B.Sc. Part I (Industrial Microbiology)

Course outcome

SEMESTER-I

Program Specific Outcomes of Industrial Microbiology:

After completion of three years Industrial Microbiology program, the students vision insights will broaden into –

1. Application of Basic & Advanced concept of industrial microbiology to diverse areas such as fermentation technology, quality control, government's law and regulations, quality management and environmental monitoring.

2. Competence of a working knowledge of theory, practicals, skills and use of various aspects of industrial microbiology according to the needs of industries.

3. Identifying societal problems and providing innovative remedies with a broader perspective of industrial microbiology.

4. Development of entrepreneur skill

Course I **DSC 27A**	**Introduction to Industrial Microbiology**
Course Objective	1. To get acquainted with the contribution made by prominent scientist in the field of industrial microbiology. 2. To study industrially important products 3. To understand the basic concept of fermentation and technique used for isolation of industrially useful microorganisms. 4. To study the characteristics and industrial importance of microorganisms
Course Outcome	At the end of the course, students will study- 1. Contribution made by prominent scientist 2. Various industrially important products. 3. Industrially important microorganism and their characteristics.
Course II **DSC 28 A**	**Basics of fermentation**
Course Objective	1. To study the formulation of fermentation media. 2. To understand the use of agricultural and industrial waste as fermentation media 3. To understand the principles of sterilization of equipment, culture media, air in industries and validation of sterilization process

Course Outcome	At the end of the course, students will study- 1) Components of fermentation media 2) Type of waste and its use as fermentation media. 3) Various sterilization techniques in fermentation industry.

Course III **DSC 27B**	**Introduction to fermentation technology**
Course Objective	1. To study the fermentor design and to understand different types of fermentor. 2. To study the temperature, pH, pressure and foam control systems and their importance. 3. To understand the concepts of inoculums preparation, strain improvement, stock culture maintenance and culture collection centers. 4. To study the various factors affecting fermentation process
Course Outcome	At the end of the course, students will study- 1) Basic fermentor design and types of fermentor 2) Various fermentor control system 3) Industrial important microorganism, their maintenance and use. 4) Controlling factors of fermentation process.
Course IV **DSC 28 B**	**Microbial Fermentations and Economics**
Course Objective	1. To study industrial production of penicillin, semi synthetic penicillin and Vit B12 2. To study microbiological assay of vitamins and antibiotics. 3. To understand various downstream processes. 4. To study economic protection of fermentation product.
Course Outcome	At the end of the course, students will study- 1) Production method of antibiotics and vitamin. 2) Quantitative estimation of antibiotic and vitamin. 3) Downstream processes of fermentation product 4) Economics of fermentation

Course outcome

Program Specific Outcomes of Industrial Microbiology:

Industrial Microbiology will enrich the students with

1. Knowledge regarding basic, advanced and applicable concepts in emerging areas of Industrial Microbiology.
2. Competence of a working knowledge of theory, practicals, skills and use of various aspects of industrial microbiology according to the needs of industries.
3. Identifying societal problems and providing innovative remedies with a broader perspective of industrial microbiology.
4. Development of entrepreneur skill

Year	Paper no. and name	Course objective	Outcome
B. Sc. II	Paper V Industrial Production of Fermented Foods	1) To study microbial production of fermented products 2) To study spoilage and preservation of fermented foods	1) Students will acquire knowledge about the production process of fermented foods 2) Students will easily become familiar with the subject and gain knowledge as the course includes the topics concerned with our day to day life like production, spoilages, and preservation of fermented foods routinely prepared and consumed at home
	Paper VI Quality Control of Food Products	1) To examine the quality control of fermented foods 2) To study different acts for quality assurance of fermented foods	1) Students will become familiar with how the microbiological quality of fermented foods is checked in industries 2) Students will get acquainted with regulations for quality assurance of food products
	Paper VII Fermentation	1) To learn fermentations of	1) Students will understand the production processes of different

	Technology	industrially important products like antibiotics and organic acids 2) To acknowledge the fermentation processes of amino acids and enzymes	industrially important fermentations like antibiotics and organic acids 2) Students will get knowledge regarding the production of amino acids and enzymes
	Paper VIII Industrial Production of Biofertilizers	1) To study biofertilizers production and application 2) To study the quality control of biofertilizers	1) Students will acquire the production process and application of nitrogen-fixing and phosphate solubilizing biofertilizers 2) Students will become familiar with quality control of biofertilizers as per the rules of FCO

B.Sc. Part III (Industrial Microbiology)

Course outcome

Program Specific Outcomes of Industrial Microbiology:

Industrial Microbiology will enrich the students with

1. Knowledge regarding basic, advanced and applicable concepts in emerging areas of Industrial Microbiology.
2. Application of Basic & Advanced concept of industrial microbiology to diverse areas such as fermentation technology, quality control, government's law and regulations, quality management and environmental monitoring
3. Competence of a working knowledge of theory, practicals, skills and use of various aspects of industrial microbiology according to the needs of industries.
4. Identifying societal problems and providing innovative remedies with a broader perspective of industrial microbiology.
5. Development of entrepreneur skill

