

Syllabus for B.Sc. (Biotechnology)
CBCS -2018
Group II Elective Courses
SEMESTER - I

BSCBTCE 133: FOOD TECHNOLOGY

24 hours

Unit I

(12 hours)

Introduction

Fermented foods: Vegetables – sauerkraut; meat- sausages; soy sauce, tempeh; pickles. Composition of milk, contamination, preservation of milk, microbiological and biochemical tests. Dairy products: Fermented dairy products- cheese, yoghurt, buttermilk, kefir, koumiss. Acidophilus milk and their value. Mushroom as food. Single cell protein – bacteria, algae and fungi. Food spoilage - Contamination and food spoilage- perishable, semiperishable and nonperishable foods. Food poisoning – Exotoxins and endotoxins. Bacterial toxins- botulin, shell fish toxins, diphtheria toxins. Mycotoxins – Aflatoxins, ochratoxins, tentoxins, fumigin

Unit II

(12 hours)

Preservation: Physical- temperature low and high; high osmotic pressure- pickling, salting, curing; dehydration, canning and bolting, vacuum packing. Chemical: Natural- vinegar, alcohol, diatomaceous earth; synthetic – benzoates, calcium propionates, sodium nitrate, sodium nitrite, sulfite; microbial – colchicines, bacteriocin. Food additives. Permitted colors and odors, stabilizer, emulsifiers, antioxidants. Flavouring agents- glutamic acid and glycine salts, carotenoids. Coloring agents- turmeric, caramel coloring, cochineal, saffron, betanin, brilliant blue, indigotine, tartrazine. Nutraceuticals

References:

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- Jay JM, Loessner MJ and Golden DA. 2005. *Modern Food Microbiology*. Springer Publication, New York.
- Knorr D. 1993. *Food Biotechnology*. Marcel Dekker Inc.
- Leo M.L. 2015. *Handbook of Food Analysis* 3rd edition. CRC Press.
- Shakuntala Monay and M Sadakshara Swamy, 2008. *Foods, Facts and Principles* 3rd revised edition. New Age International (P) Ltd. Publishers, New Delhi.
- Srilakshmi B. 2002. *Nutrition Science* 5th edition. New Age International (P) Ltd. Publishers, New Delhi.
- Swaminathan M. 1991. *Essentials of Food and Nutrition* Vol I & II, Ganesh and Co., Madras.
- Winnaker. 2000. *From genes to clones* Panima Educational Book Agency.

SEMESTER - II

BSCBTCE 183: BIOPROCESS TECHNOLOGY

24 hours

Unit I

(12 hours)

Introduction to Bioprocesses Engineering. Kinetic of microbial growth and death, Bioreactors: Principle, Kinetics, types, design, analysis and application. Types of fermentation processes: analysis of batch, Fed-batch and continuous Bioreactions, stability of microbial reactions. Aeration and Agitation systems for bioreactor. Flow behaviour of fermentation fluids Gas-Liquid mass transfer, Solid and Liquid-phase mass transfer and Heat transfer. Measurement and control of bioprocess parameters.

Unit II

(12 hours)

Media for industrial fermentation. Air and media sterilization, safety in fermentation laboratory. Strain improvement of industrially important microorganism, Classification of product formation, Product synthesis kinetics, Mass balance in bioprocesses system, Energy balance in Bioprocess system. Biochemistry of Fermentation Downstream processing: Introduction, removal of microbial cells and solid matter. Foam reparation, precipitation, centrifugation, cell disruption, chromatography. Product recovery processes and Unit operations. Safety consideration in down stream processing.

References

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- Cassida, L.E. 1968. *Industrial Microbiology*. John Wiley & Sons.
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- Moo-Young M. 2011. *Comprehensive Biotechnology*. Vol. 1, 2, 3 & 4. Pergamon Press, New York.
- Nickolas CPL. 1982. *Fundamentals of Enzymology*. Oxford Publishers.
- Peppler, H.J. 1979. *Microbial Technology*. Vol. 1 & 2. Academic Press, London.
- Rosenberg E and Cohen IR. 1983. *Microbial Biology*. Saunders College Publications.
- Stanbury PF *et al.* 1984. *Principles of Fermentation Technology*. Pergamon Press.
- Trevor. *Enzyme biochemistry, Biotechnology and Clinical Chemistry*. Harwood Publishers.

