

SEMESTER:I	COURSE CODE: 22PBTH016-1 COURSE TITLE: TOOLS IN BIOTECHNOLOGY – OPEN ELECTIVE	CREDIT: 3 HOURS: 3
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COURSE OBJECTIVES

- 1) Introduction to prokaryotic and eukaryotic genomes
- 2) Basic knowledge about cloning strategies
- 3) Technical knowledge of gene manipulation
- 4) Introduction to screening techniques
- 5) Application of biotechnology

Unit I: Gene and Genomes

Hours: 7

Prokaryotic and Eukaryotic Genomes - Structure of Gene - DNA as the genetic material; Extra chromosomal DNA: Plasmid, mitochondrial DNA and chloroplast DNA.

Unit II: Cloning Vectors

Hours: 7

Plasmid, phagemid, cosmid, Artificial Chromosomes (BAC) – Transformation techniques: Electroporation, CaCl₂ method.

Unit III: Tools for Gene Manipulation

Hours: 8

Gel Electrophoresis: AGE and PAGE; Restriction Enzymes, Ligases, Modifying Enzymes - Markers for Selection: selectable and scorable - Examples.

Unit IV: Selection Strategy and Screening for Transformants

Hours: 7

Selection of rDNA Clones: Blue-White Selection, Colony Hybridization, PCR, Molecular analysis: Western blotting, Southern Blotting and Northern Blotting.

Unit V: Application of Cloning

Hours: 7

Over expression of Biomolecules (Insulin) - Gene therapy– GMO – Application and Biosafety issues.

COURSE OUTCOMES

- 1) Obtain a comprehensive knowledge about concepts of gene and genomics.
- 2) Gain an in-depth knowledge about vectors used in gene cloning.
- 3) Apprehend about the principle tools that are used for gene manipulation.
- 4) Know about the importance of selection and screening of transformants.
- 5) Aware with the principal applications of gene cloning.

Text Books

- 1) Primrose. S.B., Twyman R.M., & Old, R.W. (2006). *Principles of Gene Manipulation and Genomics*. (7th ed.). UK: Blackwell Publishing.
- 2) Primrose, S.B. (1994). *Molecular Biotechnology*. (2nd ed.). London: Blackwell Scientific Publications.
- 3) Brown, T.A. (2010). *Gene cloning and DNA analysis: An Introduction*. (6th ed.). UK: John Wiley & Sons.

Suggested Readings

- 1) Micklos, D.A., & Freyar, G.A. (1990). *DNA Science – A first course in rDNA technology*. New York: Cold Spring Harbor laboratory Press.
- 2) Michael, R.G., & Joseph, S. (2012). *Molecular Cloning: A Laboratory Manual*. (4th ed.). New York: Cold Spring Harbor laboratory Press.

SEMESTER: I	COURSE CODE: 22PBTH016-2 COURSE TITLE :FOOD BIOTECHNOLOGY – OPEN ELECTIVE	CREDIT: 3 HOURS: 3
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COURSE OBJECTIVES

- 1) To know the basics of bio related food products.
- 2) To study the food products from microorganisms.
- 3) To learn causes for food born infections.
- 4) To know about types of beverages.
- 5) To study the importance preserved foods.

Unit I Food Biotechnology

Hours: 7

Introduction and Scope; Production of Single cell protein and Baker's yeast; Mushroom cultivation. Food and dairy products: Cheese, bread and yogurt. Fermented vegetables – Saurkraut; Fermented Meat – Sausages.

Unit II Novel Microorganisms

Hours: 7

LAB (Probiotics), Cyanobacteria, methylotrophs enzyme biotransformations. Role of Plant tissue culture for improvement of food additives; color and flavor. Genetic modifications of microorganisms; detection and rapid diagnosis. Genetically modified foods and crop

Unit III Food Borne Infections And Intoxications

Hours: 8

Food borne infections and intoxications; with examples of infective and toxic types – Clostridium, Salmonella, Staphylococcus. Mycotoxins in food with reference to Aspergillus species. Food preservation: canning, dehydration, ultrafiltration, sterilization, irradiation. Chemical and naturally occurring antimicrobials; Biosensors in food industry

Unit IV Types of beverages and their importance

Hours: 7

Synthetic beverages- carbonated, low-calorie and dry beverages; isotonic and sports drinks; soft drinks.

