

<b>DISCIPLINE: BIOTECHNOLOGY</b>	<b>SEMESTER: 6<sup>th</sup></b>	<b>NAME OF THE TEACHING FACULTY: Sunil Biswajit Maharana</b>
<b>SUBJECT: Plant Safety Management</b>	<b>NO. OF DAYS/PER WEEK CLASS ALLOTTED: 4</b>	<b>SEMESTER FROM DATE: 14-02-2023 TO DATE: 22-05-2023 NO OF WEEK: 15</b>
<b>WEEK:</b>	<b>CLASS DAY:</b>	<b>THEORY/PRACTICAL TOPICS:</b>
1 <sup>st</sup>	1 <sup>st</sup>	Fundamental of safety
	2 <sup>nd</sup>	Unsafe act and unsafe condition
	3 <sup>rd</sup>	Integration of Safety, Health and Environment
	4 <sup>th</sup>	Integration of Safety, Health and Environment
2 <sup>nd</sup>	1 <sup>st</sup>	Objective Safety Management
	2 <sup>nd</sup>	principle of Safety Management
	3 <sup>rd</sup>	Terms and definition used in safety management
	4 <sup>th</sup>	Classification of accidents
3 <sup>rd</sup>	1 <sup>st</sup>	<b>SAFE WORKING PRACTICE</b>
	2 <sup>nd</sup>	Good Housekeeping practice
	3 <sup>rd</sup>	Work place safety
	4 <sup>th</sup>	Safe working environment
4 <sup>th</sup>	1 <sup>st</sup>	Spot a hazard to stop an accident
	2 <sup>nd</sup>	Precaution in use of ladder
	3 <sup>rd</sup>	Safety instruction during maintenance
	4 <sup>th</sup>	Safety measures during handling of compressed system
5 <sup>th</sup>	1 <sup>st</sup>	Safety measures during handling of cylinders
	2 <sup>nd</sup>	Safety measures during handling of painting Equipments
	3 <sup>rd</sup>	Permit to work system
	4 <sup>th</sup>	PERSONAL PROTECTIVE EQUIPMENTS (PPE)
6 <sup>th</sup>	1 <sup>st</sup>	Requirement of personal protective equipment
	2 <sup>nd</sup>	Classification of Hazards
	3 <sup>rd</sup>	Personal protective equipment's for different parts of body
	4 <sup>th</sup>	Guideline to use personal protective equipment
7 <sup>th</sup>	1 <sup>st</sup>	Revision
	2 <sup>nd</sup>	Class test
	3 <sup>rd</sup>	FIRE PREVENTION AND FIRE FIGHTING
	4 <sup>th</sup>	Fundamentals of fire, elements of fire
8 <sup>th</sup>	1 <sup>st</sup>	Terms and definition in Fire Management
	2 <sup>nd</sup>	Classification of fire and fire extinguishing technique
	3 <sup>rd</sup>	Causes of fire and its prevention
	4 <sup>th</sup>	Different types of fire extinguisher and their application
9 <sup>th</sup>	1 <sup>st</sup>	Different types of fire extinguisher and their application

	2 <sup>nd</sup>	Precaution for prevention of fire
	3 <sup>rd</sup>	Revision
	4 <sup>th</sup>	Class test
10 <sup>th</sup>	1 <sup>st</sup>	<b>CHEMICAL HAZARDS</b>
	2 <sup>nd</sup>	Classification of Chemical Hazards
	3 <sup>rd</sup>	Factors influencing effects of toxic chemicals
	4 <sup>th</sup>	Factors influencing effects of toxic chemicals
11 <sup>th</sup>	1 <sup>st</sup>	Terms related to concentration level as per industrial hygiene norm
	2 <sup>nd</sup>	Control measure for Chemical hazards
	3 <sup>rd</sup>	Control measure for Chemical hazards
	4 <sup>th</sup>	<b>ELECTRICAL SAFETY</b>
12 <sup>th</sup>	1 <sup>st</sup>	<b>ELECTRICAL SHOCK AND THEIR PREVENTION</b>
	2 <sup>nd</sup>	Introduction to electrical safety
	3 <sup>rd</sup>	Precaution and safety in use of electricity
	4 <sup>th</sup>	Precaution and safety in use of electricity
13 <sup>th</sup>	1 <sup>st</sup>	Electrical hazards in Industrial system
	2 <sup>nd</sup>	Electrical hazards in Industrial system
	3 <sup>rd</sup>	Safety provision to prevent electrical hazards
	4 <sup>th</sup>	Safety provision to prevent electrical hazards
14 <sup>th</sup>	1 <sup>st</sup>	<b>MECHANICAL HAZARDS</b>
	2 <sup>nd</sup>	Sources of mechanical hazards
	3 <sup>rd</sup>	Machine Guard and Safety devices
	4 <sup>th</sup>	Pressure hazards and pressure vessel
15 <sup>th</sup>	1 <sup>st</sup>	Safety measures in use of gas cylinders
	2 <sup>nd</sup>	Types of maintenance (example- Breakdown, preventive)
	3 <sup>rd</sup>	Revision
	4 <sup>th</sup>	Class test

