Generic Elective Courses

For

B. Sc. with Biotechnology (Hons.)

Dibrugarh University

2018

Under

Choice Based Credit System (CBCS)

(First Semester)

GENERIC ELECTIVE (GE-1)
COURSE CODE: BTNG – 101 T
GE-BIOTECHNOLOGY
PAPER TITLE: FOOD MICROBIOLOGY
THEORY (CREDITS 4)

COURSE OBJECTIVES:

It would be expected that after completing this course a student would be able to:

1. Recognize and describe the characteristics of important pathogens and spoilage microorganisms in foods.
2. Understand the role and significance of intrinsic and extrinsic factors on growth and response of microorganisms in foods.
3. Identify ways to control microorganisms in foods.
4. Describe the beneficial role of microorganisms in fermented foods and in food processing.
5. Utilize laboratory techniques to detect, quantify, and identify microorganisms in foods.

Course content:

Units	Content	Hr
I	History of food microbiology: Common Food borne Bacteria, Molds Role, and Significance of Microorganisms in Foods.	8
II	Culture of microbes, Microscopic, and Sampling Method for detecting microbes, Physical, Chemical methods, Immunological methods.	8
III	Food Preservation & Principles of Quality Control: Chemicals antibiotics, Radiation, Low and high temperature, High-Pressure Processing of foods.	8
IV	Microbial Food Spoilage and Food borne diseases: Staphylococcal, E. coli, Salmonellosis, shigellosis, Listerial infections	8
V	Applications of Food Microbiology: Beneficial Uses of Microorganisms in Food Intestinal Beneficial Bacteria-Concept of Prebiotics and Probiotics	8

Expected learning Outcome:

The students will be able to:

- Demonstrate understanding of how microorganisms enter and grow in food or can be used to make food and processes to identify and control food borne disease and food spoilage and understand of the basis of food safety regulations that governing these processes.
- Demonstrate the ability to develop practical skills in analytical methods to evaluate the microbial quality and safety levels of food.

- Demonstrate ability to observe and evaluate data obtained and record and report finding accurately.
- Demonstrate ability to plan a work program and learn independently.
- Demonstrate the ability to work in a small group of peers using problem solving skills to solve problems in food microbiology issues and communicate the solutions in both verbal and in written communication

Recommended readings:

1. Bamforph, C.W. 2005. Food, Fermentation and Microorganisms. Blackwell Pubs.
2. Buchanan, R.L. and Whiting, R.C. 1994. Pathogen Modelling Program Version 4.0.
3. Microbial Safety Research Unit. USDA ARS Eastern Regional Research Centre.
4. Harrigan, W.P. 1988. Laboratory Methods in Food Microorganism. 3rd Ed. Academic Press. San Diego.
5. Jay, J.M. 2000. Modern Food Microbiology. CRC Press. London.
6. Lund, B.M., Parker, T.C. and Gould, G.W. 2000. The Microbiological Safety and Quality of Food. Vol. 1
7. Marianne, D., Miliotis dan Jefrey, W.B. 2003. International Handbook of food borne pathogens. Marcell & Decker Inc.

GENERIC ELECTIVE (GE-1)
COURSE CODE: BTNG – 101 P
GE-BIOTECHNOLOGY
PAPER TITLE: FOOD MICROBIOLOGY
PRACTICAL (CREDITS 2)

List of experiments:

1. Microbial analysis of spoiled dairy products
2. Antibiotic sensitivity assay of microbes
3. Replica plating method
4. Ames test for the identification of mutants
5. Extraction and characterization of microbial endo and exo toxins
6. Quality control techniques

(Second Semester)

GENERIC ELECTIVE (GE-2)
COURSE CODE: BTNG – 201 T
GE-BIOTECHNOLOGY
PAPER TITLE: BIOINSTRUMENTATION
THEORY (CREDITS 4)

COURSE OBJECTIVES:

It would be expected that after completing this course a student would:

- Familiar with the principles and design of different instrument used in Biotechnology research.

Course content:

Units	Content	Hr
I	Microscopy: simple and compound microscopes, light, dark field, phase contrast microscopy, electron microscopy (SEM and TEM)	8
II	Spectroscopic techniques: Theory & application of- UV-VIS and IR spectroscopy	8
III	Electrophoresis: Basic principles and application of SDS-PAGE, agarose, agar cellulose (horizontal and vertical) electrophoresis;	8
IV	Chromatographic techniques: Basic principles and applications of adsorption, absorption, partition, ion exchange *etc*., Paper chromatography, TLC, HPLC and their applications.	8
V	Centrifugation techniques: Basic principles and applications. Ultracentrifugation and density gradient centrifugation.	8
VI	Radioactive isotopes: Basic principle and application of tracer techniques, liquid scintillation counter, Autoradiography.	8

Expected learning Outcome:

The students will have:

- Thorough knowledge and understanding of the core concepts in the discipline of Bioinstrumentation.

