

# Rajarshi Shahu Mahavidyalaya, Latur

## ( Autonomous )

### Structured Work Plan for Teaching

(June – 2020 to March . 2021)

#### Details of Classes to be taught

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. III (Div A + B)	Dr. Vihang V. Patil	Biotechnology	<b>Course Title: Microbial Technology</b> <b>Course Code : U-MIT-608</b> <b>Course Title: Lab Course XVIII</b> <b>Course Code: U-LAC-612</b>
2	M.Sc. I			<b>Course Title: Microbial Physiology</b> <b>Course Code:P-MIB-335</b> <b>Course Title: Lab Course X</b> <b>Course Code: P-LAC-339</b>

#### 1. Summary of Lesson Plan

Name of Teacher: Dr. Vihang V Patil

Class : B.Sc. BT. III (Fifth Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Microbial Technology	<b>Unit 1</b> <b>Microbial Growth Microbial</b> -Biotechnology –Historical perspectives  - Microbial growth kinetics: Continuous culture, Batch culture, fed Batch culture,  -Thermodynamics of Growth -Fermentation concept and types. -Basic nutrition & metabolism. -Novel pathways of microorganisms.	08-07-20 To 28-07-20	02  04  01 01 02 02	Assignments	Assignment 1 : 20/07/2020  Assignment 2 : 10/10/20
		<b>Unit II</b> <b>Down Stream Processing</b> -Removal and Recovery of cell mass (Precipitation, Filtration and Centrifugation).	29-07-20 To	04	Group Discussion	Group Assignment 3 :

		<ul style="list-style-type: none"> <li>-Cell disruption: Physical and Chemical methods.</li> <li>-Purification of Product: Liquid-liquid extraction, Solvent Recovery.</li> <li>-Chromatography: Adsorption, Ion-exchange, HPLC.</li> <li>-Membrane processes: Ultrafiltration and Reverse Osmosis.</li> <li>-Drying and Crystallization.</li> </ul>	24-08-20	02		10/11/2020
		<p><b>Unit III</b></p> <p><b>Fermentation Processes</b></p> <p>Fermentation processes: Microorganisms involved, Inoculum preparation, Medium used, Fermentation process, Recovery. - Enzyme: Protease, Pectinase.</p> <ul style="list-style-type: none"> <li>-Organic acid: Citric acid.</li> <li>-Antibiotic: Penicillin, Erythromycin.</li> <li>-Vitamin: Vitamin B12, vitamin B</li> </ul>	25-08-20 To 16-10-20	04 04 05 05	Assignment	
		<p><b>Unit IV</b></p> <p><b>Quality Control, Process Economics and GLP</b></p> <ul style="list-style-type: none"> <li>-Sterility testing.</li> <li>-Pyrogen testing.</li> <li>-Carcinogenicity testing.</li> <li>-Toxicity testing.</li> <li>-Fermentation Economics: Cost Estimates, Process Design ,Capital Cost Estimates, Operating Cost Estimates.</li> <li>-Good Laboratory Practices.</li> </ul>	17-10-20 To 11-11-20	01 01 01 01 03 02	Group Project Assignment	

Sr. No.	Subject	Practicals	Date	No. of Practicals
1	Microbial Technology	Production of primary and secondary metabolite (one organic acid and one antibiotic)	22/02/21 To 31/05/21  Batch A, B,C,D	04
2		Biomass production (Baker's yeast and Spirulina)		04
3		Production of beverages (alcohol, wine)		04
4		Immobilization of yeast on calcium alginate		04
5		Estimation of the fermentation products by titration method		04
6		Estimation of fermentative product (Acetic acid from vinegar)		04
7		Production of cheese using different substrate from microorganism		04
8		Isolation & identification of bacteria from different milk & water samples		04
9		Visit to Fermentation Industry		04

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. III (Div A + B)	Dr. Vihang V. Patil	Biotechnology	Course Title: Microbial Technology Course Code : U-MIT-608 Course Title: Lab Course XVIII Course Code: U-LAC-612
2	M.Sc. I			Course Title: Microbial Physiology Course Code:P-MIB-335 Course Title: Lab Course X Course Code: P-LAC-339

