College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (core course), SEMESTER –V
Industrial Microbiology (THEORY)
Course code- MBC (T) - 3511

Lesson plan

Unit	Topic	Lecture
1	**History and development of industrial microbiology** Brief history and developments in industrial microbiology Industrially important microbes and methods for their isolation Preservation and maintenance of industrial strains, strain improvement Crude and synthetic media: molasses, corn-steep liquor, sulphite waste liquor, whey	 01 02 03 04
2	**Fermentation processes, bio-reactors and fermentation parameters** Types of fermentation processes - stationary and submerged fermentations; batch and continuous fermentations Designing of a typical bio-reactor and its components Batch fermenter and constantly stirred tank fermenters Fermentation parameters - pH, temperature, foaming and aeration	 05 02 01 04
3	**Down-stream processing** Cell disruption, filtration Centrifugation Solvent extraction Precipitation, lyophilization and spray drying.	 02 02 02 04
4	**Microbial production of industrial products and Enzyme immobilization** Microbial production: Citric acid, glutamic acid, ethanol, penicillin, Vaccine, Vitamin B12, Enzymes (amylase, protease), steroid; Enzyme immobilization: Definition, Methods of immobilization, advantages and applications of immobilization.	 07 01 04

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3RD Year Science
MICROBIOLOGY (core course), SEMESTER –V
Industrial Microbiology (THEORY)
Course code- MBC (T) – 3511

Course breakup

Lecture schedule

LECTURE NO.	TOPICS TO BE COVERED
1	Brief history and developments in industrial microbiology
2	Industrially important microbes and methods for their isolation
3	Industrially important microbes and methods for their isolation
4	Preservation and maintenance of industrial strains
5	Preservation and maintenance of industrial strains
6	Strain improvement
7	Crude and synthetic media: molasses
8	Corn-steep liquor
9	Sulphite waste liquor
10	Whey
11	Types of fermentation processes - stationary
12	Submerged fermentations;
13	Batch fermentations
14	Continuous fermentations
15	Continuous fermentations
16	Designing of a typical bio-reactor and its components
17	Designing of a typical bio-reactor and its components
18	Batch fermenter and constantly stirred tank fermenters
19	Fermentation parameters - pH
20	Temperature
21	Foaming
22	Aeration
23	Cell disruption
24	Filtration
25	Centrifugation
26	Centrifugation
27	Solvent extraction
28	Solvent extraction
29	Precipitation,
30	Lyophilization
31	Spray drying.
32	Spray drying.

33	Microbial production: Citric acid;
34	Glutamic acid
35	Ethanol
36	Penicillin
37	Vaccine
38	Vitamin B12
39	Vitamin B12
40	Enzymes (amylase, protease), steroid
41	Enzyme immobilization: Definition,
42	Methods of immobilization,
43	Advantages and applications of immobilization
44	Advantages and applications of immobilization

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (core course), SEMESTER –V
Immunology (THEORY)

Course code- MBC (T) – 3512

Lesson Plan

unit	topic	lecture
1	**Immune Cells and Organs** Concept of Innate and Adaptive immunity	**01**
	Structure, Functions and Properties of: Immune Cells – Hematopoietic stem cell, T cell, B cell, NK cell, Macrophage Neutrophil, Eosinophil , Basophil, Mast cell, Dendritic cell	**05**
	Primary lymphoid Organs: Bone Marrow, Thymus	**02**
	Secondary lymphoid organs: Lymph Node, Spleen, GALT, MALT, CALT.	**02**
2	**Antigens and Antibodies** Characteristics of an antigen ; Haptens; Epitopes (T & B cell epitopes)	**02**
	Adjuvants; Structure, Types, Functions and Properties of antibodies	**03**
	Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic)	**04**
	Monoclonal and Chimeric antibodies	**01**
	Structure and Functions of MHC I & II molecules.	**02**
3	**Immune Response and Immunological Disorders** Primary and Secondary Immune Response	**02**
	Generation of Humoral Immune Response	**01**

	Generation of Cell Mediated Immune Response Killing Mechanisms by CTL and NK cells Types of Autoimmunity and Hypersensitivity with examples Immunodeficiencies - Animal models (Nude and SCID mice), SCID, DiGeorge syndrome, Chediak- Higashi syndrome, Leukocyte adhesion deficiency, CGD.	**01** **03** **05**
4	**Immunological Techniques** Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, ELISPOT, Western blotting, Immunofluoresence, Flow cytometry, Immunoelectron microscopy.	**10**

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (core course), SEMESTER –V
Immunology (THEORY)