Recommended readings:

1. Khandpur R.S. / Biomedical Instrumentation / TMH 2.
2. Tompkins / Biomedical DSP: C Language Examples and Laboratory Experiments for the IBM PC/ PHI.

GENERIC ELECTIVE (GE-2)
COURSE CODE: BTNG – 201 P
GE-BIOTECHNOLOGY
PAPER TITLE: BIOINSTRUMENTATION
PRACTICAL (CREDITS 2)

List of experiments:

1. To prepare the solution of known normality and molarity.
2. Separation of amino acids and fatty acids by TLC/paper chromatography
3. Colorimetric/Spectrophotometric estimation of glucose, protein, RNA and Vitamin C
4. Purification of protein and SDS-PAGE.
5. Absorption spectra of nucleic acids and proteins.
6. Absorption spectra of Potassium dichromate solution.

(Third Semester)

GENERIC ELECTIVE (GE-3)
COURSE CODE: BTNG – 301 T
GE-BIOTECHNOLOGY
PAPER TITLE: ENVIRONMENTAL BIOTECHNOLOGY
THEORY (CREDITS 4)

COURSE OBJECTIVES:

It would be expected that after completing this course a student would:

1. Understand environmental problems and their sources.
2. This course includes several topics pertaining with solutions to certain difficult environmental problems.

Course content:

Units	Content	Hr
I	Environmental Pollution: Concept of Environmental Pollution; Origin of pollution; Classification and nature of Environmental Pollutants; Major sources; Impacts of Environmental Pollution at local regional and global level.	8
II	Air pollution: Concept of air Pollution; Major air pollutants and their sources; Meteorological aspects of air pollution; Oxides of nitrogen and sulphur; Particulate matter; Air pollution standards; Indoor and outdoor air pollution; Air pollution episodes and disasters; Effects of air pollution on human health, animals, plants, material and climate; Formation of fog and photochemical smog and acid rain; Monitoring of air pollution; Control on release of smoke.	8
III	Soil Pollution: Concept of soil pollution; Causes of soil salinity; Different causes of soil degradation; Chemical and metallic pollution of agricultural soil; Mining and soil pollution; Control of soil pollution.	8
IV	Solid Waste: Concept of solid waste; Industrial solid waste; Domestic solid waste; Agricultural solid waste; Municipal solid waste; Major sources of solid wastes; Effects of solid waste generation on quality of air, water and public health; Technical approach for solid waste management; Disposal of organic and medical waste; Recovery and recycling of metallic waste; Disposal of plastic waste and hazardous wastes.	8
V	Environmental Quality Assessment and Monitoring: What is environmental quality? Quality of environment for life on earth and man; Deterioration of environmental quality with reference to anthropogenic impact; Methods of assessment of environmental quality; Short term studies/surveys; Rapid assessment; Continuous short and long term monitoring	8
VI	Environmental Impact Assessment (EIA): Need of EIA; Scope and objectives; Types of environmental impacts; Steps involved in conducting the EIA Studies; Environmental Impact Assessment techniques; Merits and Demerits of EIA studies.	8

Expected learning Outcome:

The students will have knowledge on:

- Recognize the various global and regional environmental concerns due to natural causes and/or human activities, and the impact of these on various forms of life including native biodiversity.
- Investigate some examples of different types of environmental pollution and their impacts.
- Describe the applications of various fields including chemistry, biochemistry, molecular biology and/or microbiology, in understanding and addressing the above issues, as well as exploring environmental resources for new technologies.