<b>DISCIPLINE:</b> <b>Biotechnology</b>	<b>SEMESTER:6<sup>th</sup> Sem.</b>	<b>NAME OF THE TEACHING FACULTY: sunil Biswajit maharana</b>
<b>SUBJECT: Pr2.</b> <b>BIOPROCESS</b> <b>ENGINEERING LAB</b>	<b>NO. OF DAYS/ PER WEEK CLASS ALLOTTED:05</b>	<b>SEMESTER FROM DATE: 14-02-2023</b> <b>TO DATE: 22-05-2023</b> <b>NO. OF WEEKS:12</b>
<b>WEEK</b>	<b>CLASS DAY</b>	<b>THEORY/ PRACTICAL TOPICS</b>
1 <sup>st</sup>	1 <sup>st</sup>	<b>Discussion about</b> industrially important organism
	2 <sup>nd</sup>	Isolation of industrially important organism for microbial process.
	3 <sup>rd</sup>	Isolation of industrially important organism for microbial process.
	4 <sup>th</sup>	Isolation of industrially important organism for microbial process.
	5 <sup>th</sup>	Isolation of industrially important organism for microbial process.
2 <sup>nd</sup>	1 <sup>st</sup>	Isolation of industrially important organism for microbial process.
	2 <sup>nd</sup>	Isolation of industrially important organism for microbial process.
	3 <sup>rd</sup>	Isolation of industrially important organism for microbial process.
	4 <sup>th</sup>	<b>Record writing and discussion.</b>
	5 <sup>th</sup>	<b>Record checking.</b>
3 <sup>rd</sup>	1 <sup>st</sup>	Determination of thermal death point of microorganism.
	2 <sup>nd</sup>	Determination of thermal death point of microorganism.
	3 <sup>rd</sup>	Determination of thermal death point of microorganism.
	4 <sup>th</sup>	Determination of thermal death point of microorganism.
	5 <sup>th</sup>	Determination of thermal death point of microorganism.
4 <sup>th</sup>	1 <sup>st</sup>	Determination of thermal death point of microorganism.
	2 <sup>nd</sup>	Determination of thermal death point of microorganism.
	3 <sup>rd</sup>	Determination of thermal death point of microorganism.
	4 <sup>th</sup>	<b>Record writing and discussion.</b>
	5 <sup>th</sup>	<b>Record checking.</b>
5 <sup>th</sup>	1 <sup>st</sup>	Determination of growth of microorganism
	2 <sup>nd</sup>	Determination of growth of microorganism
	3 <sup>rd</sup>	Determination of growth of microorganism
	4 <sup>th</sup>	Determination of growth of microorganism
	5 <sup>th</sup>	Determination of growth of microorganism
6 <sup>st</sup>	1 <sup>st</sup>	Determination of growth of microorganism
	2 <sup>nd</sup>	Determination of growth of