Name of Teacher: Dr. Vihang V Patil

Class : M.Sc. BT. I (First Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1		<p><b>Unit 1</b></p> <p>The Beginning of Microbiology:</p> <ul style="list-style-type: none"> <li>- Discovery of the microbial world by Antony van Leeuwenhoek; Controversy over spontaneous generation,</li> <li>-Role of microorganisms in transformation of organic matter and in the causation of diseases;</li> <li>-Development of pure culture methods;</li> <li>-Enrichment culture methods,</li> <li>-Developments of microbiology in the twentieth century.</li> <li>-Knowing microbial world: Bacteria: Purple and green bacteria, Cyan bacteria, Homoacetogenic bacteria. Acetic acid bacteria, Budding and appendaged bacteria, Spirilla, Spirochetes, Sheathed bacteria, Pseudomonads; Lactic and propionic acid bacteria, Endospore forming rods and cocci, Mycobacterium, Rickettsias, Chlamydias and Mycoplasmas.</li> <li>-Archaea: Halophiles, Methanogens, Thermoplasma, Ferroplasmaand Hyperthermophilic archaea,.</li> <li>-Eukarya: Algae, Fungi, Slime moulds</li> </ul>	<p>21-12-20 To 23-01-21</p>	<p>02  02  01  01  06</p>	<p>Seminars</p>	<p>Quiz 1: 23-01-21</p> <p>Quiz 2: 26-02-21</p> <p>Assignment I: 15-02-21</p> <p>Assignment II: 15-03-21</p>

		and Protozoa. -Viruses: Bacterial Plant. Animal and Tumor viruses; -Viroids and Prions.		03 03 01		
		<b>Unit II</b> Methods in Microbiology -Pure culture techniques, -Theory and practice of sterilization, Enrichment culture techniques. -New approaches to bacterial taxonomy classification including Ribotyping; -Ribosomal RNA sequencing; Taxonomy, Nomenclature and Bergey's Manual.	18-01-21 To 15-02-21	01 02 02 03 01	Assignment I	
		<b>Unit III</b> -Microbial Growth The definition of growth, -Mathematical expression of growth, growth curve, measurement of Growth and growth yields; -Synchronous growth: Continuous culture; -Growth as affected by Environmental factors like temperature, acidity, alkalinity, water availability and oxygen; -Culture collection and maintenance of cultures.	16-02-21 To 14-03-21	02 02 01 03 02	Group Discussion	
		<b>Unit IV</b> Overview of Basic Metabolism & Microbial Nutrition: -Metabolic Diversity among Microorganisms Photosynthesis in microorganisms; -Role of Chlorophylls, carotenoids and	15-03-21 To 5-04-21	04	Assignment II	

	phycobilins; Calvin cycle;	04		
	Chemolithotrophy;			
	-Hydrogen - iron - nitrite - oxidizing bacteria;	03		
	-Nitrate and sulfate reduction;	02		
	-Methanogenesis and acetogenesis;	02		
	-Fermentations - diversity, syntrophy	02		

Sr. No.	Subject	Practicals	Date	No. of Practicals
1	Microbial Physiology	Preparation of liquid and solid media for growth of microorganisms.	22/02/21 To 31/03/21  Batch A, B	02
2		Isolation and maintenance of organisms by plating, streaking and serial dilution Methods. Slants and stab cultures. Storage of microorganisms.		02
3		Isolation of pure cultures from soil and water.		02
4		Growth: Growth curve.		02
5		Measurement of bacterial population by turbidometry and serial dilution methods.		02
6		Effect of temperature, pH and carbon and nitrogen sources on growth.		02
7		Microscopic examination of bacteria, yeast and molds and study of organisms by Monochrome stain, Negative Stain, Gram stain and staining for spores.		02
8		Assay of antibiotics.		02
9		Analysis of water for portability and determination of MPN.		02
		Biochemical characterization of selected microbes.	02	

# Rajarshi Shahu Mahavidyalaya, Latur

## ( Autonomous )

### Structured Work Plan for Teaching

(February 2021 to May 2021)

#### Details of Classes to be taught

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. II (Div A + B)	Dr. Vihang V. Patil	Biotechnology	Course Title: Process Biotechnology Course Code : U-PRB-499 Course Title: Lab Course XV Course Code: U-LAC-503