SEMESTER-V

Course IX **DSCC 27**	**Environmental Microbiology**
Course Objective	1) To study soil environment with respect to its characters and microbial interactions in the same. 2) To explore role of microorganisms in various elemental cycles. 3) Exploring microbiology of petroleum, marine, space and textile environments. 4) To acquire knowledge of microbial process of bioleaching.
Course Outcome	At the end of the course, students will study- 1) Physical, chemical and biological characters of soil and role of microbial interactions in soil fertility. 2) Elemental cycles along with role of microorganisms. 3) Types of microbial flora in various environments like petroleum, marine, space and textile and role of the same in these environments. 4) Various types of bioleaching methods in addition to role of microorganisms.
Course X **DSCC 28**	**Basic Techniques of Biotechnology**
Course Objective	1) To study Tools of genetic engineering with respect to enzymes, Cloning Vectors and Cloning organisms.

	2) To study techniques of genetic engineering. 3) To acquire knowledge of molecular biology and various techniques. 4) To study methods of protein engineering and get detailed knowledge of PCR
Course Outcome	At the end of the course, students will study- 1) Methods in genetic engineering. 2) Techniques in genetic engineering like isolation, construction recombination of DNA. 3) Types of techniques in molecular biology. 4) Various types of immobilization methods. Working and application of PCR
Course XI **DSCC 27**	**Quality Assurance And Quality Control In Industrial Products**
Course Objective	1) To study Indian pharmacopoeia. 2) To study assay of microbial products as per indian pharmacopoeia. 3) To study quality control tests of pharmaceutical products. 4) To study International standards and validation in pharmaceutical industry
Course Outcome	At the end of the course, students will study- 1) Concept of Pharmacopoeia, microbial Q.C. 2) Can quantify microbial products using assay techniques as per indian pharmacopoeia. 3) Types of quality control test of pharmaceutical products. 4) Get knowledge of WHO and ISI standards and validation process.
Course XII **DSCC 27**	**Microbial production of metabolites and bioinsecticides**
Course Objective	1) To inculcate the knowledge regarding production of metabolites and bioinsecticides. 2) To know the methods for quantitative estimation of certain metabolites. 3) To give idea regarding production safety and effectivity of toxoid, SCP and bioinsecticides. 4) Applications of every product are concluded.
Course Outcome	At the end of the course, students will study- 1) The production procedures of vitamins, organic acid and antibiotics were elaborated. 2) Different assays required after production is revealed. 3) Merits and demerits of every product are concluded. 4) Concept of production safety and effectivity is cleared.

SEMESTER-VI

Course XIII **DSCC 27**	**Environmental Pollution and control**
Course Objective	1) A clear vision why environmental monitoring is essential at industrial levels. 2) Demonstration of the concept of eutrophication and its effects. 3) To discuss various methods involved in management of wastewater from industries. 4) Familiarizing the biosafety levels in laboratories.
Course Outcome	At the end of the course, students will study- 1) Awareness of controlling pollution by treating industrial wastes. 2) The exact knowledge of characteristics of sugar industry, distillery and dairy industry. 3) Idea of various S.O.P.s's followed in various industries to protect the environmental conditions. 4) Recognizing the need of environmental monitoring, E.M.S. and E.I.A...
Course XIV **DSCC 28**	**Applications of biotechnology**
Course Objective	1) Expanding the knowledge of applications of genetic engineering. 2) Get familiar with transgenic plants and transgenic animals along with their applications. 3) Interpreting the diagnostic techniques. 4) To know applications of genetic engineering in medical field.
Course Outcome	At the end of the course, students will study- 1) Elaboration of applications in agriculture by conceptualizing transgenic plants and transgenic animals. 2) Detailed review on bioremediation and GEMs in industry. 3) Exploring vaccine and monoclonal antibodies with their production and examples. 4) Knowledge of various diagnostic techniques.
Course XV **DSCC 29**	**Industrial management , government laws and regulations**
Course Objective	1) To introduce various strategies for industrial management. 2) To understand the needs of following the rules and regulations. 3) Widen the view of laws and regulations involved in industries. 4) Necessity of management and marketing for growth of youth entrepreneur.
Course Outcome	At the end of the course, students will study- 1) Basics required for fresh new setup of industry and its

	management will be cleared. 2) Concepts like planning, organizing, HR management, financial management will be overviewed. 3) Depth of laws and regulations will be recognized which are industrially important. 4) Features of G.S.T. and tax will be declared
Course XVI **DSCC 30**	**Microbial fermentations, foods and biofuels**
Course Objective	1) To have brief overview of various industrially important fermented foods. 2) To take detailed knowledge about production process of food products. 3) To know the exact procedure for checking product quality and safety. 4Application of all the products will be determined.
Course Outcome	At the end of the course, students will study- 1) The production procedure of SCP, mushroom, probiotics and Indian made foreign liquors will be explored. 2) Production procedures of vinegar exopolysaccharides and biofuels will be studied including their types. 3) Details of quality and safety of products is overviewed. 4) Properties and applications of every product will be glanced.