Unit V Quality assurance

Hours: 7

Microbiological quality standards of food, Intellectual property rights and animal welfare. Government regulatory practices and policies. FDA, EPA, HACCP, ISI. Risk analysis; consumer and industry perceptions

Text Books

- 1) Lee B.H.V., 1996, Fundamentals of Food Biotechnology, 1st Edition, C H Publishers, Inida
- 2) Roger, A., 1989, Food Biotechnology, 1st edition, Elsevier Applied Sci. Pub., USA

Supplementary Readings

- 1) Goldberg I., 1994, Functional Food, . 1st edition. Chapman & Hall Publishers, India
- 2) Anthony P. et al, 2005. Food Biotechnology. 2nd edition. CRC Publication, USA.
- 3) Casida, L.E. 1997. Industrial Microbiology. 6th edition. New Age International Publishers, India
- 4) Prescott, L. M. Harley, J. P. and Klein, D. A. 1999. Microbiology, 4th edition, WCB Mc Graw-Hill, India

SEMESTER: I	COURSE CODE: 22PBTHO16-3 COURSE TITLE: TOXICOLOGY – OPEN ELECTIVE	CREDIT: 3 HOURS: 3
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COURSE OBJECTIVES

- 1) To make the students to understand the history and principle of toxicology.
- 2) To provide adequate knowledge on mechanisms of toxicity.
- 3) To depict the information to the different Phase reactions of metabolism of toxicants.
- 4) To understand the information about various toxicology testing.
- 5) To provide knowledge of the Safety of nanomaterials and nanotoxicity.

Unit I: Introduction to toxicology

Hours: 7

History and scope of toxicology, Source of toxicants. Classification of toxic agents. Occupational toxicology: Workplace, hazardous exposure, and occupational diseases.

Unit II: Mechanism of toxicity

Hours: 7

Toxicant delivery, reaction with the target molecule, cellular dysfunction, inappropriate repair and adaptation. Non target organ toxicity: Chemical carcinogenesis mechanisms of carcinogens. Cytotoxicity mechanisms of cell death mitochondrial dysfunction.

Unit III: Metabolism of toxicants

Hours: 7

Phase I Reactions: Microsomal oxidation Nonmicrosomal oxidations Reduction Reactions, Hydrolysis, Epoxide Hydration. cooxidation. Phase II Reactions: Conjugation reactions, Methyl transferases and Acylation. Reactive Metabolites: nature, stability and fate of reactive metabolites, Elimination of Toxicants: renal, hepatic and respiratory elimination.

Unit IV: Toxicology Testing

Hours: 8

Food toxicology: introduction, safety standards for foods and food ingredients and contaminants. In Vivo Toxicology: Testing of acute, subchronic and chronic toxicity. In Vitro testing: Cell Culture Methods, Ames forward mutation assay, Assessing genotoxicity: mitotic index, chromosomal aberrations, micronucleus assay, cytotoxicity and apoptosis assay.

Unit V: Nanotoxicity

Hours: 7

Introduction to Safety of nanomaterials, Basics of nanotoxicity, Models and assays for Nanotoxicity assessment; Fate of nanomaterials in different stratas of environment; Ecotoxicity models and assays; Life Cycle Assessment, containment.

COURSE OUTCOMES

- 1) Gain knowledge about the basic concepts of toxicology.
- 2) Learn the mechanisms of toxicity reaction with the target molecule.
- 3) Understand the various Reactive Metabolites.
- 4) Learn toxicology testing as food, In vivo, In vitro and genotoxicity assessing.
- 5) Get an idea about the Models and assays for Nanotoxicity.

Text Books

- 1) Barile, F.A. (2008). *Principles of toxicology testing*. New York: CRC Press.
- 2) Hodgson, E. (2004). *A Textbook of Modern Toxicology*. (3rd ed.). London: John Wiley & Sons.
- 3) Osweiler, G.D. (1996). *Toxicology*. Philadelphia : Williams & Wilkins

Suggested Readings

- 1) Marquardt, H., Schafer, S.G., McClellan, R., & Welsch, F. (1999). *Toxicology*. San Diego, CA: Academic Press.
- 2) Fulekar, M.H. (2010). *Nanotechnology importance and applications*. New Delhi: IK International Publishing House.