#### 1. Summary of Lesson Plan

Name of Teacher: Dr. Vihang V Patil

Class : B.Sc. BT. III (Fifth Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1	Process Biotechnology	<b>Unit 1</b> <b>Introduction to Concepts of Bioprocess engineering:</b> -Definition of Bioprocesses engineering. -Introduction to Simple engineering calculations, Mass & Energy Balances. -Oxygen uptake rate (OUR), KLa, Viscosity & its control. -Design of Fermenters: Construction, Design & Operation, Materials of Constructions, Welding, Surface treatment Components of the fermenters & their specifications	22-02-21 To 10-03-21	02  02  02  06	Assignments	Assignment 1 : 09/03/2021  Assignment 2 : 11/04/21  Group Assignment 3 : 02/05/2021
		<b>Unit II</b> -Air & Media sterilization: Air Sterilization Principles, Mechanisms of capture of particles in Air, Depth &	11-03-21	03		

	<p>Screen Filters, Sizing, Testing &amp; validation of filters for air Sterilization.</p> <p>-Principles of Media Sterilization, Decimal reduction, Design of sterilization, Cycle using kinetics of thermal death of microbes Equipments used in sterilization;</p> <p>-Constituents of media,</p> <p>-Media Optimization their estimation &amp; quantification.</p> <p>-Design of media.</p> <p>-Costing of media</p>	<p>To 31-03-21</p>	<p>02</p> <p>04</p> <p>02</p> <p>01</p> <p>01</p> <p>01</p>	<p>Group Discussion</p>	
	<p><b>Unit III</b></p> <p>-Types of Bioprocesses: Biotransformation (enzyme, whole cell), Batch, Fed-batch, continuous.</p> <p>- Screening: Primary and Secondary Screening, Preservation and Maintenance methods for Microbial culture.</p> <p>-Strain Improvement: Feed back Mechanism, Isolation of mutants which do not produce feedback inhibitors or repressors.</p> <p>-Isolation of mutants which do not recognize presence of inhibitors or repressors. Modification of Permeability.</p>	<p>01-04-21 To 20-04-21</p>	<p>03</p> <p>02</p> <p>03</p> <p>03</p>	<p>Assignment</p>	
	<p><b>Unit IV</b></p> <p>-Measurement &amp; Control of Bioprocesses Parameters: Cell growth. pH, temperature, Substrate consumption, product formation, Measurement of O<sub>2</sub>/CO<sub>2</sub> uptake, evolution.</p>	<p>21-04-21 To 15-05-21</p>	<p>05</p>	<p>Group Project Assignment</p>	



		-Specific rates of consumption substrate & formation of product. - Strategies for fermentation control. -Foam & its control. -Computer controlled fermentations. -Scale up in Bioprocesses fermentations, Factors used in scale up.		02  1 1 1  02		
--	--	---	--	---------------------------------	--	--

Sr. No.	Subject	Practicals	Date	No. of Practicals
1	<b>Process Biotechnology</b>	Isolation and Screening of Industrially important Microbes-Acid, Antibiotics, Enzymes	22/02/21 To 31/05/21  Batch A, B,C,D	04
2		Strain improvement		04
3		Sterilization Techniques		04
4		Maintenance of pure Culture		04
5		Growth Curve		04
6		Growth kinetics: Effect of pH & Temp		04
7		Media Formulation		04
8		Media Formulation		04
9		Cell and Enzyme immobilization		04

Sr. No.	Class	Name of Asstt. Prof.	Subject	Paper
1	B.Sc. III (Div A + B)	Dr. Vihang V. Patil	Biotechnology	<b>Course Title: Microbial Technology</b> <b>Course Code : U-MIT-608</b> <b>Course Title: Lab Course XVIII</b> <b>Course Code: U-LAC-612</b>
2	M.Sc. I			<b>Course Title: Microbial Physiology</b> <b>Course Code:P-MIB-335</b> <b>Course Title: Lab Course X</b> <b>Course Code: P-LAC-339</b>

Name of Teacher: Dr. Vihang V Patil

Class : M.Sc. BT. I (First Semester)