		microorganism
	3 <sup>rd</sup>	Determination of growth of microorganism
	4 <sup>th</sup>	<b>Record writing and discussion.</b>
	5 <sup>th</sup>	<b>Record checking.</b>
7 <sup>th</sup>	1 <sup>st</sup>	Determination of substrate degradation profile..
	2 <sup>nd</sup>	Determination of substrate degradation profile..
	3 <sup>rd</sup>	Determination of substrate degradation profile..
	4 <sup>th</sup>	Determination of substrate degradation profile..
	5 <sup>th</sup>	Determination of substrate degradation profile..
8 <sup>th</sup>	1 <sup>st</sup>	Determination of substrate degradation profile..
	2 <sup>nd</sup>	Determination of substrate degradation profile..
	3 <sup>rd</sup>	Determination of substrate degradation profile..
	4 <sup>th</sup>	<b>Record writing and discussion.</b>
	5 <sup>th</sup>	<b>Record checking.</b>
9 <sup>th</sup>	1 <sup>st</sup>	Ethanol production using different substrate.
	2 <sup>nd</sup>	Ethanol production using different substrate.
	3 <sup>rd</sup>	Ethanol production using different substrate.
	4 <sup>th</sup>	Ethanol production using different substrate.
	5 <sup>th</sup>	Ethanol production using different substrate.
10 <sup>th</sup>	1 <sup>st</sup>	<b>Record writing and discussion.</b>
	2 <sup>nd</sup>	<b>Record checking.</b>
	3 <sup>rd</sup>	Growth kinetics of yeast- evaluation of specific growth rate, yield coefficient and doubling time
	4 <sup>th</sup>	Growth kinetics of yeast- evaluation of specific growth rate, yield coefficient and doubling time
	5 <sup>th</sup>	Growth kinetics of yeast- evaluation of specific growth rate, yield coefficient and doubling time
11 <sup>st</sup>	1 <sup>st</sup>	Growth kinetics of yeast- evaluation of specific growth rate, yield coefficient and doubling time
	2 <sup>nd</sup>	Growth kinetics of yeast- evaluation of specific growth rate, yield coefficient and doubling time
	3 <sup>rd</sup>	<b>Record writing and discussion.</b>
	4 <sup>th</sup>	<b>Record checking.</b>
	5 <sup>th</sup>	Growth kinetics of bacteria- evaluation of specific growth rate, yield coefficient and doubling time.
12 <sup>th</sup>	1 <sup>st</sup>	Growth kinetics of bacteria- evaluation of specific growth rate, yield coefficient and

		doubling time.
	2 <sup>nd</sup>	Growth kinetics of bacteria- evaluation of specific growth rate, yield coefficient and doubling time.
	3 <sup>rd</sup>	Growth kinetics of bacteria- evaluation of specific growth rate, yield coefficient and doubling time.
	4 <sup>th</sup>	<b>Record writing and discussion.</b>
	5 <sup>th</sup>	<b>Record checking.</b>

