St. Aloysius College (Autonomous), Jabalpur, M.P.

Department of Botany and Microbiology

Department of Higher Education, Govt. of M.P.

Under Graduate Annual Pattern Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

Session 2020-2022

Class: B.Sc.
Year: III
Subject: Industrial Microbiology
Paper: 1 - Fermentation Technology & Biostatistics
Max. Marks: 40(TH.)+10 (CCE) = 50

Course outcome: Learners are equipped to become an entrepreneur in the field of Industrial production of microbial products like antibiotics, vitamins and enzymes. Awareness regarding bio safety measures enables student to serve the microbial industry in future. Students get acquainted with techniques of agriculture and microbiology, production of biofertilizer and quality testing of edibles. They will develope an understanding of different types of reactors or fermenters which are used for laboratory, pilot and industrial scale fermentations and their processes parameters.

UNIT -I PRINCIPLE OF FERMENTATION:-

Primary and secondary screening of industrially important microorganisms; Strain improvement mutation, recombination and protoplasmic fusion; development of inoculum for industrial fermentation; types of fermentation media - saccharine materials, starchy materials, cellulosic materials, nitrogenous materials, enhancers and precursors.

UNIT -II - DESIGN AND TYPES OF FERMENTOR :-

Structure of a batch fermentor; Types of fermentor; Batch; Continuous; Stirred tank; Fluidized bed and Solid State fermenter; computer control of fermentation process.

UNIT - III:- RECOVERY PROCESS :-

Downstream Processing - intracellular and extracellular product recovery (Physical and Chemical methods); Cell disruption method, solvent extraction and purification; Product recovery by whole broth processing.

UNIT-IV :- BIOSAFETY MEASURES :- in fermentation technology

Government regulations of recombinant DNA Research; Quality control regulations; Hazardous industrial waste; mycotoxin hazards; Regulation for disposal of bio-hazardous materials; Biopatents in industries; Biosafety in laboratories and industries (Dairy and Food, Pharmaceutical. Agricultural and Beverages).

18/12/20

UNIT -V- BIOSTATISTICS AND BIOINFORMATICS :-

A. Biostatistics : Principle of Biostatistics; Classification of Data; Tabulation and Graphic representation; Measures of Central Tendency- Mean, Mode, Median- merits and demerits; Measu of Dispersion Range; Mean Deviation variance and Standard Deviation.

B. Bioinformatics: Basic Organization of computer; Computer Hardware; Software, Bit, By Computer Memory, Binary Code, Binary System; Introduction to Bioinformatics, Database a application of Bioinformatics.

Text & Reference Books:

1. Whitaker. A. Stanbury, P.F. and Hall, SJ. 2009. Principles of fermentation techniques. Elsevier

2. Prescott, S.C., Dunn, C.G., and Reed, G. 1982, Prescott and Dunn's Industrial Microbiology, Edition. AVI Publ. Co., Westport, Conn.,

3. Hui. Y. H.. Meunjer-goddik, L., Hansen, A.L., Josephsen, J., Nip, W.K., Stanfield, P.S. and Toldra 2004. Handbook of Food and Beverage Fermentation Technology, New York: Marcel Dek Incorporated.

4. Casida L. E., 1968, Industrial Microbiology, Wiley New York.

5. Shrivastava M. 2008, Fermentation Technology, Alpha science International

6. Agrawal B.L., Basic Statistics.

7. Mishra and Mishra Statistics

8. Glover and Mitchell: Biostatistics.

18/12/20

12/12

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Under Graduate Annual Pattern Syllabus

As recommended by Central Board of Studies and approved by the Governor

Session 2021 - 2022

Class: B.Sc.
Subject: Industrial Microbiology
Paper: II - Agricultural, Environmental and Industrial Microbiology
Max. Marks: 40(TH.)+10 (CCE) = 50

Course outcome: Student will learn techniques regarding microbial analysis of food samples and dairy products. Information regarding microbial food poisoning. Industrial and municipal waste water treatment, production of single cell protein makes the student efficient to start enterprise at pilot scale level. the students Have developed a fairly good knowledge and understanding of different types of environments and habitats where microorganisms grow including the microbiomes of the human gut and animal gut

UNIT -I : BIOFERTILIZERS AND BIOPESTICIDES :-

Biofertilizer :– Industrial production of *Rhizobium*, *Azotobacter*, , Cyanobacteria, Mycorrhizae - VAM and phosphate solubilizing bacteria

Biopesticides :– Production of bacterial, viral and fungal biopesticides, microbial warfare on plants.

UNIT -II : BIOREMEDIATION AND BIOLEACHING :-

Management of Industrial waste- textile, pharmaceutical and dairy industry.

Management of agricultural waste.

Management of Municipal waste- Primary, Secondary and Tertiary treatment, Microorganisms in Composting, Bioleaching of copper and gold.

UNIT-III : METABOLITES PRODUCTION :-

Industrial production of organic acids, enzymes (amylase and protease), solvents (acetone, ethanol and glycerol), Vitamins (B12 and riboflavin), Antibiotics (Penicillin and Streptomycin)

UNIT -IV : FOOD AND DAIRY MICROBIOLOGY :-

Microbial role in production of bread, cheese, butter, yoghurt, cultured buttermilk, condensed and dry milk products, Indian fermented foods.

18/12/20

18/12

UNIT - V : BIOFUEL AND MICROBIAL FOODS :-

Biofuel :-Microorganism used, fermentation condition, recovery, production and uses of hyd ethanol and biogas

SCP :- Production of SCP (Algae and Bacterial); Product quality, merits and demerits. Mushroom Production (long and short method) and harvesting.

Text & Reference Books:

1. Casida, L.E 1968. Industrial Microbiology. Willey, New York; London.
2. Doyle, M.P. Beuchat, L.R. and Montville, T. J. 2001. Food microbiology: Fundamenta Frontiers. 2nd edition ASM Press, Washington, D.C.
3. Frazier, W.C.. and Westhoff, D.C. 2004. Food microbiology. Tata McGraw Hills Pub Company Limited.
4. Rose, A.H. 1983. Food microbiology, Academic Press, London
5. Garbutt,. J.H. 1997. Essentials of food microbiology. Arnold, London.
6. Wood, B.J.B. 1998. Microbiology Of Fermented Foods. 2nd edition. Blackie academ professional, London
7. Prajapati J.B. 1995. Fundamentals of Dairy Microbiology
8. R.C. Dubey A textbook of Biotechnology.
9. R. P. Singh. A textbook of Microbiology.

18/12/20

18/12