Sr. No.	Subject	Unit and Chapter to be covered	Date	No. of Lectures	Academic activities to be organized	No. of Test / Assignment with topic and date
1		<b>Unit 1</b> The Beginning of Microbiology: - Discovery of the microbial world by Antony van Leeuwenhoek; Controversy over spontaneous generation, -Role of microorganisms in transformation of organic matter and in the causation of diseases; -Development of pure culture	21-12-20 To 23-01-21	02   02	Seminars	Quiz 1: 23-01-21  Quiz 2: 26-02-21

	<p>methods;</p> <p>-Enrichment culture methods,</p> <p>-Developments of microbiology in the twentieth century.</p> <p>-Knowing microbial world: Bacteria: Purple and green bacteria, Cyan bacteria, Homoacetogenic bacteria. Acetic acid bacteria, Budding and appendaged bacteria, Spirilla, Spirochetes, Sheathed bacteria, Pseudomonads; Lactic and propionic acid bacteria, Endospore forming rods and cocci, Mycobacterium, Rickettsias, Chlamydias and Mycoplasmas.</p> <p>-Archaea: Halophiles, Methanogens, Thermoplasma, Ferroplasma and Hyperthermophilic archaea,.</p> <p>-Eukarya: Algae, Fungi, Slime moulds and Protozoa.</p> <p>-Viruses: Bacterial Plant. Animal and Tumor viruses;</p> <p>-Viroids and Prions.</p>		01		Assignment I: 15-02-21
			01		
			06		Assignment II: 15-03-21
			03		
			03		
			01		
	<p><b>Unit II</b></p> <p>Methods in Microbiology</p> <p>-Pure culture techniques,</p> <p>-Theory and practice of sterilization, Enrichment culture techniques.</p> <p>-New approaches to bacterial taxonomy classification including Ribotyping;</p> <p>-Ribosomal RNA sequencing;</p> <p>Taxonomy, Nomenclature and Bergey's Manual.</p>	18-01-21 To 15-02-21	01	Assignment I	
			02		
			02		
			03		
			01		

		<p><b>Unit III</b></p> <p>-Microbial Growth The definition of growth,</p> <p>-Mathematical expression of growth, growth curve, measurement of Growth and growth yields;</p> <p>-Synchronous growth: Continuous culture;</p> <p>-Growth as affected by Environmental factors like temperature, acidity, alkalinity, water availability and oxygen;</p> <p>-Culture collection and maintenance of cultures.</p>	<p>16-02-21 To 14-03-21</p>	<p>02</p> <p>02</p> <p>01</p> <p>03</p> <p>02</p>	<p>Group Discussion</p>	
		<p><b>Unit IV</b></p> <p>Overview of Basic Metabolism &amp; Microbial Nutrition:</p> <p>-Metabolic Diversity among Microorganisms Photosynthesis in microorganisms;</p> <p>-Role of Chlorophylls, carotenoids and phycobilins; Calvin cycle; Chemolithotrophy;</p> <p>-Hydrogen - iron - nitrite - oxidizing bacteria;</p> <p>-Nitrate and sulfate reduction;</p> <p>-Methanogenesis and acetogenesis;</p> <p>-Fermentations - diversity, syntrophy</p>	<p>15-03-21 To 5-04-21</p>	<p>04</p> <p>04</p> <p>03</p> <p>02</p> <p>02</p> <p>02</p>	<p>Assignment II</p>	

Sr. No.	Subject	Practicals	Date	No. of Practicals
1	Microbial Physiology	Preparation of liquid and solid media for growth of microorganisms.		02
2		Isolation and maintenance of organisms by plating, streaking and serial dilution Methods. Slants and stab cultures. Storage of microorganisms.		02

3	Isolation of pure cultures from soil and water.	22/02/21 To 31/03/21  Batch A, B	02
4	Growth: Growth curve.		02
5	Measurement of bacterial population by turbidometry and serial dilution methods.		02
6	Effect of temperature, pH and carbon and nitrogen sources on growth.		02
7	Microscopic examination of bacteria, yeast and molds and study of organisms by Monochrome stain, Negative Stain, Gram stain and staining for spores.		02
8	Assay of antibiotics.		02
9	Analysis of water for portability and determination of MPN.		02
	Biochemical characterization of selected microbes.		02