SEMESTER - III

BSCBTCE 233: ADVANCED BIOTECHNIQUES

24 hours

Unit I

(12 hours)

Electrophoresis- Introduction, Migration of ions in electric field, factors affecting electrophoretic mobility. Paper electrophoresis: - Electrophoretic run, Detection techniques, Cellulose acetate electrophoresis, High voltage electrophoresis. Gel electrophoresis: - Types of gels, Solubilizers, Procedure, Column & slab gels, Detection, Recovery & Estimation of macromolecules. Starch-gel; polyacrylamide gel (native and SDS-PAGE (determination of molecular weight of proteins, determination of subunit stoichiometry, molecular biology applications). Agarose-gel electrophoresis, 2D electrophoresis, pulsed field gel electrophoresis, immune-electrophoresis, isoelectric focusing - Principle, Establishing pH and density gradients, Procedures & applications.

(12 hours)

Unit II

Isotopic tracer technique - Radioactive & stable isotopes, rate of radioactive decay. Units of radioactivity. Measurement of radioactivity: - Ionization chambers, proportional counters, Geiger- Muller counter, Solid and liquid scintillation counters (basic principle, instrumentation and technique), Cerenkov radiation. Measurement of Stable isotopes: Falling drop method for deuterium measurement, Mass spectrometry. Principles of tracer technique, advantages and limitations, applications of isotopes in biotechnology (distribution studies, metabolic studies, isotope dilution technique, metabolic studies, clinical applications, autoradiography).

References

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- Arora MP. 2007. *Biophysics*. Himalaya Publishing House, New Delhi.
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- Da Skooge Holt-Saunders. 1985. *Principles of instrumental analysis*. Holt Saunders.
- Friedlander G. 1981. *Nuclear and Radio Chemistry* 3rd edition. John Wiley and Sons.
- Handbook for teachers and Students. *Radiation Biology*: IAEA, online Basic and Clinical
- Joiner M. and van der Kogel A. *Radiobiology* UK, online Nuclear and Radiochemistry.
- José Luis R. Arrondo, Alicia Alonso. 2007. *Advanced Techniques in Biophysics*. Springer Science & Business Media.
- Khopkar SM. 1998. *Basic concepts of Analytical Chemistry*. New Age International Publishers, New Delhi.
- Martin *et al.* 2000. *Harpers review of Biochemistry* 25th edition. Large Medical Publishers.
- Skooge DA, Holler FJ, and Crouch SR. 1988. *Bioanalytical Principles of instrumental analysis*. Thompson Brooks Publishers.

SEMESTER - IV

BSCBTOE 283: BIOTECHNOLOGY IN DAILY LIFE

24 hours

Unit I

(12 hours)

Definition and History of Biotechnology, Scope and Importance of Biotechnology. Microbial world, fermentation. Applications of Biotechnology in Industry: Production of citric acid, alcoholic beverages, Enzymes like proteases, lipases and amylases. Plant biotechnology- GM crops, gene transfer technology, bioreactors, disease control through Bt genes. Applications of Biotechnology in Agriculture: Biofertilizers, Biopesticides, Transgenic plants, Mushroom production

Unit II

(12 hours)

Applications of Biotechnology in Medicine and pharmaceuticals: Insulin therapeutic molecules like tPA, factor VIII, antibiotics. Animal biotechnology – transgenic animals, test tube babies (*In-vitro* fertilization), ethical issues, animal bioreactors, stem cells, stem cell therapy, Environmental biotechnology- composting, biodegradation, biotransformation, biomining. Applications of Biotechnology in Environmental pollution control: Municipal Solid waste management, sewage and industrial effluent treatment, biofuels, Petroleum degradation

References

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- Bajaj YPS. 2007. *Biotechnology in Agriculture and Forestry*. Springer Verlag Publishers.
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- Jogdand SN. 2010. *Environmental Biotechnology*. Himalaya Publishing House, Bangalore, New Delhi.
- Jogdand SN. 2004. *Gene Biotechnology*. Himalaya Publishing House, Bangalore, New Delhi.
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