DISCIPLINE: Biotechnology	SEMESTER: 6 <sup>th</sup> Sem	NAME OF THE TEACHING FACULTY: sunil Biswajit maharana
SUBJECT:Th3. BIOPROCESS ENGINEERING	NO. OF DAYS/ PER WEEK CLASS ALLOTTED:04	SEMESTER FROM DATE: 14-02-2023 TO DATE : 22-05-2023 NO. OF WEEKS:15
<b>WEEK</b>	<b>CLASS DAY</b>	<b>THEORY/ PRACTICAL TOPICS</b>
1 <sup>st</sup>	1 <sup>st</sup>	1.1 About Bioreactor
	2 <sup>nd</sup>	1.1 General features of Bioreactor.
	3 <sup>rd</sup>	1.1 What is downstream process?
	4 <sup>th</sup>	1.2 Preservation of industrial microorganisms.
2 <sup>nd</sup>	1 <sup>st</sup>	1.2 Maintenance of industrial microorganisms.
	2 <sup>nd</sup>	1.3 Kinetics of microbial growth and death.
	3 <sup>rd</sup>	1.3 Phases of Growth.
	4 <sup>th</sup>	1.3 Lag phase, Log phase and death phase
3 <sup>rd</sup>	1 <sup>st</sup>	1.4 Regarding Air Sterilization.
	2 <sup>nd</sup>	1.4 Regarding Media Sterilization.
	3 <sup>rd</sup>	2.1 Regarding Types of Fermentation.
	4 <sup>th</sup>	2.1 Batches types of Fermentation.
4 <sup>th</sup>	1 <sup>st</sup>	2.1 Aerobic Fermentation.
	2 <sup>nd</sup>	2.1 Anaerobic Fermentation.
	3 <sup>rd</sup>	2.1 Anaerobic Fermentation.
	4 <sup>th</sup>	2.2 Fed Batch and Continuous Bioreactor
5 <sup>th</sup>	A	2.2 Characters of Fed Batch fermentation
	2 <sup>nd</sup>	2. 2 Solid state fermentation.
	3 <sup>rd</sup>	2.2 Continuous Bioreactor
	4 <sup>th</sup>	2.3 Specialized Bioreactor: Pulsed
6 <sup>st</sup>	1 <sup>st</sup>	2.3 Specialized Bioreactor: Fluidized
	2 <sup>nd</sup>	2.3 Specialized Bioreactor: Bubble Colum bioreactor.
	3 <sup>rd</sup>	2.3 Specialized Bioreactor: Air lift Fermentation.
	4 <sup>th</sup>	2.3 Photo bioreactor
7 <sup>th</sup>	1 <sup>st</sup>	2.4 Bioprocess Parameters: Measurement and Control.
	2 <sup>nd</sup>	3.1 Introduction to General idea on downstream processing.
	3 <sup>rd</sup>	3.2 Removal of microbial cells.
	4 <sup>th</sup>	3.2 Removal of Solid matter
8 <sup>th</sup>	1 <sup>st</sup>	3.2 Methods of foam separation
	2 <sup>nd</sup>	3.2 Methods of precipitation

	3 <sup>rd</sup>	3.2 Methods filtration Centrifugation,
	4 <sup>th</sup>	3.2 Methods cell disruption
9 <sup>th</sup>	1 <sup>st</sup>	3.2 Methods of liquid-liquid extraction
	2 <sup>nd</sup>	3.3 Chromatography: Role of chromatography in downstream processing.
	3 <sup>rd</sup>	3.3 Chromatography: Role of chromatography in downstream processing.
	4 <sup>th</sup>	3.4 Regarding purification.
10 <sup>th</sup>	1 <sup>st</sup>	3.4 Methods of Dialysis.
	2 <sup>nd</sup>	3.4 Methods of Drying
	3 <sup>rd</sup>	3.4 Methods of Crystallization.
	4 <sup>th</sup>	3.4 Methods of Crystallization.
11 <sup>st</sup>	1 <sup>st</sup>	4.1 Methods of cell immobilization .
	2 <sup>nd</sup>	4..1A applications in industries
	3 <sup>rd</sup>	4.2 Production of Alcohol ( Ethanol).
	4 <sup>th</sup>	4.2 Production of Glycerol
12 <sup>th</sup>	1 <sup>st</sup>	4.2 Production of Acetone
	2 <sup>nd</sup>	4.3 Production of Antibiotics (Penicillin).
	3 <sup>rd</sup>	4.3 Production of Antibiotics (Streptomycin)
	4 <sup>th</sup>	4.3 Antibiotics ( Tetracycline)
13 <sup>th</sup>	1 <sup>st</sup>	4.4 Sources of Single Cell Protein.
	2 <sup>nd</sup>	4.4 Methods of Single Cell Protein.
	3 <sup>rd</sup>	5.1 Methods of Sterilization
	4 <sup>th</sup>	5.1 Methods of Sterilization
14 <sup>th</sup>	1 <sup>st</sup>	5.1 Methods of Pasteurization
	2 <sup>nd</sup>	5.1 Methods of Pasteurization
	3 <sup>rd</sup>	5.2 About food Preservation
	4 <sup>th</sup>	5.2 Techniques used in of food

		Preservation.
15 <sup>th</sup>	1 <sup>st</sup>	5.2 Techniques used in of food Preservation
	2 <sup>nd</sup>	5.2 Techniques used in of food Preservation
	3 <sup>rd</sup>	5.3 Regarding Packing.
	4 <sup>th</sup>	5.3 Methods of Packing.