

Semester III
SEC1: Biotechnology in Health and Agriculture (MBTSE3011T)

Theory: CIA: 20 Marks; End-Sem: 80 Marks

Module A: (40 Marks)

(1 Class per week)

Technology for plant improvement

UNIT I: Mushroom culture technology - Nutritional and medicinal value of edible mushrooms; poisonous mushrooms; types of edible mushrooms available in India – *Volvariella volvacea*, *Pleurotus scitrinopileatus*, *Agaricus bisporus*; cultivation technology: infrastructure; medium; sterilization; preparation of spawn; multiplication; mushroom bed preparation; composting technology in mushroom production; storage and nutrition

UNIT II: Seed science and post-harvest technology - Seed dormancy; causes and methods of breaking dormancy; seed storage; factors affecting seed viability; detecting seed viability; genetic erosion; seed testing and certification; methods of food preservation and processing; methods of minimizing losses during storage and transportation; food irradiation: advantages and disadvantages; food safety

UNIT III: Pharmacognosy and phytochemistry - Preparation of drugs; drug evaluation methods: organoleptic, microscopic, biological, chemical and physical; active principles of herbal drugs, their uses and methods of biological testing; drug adulteration types; representative examples of some medicinal plants; secondary metabolites: types (terpenes, phenolics and nitrogenous compounds) and uses; phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds); brassinosteroids, strigolactones, jasmonic acid and salicylic acid

UNIT IV: Phytoremediation - Different technologies; plant species used; hyperaccumulators, phytochelators and their regulation

UNIT V: Molecular markers - RAPD, RFLP

UNIT VI: Intellectual property rights - Introduction to intellectual property right (IPR): concept and kinds; IPR and WTO (TRIPS, WIPO); Patents; copyrights; trademarks; geographical indications; multilateral Treaties; Indian position; issues concerning bioprospecting and biopiracy; plant varieties protection; Rights of farmers, breeders and researchers; protection of plant varieties and Farmers' Rights (PPVFR) Act, 2001, patenting biotechnological inventions.

Module B: (40 Marks)

(1 Class per week)

Biochemical and Cytological Methods

UNIT VII: Introduction to Histology and Histochemistry

Histology, Histopathology and histochemistry (basic concept, principle).

Fixation and processing of tissues, Sectioning, Fixatives, mordant and dye.

Staining (basic principle, different types of stain, different staining techniques, applications).

Postmortem examination as a diagnostic tool. Exfoliative cytology.

Concept of Medical transcription.

UNIT VIII: Introduction to Clinical and Nutritional biology

Concept of clinical and nutritional biochemistry.

Organ function tests as diagnostic tools: Liver function tests (SGOT, SGPT, Cholesterol, alkaline phosphatase, bilirubin, etc), Pancreatic function tests, Gastric function tests, Renal function tests & urine analysis.

Biochemical aspects of hematology. Routine Blood tests.

Concept of Hunger drive, Food pyramid, Dietary management.

Physiological adaptation to High altitude and deep sea.

Thermoregulation and biochemical adaptations (concept of antifreeze substances, heat shock proteins).

Concept of disease biomarkers (examples: Cardiac markers, liver markers, tumour markers).

UNIT IX: Introduction to Biochemical Toxicology

Concept of biochemical toxicology, Toxicity levels. Concept of LD₅₀ and LC₅₀.

Pharmacokinetics and pharmacodynamics, basic mechanism of drug action, bioavailability of drugs. Basics of xenobiotic metabolism, drug toxicity in humans. Drug abuse.

Molecular epidemiology.

Biomedical genome research and pharmaco-genomics.

UNIT X: Introduction to Nanotechnology

Basics of nanoscience and nanotechnology, definition of a nanosystem.

Concept of biological nanomaterials.

Nanotechnology in medicine and health
Nanotoxicology challenges. Societal implications and ethical issues in nanotechnology.

Teachers involved: Dr. Aryadeep Roy Choudhury (Module A), Dr. Priyanka De (Module B)

Texts &Reading/Reference Lists

1. Tewari, Pankaj Kapoor, S.C., (1988). Mushroom cultivation, Mittal Publications, Delhi.
2. Nita Bahl (1984-1988) Hand book of Mushrooms, II Edition, Vol. I & Vol. II.
3. N.S. Gopalakrishnan & T.G. Agitha, (2009) Principles of Intellectual Property Eastern Book Company, Lucknow.
4. Pharmacognosy, Dr.C.K.Kokate et al. 1999. NiraliPrakashan.
5. Plant Physiology, Taiz and Zeiger
6. Harper's Illustrated Biochemistry. R.K. Murray, D.K. Granner, V.W. Rodwell.
7. Cell and Molecular Biology – Concepts and Experiments – G. Karp (Wiley).
8. Text Book of Medical Physiology – A. C. Guyton (Holt Saunders).
9. Basic Histology – L. C. Janqueira, J. Carneiro& R. O. Kelly (Appleton & Lange).
10. Histology and Histological techniques – Bankroft (Elsevier).
11. Histology: A text and atlas – M. H. Ross & E. J. Reith (Williams & Wilkins).
- 12.NanoBioTechnology: Bioinspired devices and materials of the future. (Shoseyov, Oded, Levy, Ilan Eds.). Humana Press.