (2014). Plant Physiology. Sinauer Associates Inc., U.S.A. 6 th Edition. Verma, S.K.: Textbook of plant physiology. S. Chand & Company, 1999.
- Parashar, A. N. and Bhatia, K. N.: Plant physiology. Trueman Book Company, 1985.
- Jain, V. K.: Fundamentals of plant physiology. S. Chand & Company Ltd., 2013.
- Verma, V.: Textbook of plant physiology. ANE Books India, 2007.
- Malik, C. P. and Srivastava, A. K.: Textbook of plant physiology. Kalyani publication, 1982.

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Objectives:

- ▶ Understand basic ecological concepts and interrelations with environment.
- ▶ Gain knowledge on economically important plants and their processing.
- ▶ Aware students about environmental issues and ethnobotany application.

Course Outcomes:

At the completion of the course, the student would be able to:

Understanding

- ▶ Insights into sustainable management of natural resources.
- ▶ Knowledge of morphology and processing of cereals, legumes, spices, etc.

Memorizing

- ▶ Insights into ecosystem functioning and relationships.
- ▶ Identify important plant species and their useful parts.

Applying

- ▶ Application in assessing ecosystem services (pollination, etc.).
- ▶ Development of conservation strategies and learning about plant products.

UNIT I

Environment and plant: Ecological factors (Atmosphere, light, temperature, soil). Ecological adaptations of hydrophytes, xerophytes, etc. **15 hrs**

Population ecology: growth curve, interactions (mutualism, predation, etc.).

Community and Ecosystem: Succession, food chain, energy flow, productivity and biogeochemical cycles.

UNIT II

Biogeographic regions of India: Forest/grassland of Rajasthan. **15 hrs**

Environmental pollution: Air, water, soil; Greenhouse effect, ozone depletion, biodiversity loss.

Environmental management: Principles, sustainable development, policies and international protocols (Kyoto, Montreal, etc.).

UNIT III

Origin of Cultivated Plants: Vavilov's work. History and cultivation of cereals (wheat, rice, maize, bajra), pulses (chana, moong), and medicinal plants. **15 hrs**

Spices and condiments of Rajasthan: Timber yielding plants (teak, sal), dyes, beverages (tea, coffee), and oil yielding plants.

UNIT IV

Fruits, vegetable and ornamental plants: Cultivation and processing of sugar, rubber, and fibre. **15 hrs**

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yielding plants (cotton, jute).

Ethnobotany: Concepts, areas in Rajasthan, ethnic groups and ethical aspects.

Suggested Laboratory Exercises:

- Adaptive features of Hydrophytes and Xerophytes.
- Soil pH and moisture study.
- Quadrat method for community study.
- Statistical methods (mean, median, mode, SD).
- Study of economically important plants and products.
- Microchemical tests for starch, oils, and proteins.

Suggested Readings

- Verma, V. 1974. A Text book of Economic Botany, Emkay, Publication, New Delhi.
- Singh, V., Pandey, P. C. and Jain, D. K. 1989. Economic Botany. Rastogi Pluction, Meerut.
- Sambanurthy, A.V. V. S. and Subrahmanyam, N.S. 1989. A Text Book of Economic Botany. Willey Eastern Ltd. , New Delhi.
- Hill, A. W. 1952. Economic Botany. Mc Graw Hill Book. Co., New York.
- Sharma, P.D. 2010. Ecology and Environment (8th Ed.) Rastogi Publication, Meerut.
- Odum, E.P. 2008. Ecology. Oxforda and IBH Publisher.
- Odum, E.P. 1983. Basic Ecology. 5th edition Thomson Business international WaldisPvt. Ltd. Baricahd.

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Course Objectives:

- (i) to appreciate the applications of biochemistry in clinical background
- (ii) to understand about the disorders and their impacts which resulted due to malfunctioning of carbohydrate, protein and lipid metabolism
- (iii) lastly to enlighten about the diagnostic enzymology under clinical conditions.

Course Outcome:

- Upon successful completion of the course the candidate will
- understand the basic concepts in clinical biochemistry.
 - comprehend disorders related to carbohydrate metabolism.
 - understand the disorders related to amino acid and lipid metabolism.
 - understand the importance of liver functions and gastric functions and diagnosis of their disorders.
 - understand the role of various enzymes in disease diagnosis, prognosis and assessment of response therapy.

UNIT I

Basic concepts of clinical biochemistry: A brief review of units and abbreviations used in expressing concentrations and standard solutions. Biological samples – specimen collection – anticoagulant – preservatives for blood and urine – transport of specimens. **15 hrs**

UNIT II

Disorders related to carbohydrate metabolism: diabetes mellitus – definition – WHO criteria – classification of diabetes mellitus – signs, symptoms and complications – GTT– galactosemia, galactosuria, fructosuria. **15 hrs**

UNIT III

Disorders related to amino acid and lipid metabolism: Inborn errors of metabolism – phenylketonuria, alkaptonuria, albinism and tyrosinosis. Exogenous and endogenous transport of lipids – chylomicron transport, VLDL transport – reverse cholesterol transport – atherosclerosis – fatty liver – risk and anti-risk factors. **15 hrs**

UNIT IV

Liver function test: detoxification and excretory functions – protein changes in liver disease – differential diagnosis of jaundice – haemolytic hepatic and obstructive jaundice – Bilirubin metabolism, bile pigment levels in blood and urine – gastric function test – fractional test meal analysis and its interpretation. GI hormones – gastrin, secretin, CCK and gastric inhibitory peptide. Diagnostic enzymology: plasma enzymes – functional and non-functional enzymes – isoenzymes – enzyme patterns in acute pancreatitis, liver diseases and myocardial infarction. **15 hrs**

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Suggested Laboratory Exercises:

Biochemical Specimens – collection – anticoagulants - calorimetric analysis - Blood sugar analysis - Blood urea analysis - Serum – creatinine estimation - Serum uric acid estimation - Serum cholesterol estimation - Serum – bilirubin estimation - estimation of total protein - Determination of A/G ratio - Urine analysis - Estimation of SGOT and SGPT.

Suggested Readings:

- Ahmed N. (2011). Clinical Biochemistry. Oxford University Press.
- Vasudevan D.M. (2008). Textbook of Biochemistry for Medical Students, 5thEdn, Jaypee publishers.
- Beckett G., Walker S., Rae P. and Ashby P. (2010). Lecture notes: Clinical Biochemistry, 8th Edn., Wiley-Blackwell.
- Sathya Narayana U. (1999). Biochemistry, 2nd Edn. Kolkata, Allied Publishers.
- Mallikarjuna Rao N. (2002). Medical Biochemistry, 2nd Edn. New Age Publishers.

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