



Source : <https://www.bioeconomie-bw.de/en/articles/dossiers/industrial-biotechnology-biological-resources-for-industrial-processes>

22BT205 INDUSTRIAL BIOTECHNOLOGY

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Microbiology and Fermentation Technology, Biochemistry and Enzymology.

COURSE DESCRIPTION & OBJECTIVES:

The course aims to provide fundamental insights to exploit enzymes and microbes for the manufacturing of products which have a huge industrial significance. It uniquely blends the science and engineering with various biochemical processes to obtain products of diverse fields such as chemicals, food and bioenergy.

MODULE-1

UNIT-1

9L+0T+6P=15 Hours

MARKETING MANAGEMENT

Fermentations by Bacteria, Fungi and yeast, Modern Biotechnology processes and products, Upstream and Down stream processes, Process Flow Diagram - industrial production of wine.

UNIT-2

15L+0T+10P=25 Hours

PRODUCTION OF PRIMARY AND SECONDARY METABOLITES

Industrial Production of commercially important organic acids, amino acids and solvents, Production of Antibiotics, Vitamins and steroids.

PRACTICES:

- Bacterial fermentation for production of Amino acids.
- Preparation of wine.
- Lactic acid production by fermentation.
- Citric acid production by fermentation.

MODULE-2

UNIT-1

9L+0T+6P=15 Hours

INDUSTRIAL BIOPRODUCTS

Importance of Industrial Enzymes, Biopesticides, Biofertilizers, Bio-preservatives, Biopolymers, Biodiesel, Single cell Proteins.

UNIT-2

15L+0T+10P=25 Hours

PRODUCTION OF THERAPEUTIC MOLECULES

Recombinant proteins for therapeutic and diagnostic applications, Production of vaccines and recombinant proteins, Product development based on Plant Cell and Animal Cell culturing technologies. Bioreactors for production of modern biotechnology products, Production of Monoclonal Antibodies.

PRACTICES:

- Production of bio-preservatives.
- Shake flask fermentation for production of *Spirulina*.
- Fermentation for production Amylase.
- PBH production by fermentation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the principles and methods of fermentation processes for bioproducts production.	Apply	1	1,4,5,6,9,10
2	Select suitable microbial strains for production of primary and secondary metabolites.	Analyze	1	2,4,6,7,9,10
3	Develop the process flows steps for efficient production of products.	Create	2	3,4,6,9,10
4	Design of novel process trains for enhanced yield of bioproducts.	Create	2	3,4,6,9,10

TEXT BOOKS:

1. Lee SY, Nielsen J and Stephanopoulos G, "Industrial biotechnology: microorganisms", 2nd edition, John Wiley & Sons, 2016.
2. Liese A, Seelbach K and Wandrey C, "Industrial biotransformations", 1st edition, John Wiley & Sons, 2006.

REFERENCE BOOKS:

1. Glazer AN and Nikaido H, "Microbial biotechnology: fundamentals of applied microbiology", 1st edition, Cambridge University Press, 2007.
2. Faye L and Gomord V, "Recombinant Proteins From Plants", 1st edition, Humana Press, 2009.
3. Lee SY, Nielsen J and Stephanopoulos G, "Cell culture engineering: recombinant protein production", 3rd edition, 2nd edition, John Wiley & Sons, 2020.
4. Okafor N and Okeke BC, "Modern industrial microbiology and biotechnology", CRC Press, 2017.
5. Rai BK, "Basic Practical Manual on Industrial Microbiology", 2nd edition, Lulu. Com, 2016.

SKILLS:

- ✓ Lab scale culturing of bacteria and yeast for production of bioproducts.
- ✓ Developing the process flow sheet for production of products.
- ✓ Selecting the suitable mode of fermentation reactions for production of products.



Source :
Biogas plant at VFSTR

22CT201 ENVIRONMENTAL STUDIES

Hours Per Week :

L	T	P	C
1	1	0	1

PREREQUISITE KNOWLEDGE: General awareness regarding environmental problems and importance of environmental protection.

COURSE DESCRIPTION AND OBJECTIVES:

It is a multidisciplinary subject where different aspects of society and environment are dealt using a holistic approach. It is evolving to be the education for sustainable and ethical development both at a local and global level. It helps to prepare the next generation for planning appropriate strategies to address environmental issues. It identifies and creates solutions that conserve to manage ecosystem and biodiversity and helps to eliminate pollutants, toxicants, preserve air, water and soil quality. Environmental education recognizes impacts of global issues, enhances the public awareness and helps to take decisions towards environmentally responsible actions.

MODULE-1

UNIT-1

4L+4T+0P=8 Hours

NATURAL RESOURCES, ECOSYSTEMS AND BIODIVERSITY

Environment and sustainable development, Natural resources- forest, water, energy and land resources; Ecosystem-basic structural components, function and interactions in ecosystem, ecological succession.