Course code- MBC (T) – 3512

Course breakup

Lecture schedule

LECTURE NO	TOPICS TO BE COVERED
1	Concept of Innate and Adaptive immunity
2	Structure, Functions and Properties of: Immune Cells – Hematopoietic stem cell
3	T cell, B cell,
4	NK cell ,Macrophage
5	Neutrophil, Eosinophil , Basophil
6	Mast cell, Dendritic cell
7	Primary lymphoid Organs: Bone Marrow, Thymus
8	Primary lymphoid Organs: Bone Marrow, Thymus
9	Secondary lymphoid organs: Lymph Node, Spleen
10	GALT, MALT, CALT
11	Characteristics of an antigen ; Haptens
12	Epitopes (T & B cell epitopes)
13	Adjuvants
14	Structure, Types, Functions and Properties of antibodies
15	Structure, Types, Functions and Properties of antibodies
16	Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic)
17	Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic)
18	Antigenic determinants on antibodies (Isotypic, allotypic, idiotypic)
19	Monoclonal and Chimeric antibodies
20	Monoclonal and Chimeric antibodies
21	Structure and Functions of MHC I & II molecules.
22	Structure and Functions of MHC I & II molecules.

23	Primary and Secondary Immune Response
24	Primary and Secondary Immune Response
25	Generation of Humoral Immune Response
26	Generation of Cell Mediated Immune Response
27	Killing Mechanisms by CTL and NK cells
28	Killing Mechanisms by CTL and NK cells
29	Killing Mechanisms by CTL and NK cells
30	Types of Autoimmunity and Hypersensitivity with examples Immunodeficiencies - Animal models (Nude and SCID mice)
31	SCID, DiGeorge syndrome
32	Chediak- Higashi syndrome
33	Leukocyte adhesion deficiency
34	CGD
35	Principles of Precipitation
36	Agglutination
37	Immunodiffusion
38	Immunoelectrophoresis
39	ELISA
40	ELISPOT
41	Western blotting
42	Immunofluoresence
43	Flow cytometry
44	Immunoelectron microscopy

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (Discipline specific elective), SEMESTER –V
Microbial Biotechnology (THEORY)
Course code- MBD (T) - 3501

Lesson Plan

Unit	Topic	Lecture
1	**Therapeutic and Industrial Biotechnology**	
	Recombinant microbial production processes in pharmaceutical industries -recombinant vaccines (Hepatitis B vaccine).	03
	Genetically engineered microbes for industrial application: Bacteria and yeast.	02
	Microbial polysaccharides and polyesters.	02
	Microbial production of Bio-pesticides and Bioplastics.	02
	Microbial biosensors.	01
2	**Applications of Microbes in Biotransformation**	
	Microbial based transformation of steroids and sterols.	02
	Bio-catalytic processes and their industrial applications.	03
	Production of high fructose syrup.	03
	Production of cocoa butter substitute.	02

3	**Microbial Products and their Recovery** Microbial product purification: filtration, ion exchange & affinity chromatography techniques Down streaming process Immobilization methods and their application.	04 02 04
4	**Microbes for Bio-energy and Environment** Bio-ethanol and bio-diesel production. Commercial production from lignocellulosic waste and algal biomass Biogas production: Methane and hydrogen production using microbial culture.	02 04 04

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (Discipline specific elective), SEMESTER –V
Microbial Biotechnology (THEORY)

Course code- MBD (T) – 3501

Course breakup

Lecture schedule

Lecture No.	Topics to be covered
1	Recombinant microbial production processes in pharmaceutical industries
2	Recombinant microbial production processes in pharmaceutical industries
3	Recombinant vaccines (Hepatitis B vaccine).
4	Recombinant vaccines (Hepatitis B vaccine).
5	Genetically engineered microbes for industrial application: Bacteria and yeast.
6	Genetically engineered microbes for industrial application: Bacteria and yeast.
7	Microbial polysaccharides and polyesters.
8	Microbial polysaccharides and polyesters.
9	Microbial production of Bio-pesticides and Bioplastics.
10	Microbial biosensors.
11	Microbial based transformation of steroids and sterols.
12	Microbial based transformation of steroids and sterols.
13	Microbial based transformation of steroids and sterols.
14	Bio-catalytic processes and their industrial applications.
15	Bio-catalytic processes and their industrial applications.

16	Bio-catalytic processes and their industrial applications.
17	Production of high fructose syrup.
18	Production of high fructose syrup.
19	Production of cocoa butter substitute.
20	Production of cocoa butter substitute.
21	Microbial product purification: filtration, ion exchange & affinity chromatography techniques
22	Microbial product purification: filtration, ion exchange & affinity chromatography techniques
23	Microbial product purification: filtration, ion exchange & affinity chromatography techniques
24	Microbial product purification: filtration, ion exchange & affinity chromatography techniques
25	Down streaming process
26	Down streaming process
27	Immobilization methods and their application.
28	Immobilization methods and their application.
29	Immobilization methods and their application.
30	Immobilization methods and their application.
31	Bio-ethanol production.
32	Bio-diesel production
33	Commercial production from lignocellulosic waste and algal biomass
34	Commercial production from lignocellulosic waste and algal biomass
35	Commercial production from lignocellulosic waste and algal biomass
36	Commercial production from lignocellulosic waste and algal biomass
37	Biogas production: Methane and hydrogen production using microbial culture
38	Biogas production: Methane and hydrogen production using microbial culture
39	Biogas production: Methane and hydrogen production using microbial culture
40	Biogas production: Methane and hydrogen production using microbial culture

