20FT016 - INDUSTRIAL BIOTECHNOLOGY AND FERMENTATION TECHNOLOGY

Hours Per Week

L	T	P	C
3	0	0	3

Total Hours

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
15	**30**	**-**	**5**	**5**	**-**

Course Description and Objectives:

This course will impart the knowledge to students about prospectus of industrial biotechnology and fermentation in food sector. By the end of this course students will be able to understand the demanding needs of biotechnology and fermentation technology along with their application in food industry and other related industries.

Course Outcomes:

Upon successful completion of this course student should be able to:

- ✓ Get the knowledge about cell and tissue culturing techniques and downstream processing
- ✓ Know about RDNA technology and their application in different areas
- ✓ Know about application of biotechnology in particular to food industry

SKILLS:

- ➢ Understand the concept of cellular and microbial culture techniques and their downstream and upstream techniques.
- ➢ Gain perspectives to industrially important food products manufacture with the implication of biotechnology.
- ➢ Acquire field work techniques to study, observe and prepare documents, charts, ppts, models etc.

UNIT - I

Prospectus of biotechnology- definition, scope and applications, Application of Biotechnology in food (Food industries), pharmaceuticals and agriculture, Application of biotechnology for food plant waste utilization, biogas plants, Microbial Foods –Food, Fodder and Baker's yeast, Nutritional characteristics of food yeast, mushroom production. Soya-sauce & cheese production.

UNIT - II

Fermentation Process: General requirements of fermentation processes, Basic design and construction of fermenter and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An over view of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid substrate, slurry fermentation and its applications,

whole cell immobilization, behavior of microbes in different reactors (air lift, fluidized, batch, continuous and fed batch condition), Aeration and agitation in bioreactors.

UNIT - III

Solid state fermentation: Introduction to solid state fermentation (SSF), comparison of SSF with submerged fermentation, applications in industry, growth kinetics in SSF, Heat and Mass transfer problems in SSF, SSF bioreactors, Scale up of SSF.

UNIT - IV

Bioprocess optimization: Conventional optimization process (one variable at a time approach), need for statistical experimental design, screening techniques-Plackett Burman design, response surface methodology-Box- Behnken design, central composite design and self-directing optimization, Principles and mechanism of media and air sterilization, batch and continuous design of air filter.

UNIT - V

Plant and animal cell cultivation: Plant and animal cells compared to microbial cultivation, Bioreactor considerations for plant cell-suspension culture, immobilization culture and organized tissues. Methods used for cultivation of animal cells, Bioreactor consideration for animal cell culture suspension culture, anchorage dependent cultivation. Important industrial products from plant and animal cell cultivation. value addition of these herbs. Their nutritive value & health benefits, their processing and Postharvest handling. Packaging methods for processed products. NIH guidelines for minimum containment requirements for different risk level agents. Regulations for biosafety related to production of bioprocess-based foods.

ACTIVITY:

o Flowchart for the manufacturing of industrially important food products using fermentation technology

TEXT BOOKS :

1. M. M. Cox, “Lehninger principles of biochemistry”. 4th edition. New York: Worth Publishers, 2000.
2. R. F. Boyer, “Modern Experimental Biochemistry”, 3rd edition, Pearson Education, 2009

REFERENCE BOOKS :

1. L. Stryer, “Biochemistry”, 3rd edition. Freeman & Co, New York. 2009.
2. D. Voet, J. G. Voet and C. W. Pratt, “Fundamentals of Biochemistry”, 4th edition. Jonh Willey & Sons, 2013.