UNIT-2

4L+4T+0P=8 Hours

BIODIVERSITY AND CONSERVATION

Introduction to biodiversity, types of biodiversity - species, genetic and ecosystem diversity, Threats to biodiversity - natural and anthropogenic, species extinctions, man wildlife conflicts, Biodiversity conservation - principles and strategies, in-situ and ex-situ conservation.

PRACTICES:

- Visit to a Biogas plant, Solar Power plant.
- Visit to a local area: river/pond/lake/forest / grassland / hill /mountain and study of different.
- types of ecosystems, biodiversity study and documentation (herbarium sheet preparation).
- Set up an aquarium.
- Case study: Renewable energy use.

MODULE-2

UNIT-1

4L+4T+0P=8 Hours

ENVIRONMENTAL POLLUTION AND CLIMATE CHANGE

Air, water, soil, radioactive and noise pollution, Study of different pollutants (SO_x, NO_x, PAN, PAH etc.); Toxicity study, Climate change - greenhouse effect, acid rain, ozone layer depletion.

UNIT-2**4L+4T+0P=8 Hours****POLLUTION CONTROL DEVICES AND WASTEWATER TREATMENT TECHNOLOGIES**

Air pollution control devices - Gravitational settling chambers, cyclonic separators, electrostatic precipitators, fabric filters and bio filters, Wastewater management.

PRACTICES:

- Visit to a sewage treatment plant and wastewater analysis.
- Case study: Recycling Technologies.
- Case study: Effects of contaminants on microorganisms.
- Report writing: 12 principles of green chemistry for environmental sustainability.
- Report writing: Environmental Impact Analysis, Local Disaster Management Plan.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the basic concepts of sustainable development, natural resource utilization and ecology for the purpose of environmental protection.	Apply	1	1,6,7, 9, 10, 11, 12
2	Design remediation technologies for their abatement.	Apply	2	1, 3,6,7, 9, 10, 11, 12
3	Analyze the biodiversity of different ecosystems and formulate various conservation approaches	Analyze	1	1, 7, 8, 9, 10, 11, 12
4	Analyze the presence of various environmental pollutants.	Analyze	2	1, 6,7,9, 10, 11, 12
5	Recommend various waste management approaches and their implementation strategies.	Evaluate	2	1,2, 7,8,9,10,11, 12

TEXT BOOKS:

1. A. Kaushik and C. P. Kaushik, "Perspectives in Environmental Studies", New Age International Publishers, 5th Edition, 2016.
2. Y. Anjaneyulu, "Introduction to Environmental Science", 1st edition, B. S. Publications, 2015.

REFERENCE BOOKS:

1. B. Joseph, "Environmental Studies", Mc Graw Hill Education, 2nd Edition, 2015.
2. S. Subash Chandra, "Environmental Science", 1st edition New Central Book Agency, 2011.
3. M.Basuand S.Xavier, "Fundamentals of Environmental Studies", 2nd edition Cambridge University Press, 2016.

SKILLS:

- ✓ Create a bio-diversity map of any habitat/ ecosystem.
- ✓ Strategize different ways of using renewable energy resources.
- ✓ Design novel strategies and approaches for pollution control and waste management.



Source : <https://xueqi326.wordpress.com/semester-3/management-science/>

22MS201 MANAGEMENT SCIENCE

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Basic knowledge on management.

COURSE DESCRIPTION & OBJECTIVES:

The goal of this course is to analyse the importance of management, significance of operation management and carry out production operations through work-study. Students will be able to analyse the markets, customers, competitors, and then plan HR function effectively.

MODULE- 2

UNIT-1

6L+6T+0P=12 Hours

INTRODUCTION TO MANAGEMENT

Concepts of Management and organization- nature, importance and Functions of Management, Systems approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Leadership Styles, Social responsibilities of Management.

UNIT-2

10L+10T+0P=20 Hours

OPERATIONS MANAGEMENT

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement, Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records. Statistical Quality Control: control charts for variables and attributes (simple Problems), Acceptance Sampling

PRACTICES:

- Collect some examples with videos for types of production.
- Carry out production operations through work-study.
- Practice problems with Inventory control methods and Quality Control charts.

MODULE- 2

UNIT- 1

8L+8T+0P=16 Hours

HUMAN RESOURCES MANAGEMENT

Concepts of Human Resource Management, Basic functions of HR Manager - Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT- 2

8L+8T+0P =16 Hours

MARKETING MANAGEMENT

Evolution of Marketing, Functions of Marketing Selling Vs Marketing, 4 P's of Marketing – Product Mix - Product Life Cycle – Place Mix – Channels of Distribution – Price Mix – Pricing Methods – Promotion Mix – Tools of Promotions.