Recommended readings:

1. Wang, L. et al. (2010). Environmental Biotechnology, Humana Press. (available at UTS Library, either in hard copy or electronic version)
2. Wang, L. et al. (2010). Environmental Engineering, Humana Press. (available at UTS Library, either in hard copy or electronic version)
3. Vallero, D. A. (2010). Environmental Biotechnology: A Biosystems Approach, Elsevier. (available at UTS Library)
4. Evans, G. M. and Furlong, J. C. (2011). Environmental Biotechnology: Theory and Application, Wiley-Blackwell. (available at UTS Library)
5. Jördening, H. J. and Winter, J. (2005). Environmental Biotechnology: Concepts and Applications, Wiley-VCH. (available at UTS Library E-book)

GENERIC ELECTIVE (GE-3)
COURSE CODE: BTNG – 301 P
GE-BIOTECHNOLOGY
PAPER TITLE: ENVIRONMENTAL BIOTECHNOLOGY
PRACTICAL (CREDITS 2)

List of experiments:

1. Isolation and Characterization of Bacteria from Crude Petroleum Oil Contaminated Soil
2. Growth Response of Bacteria on Petroleum Fuel (Diesel)
3. Determination of BOD
4. Determination of COD
5. Determination of DO

(Fourth Semester)

GENERIC ELECTIVE (GE-4)
COURSE CODE: BTNG – 401 T
GE-BIOTECHNOLOGY
PAPER TITLE: CELL AND TISSUE CULTURE
THEORY (CREDITS 4)

COURSE OBJECTIVES:

It would be expected that after completing this course a student would:

1. To have a comprehensive knowledge of the laboratory requirements and techniques of plant tissue culture and application of these for commercial production
2. To have an in-depth understanding of basic laboratory requirements and culture conditions required for maintenance of animal cell culture for their applications in various aspects of medicine and biotechnology
3. To develop skills, through hands-on lab experiments and exercises, in techniques used for plant tissue culture and animal cell culture

Course content:

Units	Content	Lectures/h
I	Introduction to tissue culture media (plants and animals), aseptic tissue culture techniques, basic quality control measures and tackling microbial contaminations.	8
II	Initiation and maintenance of callus culture, suspension culture, single cell cultures, organogenesis and cellular totipotency, somatic embryogenesis, artificial seed production, regeneration of whole plant.	8
III	Clonal propagation, axillary bud, shoot tip and meristem culture, in vitro pollination, embryo culture, endosperm culture and triploid production.	8
IV	Antherandpollenculture, androgenesis, gynogenesis, productionofhaploidsandtheirapplication.Protoplastisolation, cultureandfusion, somatichybridizationandcybridization. Somaclonalvariation.	10
V	Artificial seed production, Cryopreservation and germplasm conservation. Biotransformation and Production of secondary metabolites (insulin, growth hormones, interferons, etc.)	8
VI	Basic techniques of animal cell culture, transplanting, in vitro fertilization and culture of cells. Application of animal cell culture in medicine and biotechnology. Cell lines, cell strain and cell clones. Hybridoma technology. Stem cell research.	10

Expected learning Outcome:

The students will have:

- Thorough knowledge and understanding of the core concepts ad techniques in Plant Tissue Culture
- Knowledge on techniques in Animal Cell culture and their commercial application

Recommended readings:

1. Animal Cell Culture Techniques (Springer Lab Manuals). Martin Clynes. Springer. 1998
2. Animal Cell Culture and Technology. Michael Butler. Taylor & Francis; 2 edition (25 December 2003)
3. Animal Cell Culture: A Practical Approach. John Masters. OUP Oxford; 3 edition (29 June 2000)
4. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, R. Ian Freshney, Sixth Edition, March 2011
5. Plant Tissue Culture: Theory and Practice. S.S. Bhojwani, M.K. Razdan, Elsevier, November 1996
6. Plant Tissue Culture Techniques and Experiments. Roberta H. Smith. Academic Press; 3rd edition (August 3, 2012)
7. Plants from Test tubes- An Introduction to Micropropagation. Holly Scoggins and Mark Bridgen. Timber Press; Fourth Edition, Revised edition (August 13, 2013)
8. Plant Biotechnology: The Genetic Manipulation of Plants. Slater, Scott, Fowler. Oxford University Press; 2 edition (June 2, 2008)

GENERIC ELECTIVE (GE-4)
COURSE CODE: BTNG – 401 P
GE-BIOTECHNOLOGY
PAPER TITLE: CELL AND TISSUE CULTURE
PRACTICAL (CREDITS 2)

List of experiments:

1. Handling and Operation of Tissue Culture equipments
2. Sterilisation Techniques
3. Media preparation
4. Callus culture
5. Artificial seed production
6. Operation and handling of equipments used in animal cell culture
7. Preparation of animal cell culture media
8. Passaging of cells
9. Primary and secondary cell culture

Generic Elective Courses:

GE-I: FOOD MICROBIOLOGY

GE-II: BIOINSTRUMENTATION

GE-III: ENVIRONMENTAL BIOTECHNOLOGY

GE-IV: CELL AND TISSUE CULTURE