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (Discipline specific elective), SEMESTER –V
Plant Pathology(THEORY)
Course code- MBD (T) - 3502

Lesson Plan

Unit	Topic	Lectures
1	**Introduction and History of plant pathology** Concept of plant disease- definitions of disease, disease cycle & pathogenicity Symptoms associated with microbial plant diseases, Types of plant pathogens Stages in development of a disease: Infection, invasion, colonization, dissemination of pathogens and perennation, Significant landmarks in the field of plant pathology-	 01 01 01 02 05

	Contributions of Anton DeBary, Millardet, E. Smith, Adolph Mayer, Ivanowski, Koch's postulates,	
2	**Host Pathogen Interaction** Microbial Pathogenicity: Virulence factors of pathogens: enzymes, toxins (host specific and non specific) Effects of pathogens on host physiological processes, Genetics of Plant Diseases: Concept of resistance (R) gene and avirulence (avr) gene Defense Mechanisms in Plants*:* Concepts of constitutive defense mechanisms in plants, Inducible structural defenses (histologicalcork layer, abscission layer, tyloses, gums), inducible biochemical defenses [hypersensitive response (HR), systemic acquired resistance (SAR), phytoalexins, pathogenesis related (PR) proteins, phenolics, quinones,].	02 02 02 02 02
3	**Specific Plant diseases** Study of some important plant diseases giving emphasis on its etiological agent, symptoms, epidemiology and control: Important diseases caused by fungi- Late blight of potato - *Phytophthora infestans,* Ergot of rye -*Claviceps purpurea*, Important diseases caused by phytopathogenic bacteria- bacterial leaf blight of rice, bacterial cankers of citrus, Important diseases caused by viruses- banana bunchy top, rice tungro	03 02 03 02
4	**Control of Plant Diseases** Management of plant diseases by different methods, *viz.* regulatory - quarantine, crop certification, avoidance of pathogen, Use of pathogen free propagative material cultural - host eradication, crop rotation, sanitation, polyethylene traps and mulches Chemical - protectants and systemic fungicides, antibiotics, Biological - suppressive soils, antagonistic microbes- bacteria and fungi; Engineering of disease resistant plants- with plant derived genes and pathogen derived genes	02 03 02 03

College of Basic Science and Humanities, OUAT, Bhubaneswar-3
Syllabus for +3, 3rd Year Science
MICROBIOLOGY (Discipline specific elective), SEMESTER –V
Plant Pathology (THEORY)
Course code- MBD (T) - 3502

Course breakup

Lecture schedule

Lecture No.	Topics to be covered
1	Concept of plant disease- definitions of disease, disease cycle & pathogenicity
2	symptoms associated with microbial plant diseases, types of plant pathogens
3	Stages in development of a disease: Infection, invasion, colonization
4	dissemination of pathogens and perennation
5	Significant landmarks in the field of plant pathology- Contributions of Anton DeBary
6	Contributions of Millardet
7	Contributions of E. Smith
8	Contributions of Adolph Mayer
9	Contributions of Ivanowski
10	Contributions of Koch's postulates
11	Microbial Pathogenicity: Virulence factors of pathogens
12	Enzymes, toxins (host specific and non specific)
13	Effects of pathogens on host physiological processes, Genetics of Plant Diseases
14	Concept of resistance (R) gene and avirulence (avr) gene
15	Defense Mechanisms in Plants*:* Concepts of constitutive defense mechanisms in plants
16	Inducible structural defenses (histologicalcork layer
17	Abscission layer, tyloses, gums)
18	Inducible biochemical defenses [hypersensitive response (HR)
19	Systemic acquired resistance (SAR), phytoalexins,
20	pathogenesis related (PR) proteins, phenolics, quinones
21	Study of some important plant diseases giving emphasis on its etiological agent
22	Symptoms, epidemiology and control
23	Important diseases caused by fungi- Late blight of potato - *Phytophthora infestans,*
24	Important diseases caused by fungi- Late blight of potato - *Phytophthora infestans,*
25	Ergot of rye -*Claviceps purpurea*
26	Ergot of rye -*Claviceps purpurea*
27	Important diseases caused by phytopathogenic bacteria- bacterial leaf blight of rice
28	Bacterial cankers of citrus
29	Important diseases caused by viruses- banana bunchy top

30	Rice tungro
31	Management of plant diseases by different methods, *viz.* regulatory - quarantine use of pathogen
32	Crop certification, avoidance of pathogen,
33	Free propagative material cultural - host eradication, crop rotation
34	Sanitation, polyethylene traps
35	Mulches chemical - protectants and systemic fungicides, antibiotics
36	Biological - suppressive soils
37	Antagonistic microbes-bacteria and fungi
38	Engineering of disease resistant plants- with plant derived genes
39	Engineering of disease resistant plants- with plant derived genes
40	Pathogen derived genes