DISCIPLINE: BIOTECHNOLOGY	SEMESTER: 6th	NAMEOF THE TEACHING FACULTY: Sunil Biswajit Maharana
SUBJECT: Plant Safety Management	NO.OFDAYS/PER WEEK CLASSALLOTED:4	SEMESTER FROM DATE: 16-01-2024 TO DATE: 30-05-2024 NO OF WEEK: 15
WEEK:	**CLASS DAY:**	**THEORY/PRACTICAL TOPICS:**
1st	1st	Fundamental of safety
	2nd	Unsafe act and unsafe condition
	3rd	Integration of Safety, Health and Environment
	4th	Integration of Safety, Health and Environment
2nd	1st	Objective Safety Management
	2nd	principle of Safety Management
	3rd	Terms and definition used in safety management
	4th	Classification of accidents
3rd	1st	**SAFE WORKING PRACTICE**
	2nd	Good Housekeeping practice
	3rd	Work place safety
	4th	Safe working environment
4th	1st	Spot a hazard to stop an accident
	2nd	Precaution in use of ladder
	3rd	Safety instruction during maintenance
	4th	Safety measures during handling of compressed system
5th	1st	Safety measures during handling of cylinders
	2nd	Safety measures during handling of painting Equipments
	3rd	Permit to work system
	4th	PERSONAL PROTECTIVE EQUIPMENTS (PPE)
6th	1st	Requirement of personal protective equipment
	2nd	Classification of Hazards
	3rd	Personal protective equipment's for different parts of body
	4th	Guideline to use personal protective equipment
7th	1st	Revision
	2nd	Class test
	3rd	FIRE PREVENTION AND FIRE FIGHTING
	4th	Fundamentals of fire, elements of fire
8th	1st	Terms and definition in Fire Management
	2nd	Classification of fire and fire extinguishing technique
	3rd	Causes of fire and its prevention
	4th	Different types of fire extinguisher and their application
9th	1st	Different types of fire extinguisher and their application

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

DISCIPLINE: **Biotechnology**	**SEMESTER:6th Sem.**	**NAME OF THE TEACHING FACULTY: sunil Biswajit maharana**
SUBJECT: Pr2. BIOPROCESS ENGINEERING LAB	**NO. OF DAYS/ PER WEEK CLASS ALLOTTED:05**	**SEMESTER FROM DATE: 16-01-2024** **TO DATE: 30-05-2024** **NO. OF WEEKS:12**
WEEK	**CLASS DAY**	**THEORY/ PRACTICAL TOPICS**
1st	**1st**	**Discussion about** industrially important organism
	2nd	Isolation of industrially important organism for microbial process.
	3rd	Isolation of industrially important organism for microbial process.
	4th	Isolation of industrially important organism for microbial process.
	5th	Isolation of industrially important organism for microbial process.
2nd	**1st**	Isolation of industrially important organism for microbial process.
	2nd	Isolation of industrially important organism for microbial process.
	3rd	Isolation of industrially important organism for microbial process.
	4th	**Record writing and discussion.**
	5th	**Record checking.**
3rd	**1st**	Determination of thermal death point of microorganism.
	2nd	Determination of thermal death point of microorganism.
	3rd	Determination of thermal death point of microorganism.
	4th	Determination of thermal death point of microorganism.
	5th	Determination of thermal death point of microorganism.
4th	**1st**	Determination of thermal death point of microorganism.
	2nd	Determination of thermal death point of microorganism.
	3rd	Determination of thermal death point of microorganism.
	4th	**Record writing and discussion.**
	5th	**Record checking.**
5th	**1st**	Determination of growth of microorganism
	2nd	Determination of growth of microorganism
	3rd	Determination of growth of microorganism
	4th	Determination of growth of microorganism
	5th	Determination of growth of microorganism
6st	**1st**	Determination of growth of microorganism
	2nd	Determination of growth of

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

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

DISCIPLINE: Biotechnology	**SEMESTER: 6th Sem**	**NAME OF THE TEACHING FACULTY: sunil Biswajit maharana**
SUBJECT:Th3. BIOPROCESS ENGINEERING	**NO. OF DAYS/ PER WEEK CLASS ALLOTTED:04**	**SEMESTER FROM DATE: 16-01-2024 TO DATE : 30-05-2024 NO. OF WEEKS:15**
WEEK	**CLASS DAY**	**THEORY/ PRACTICAL TOPICS**
1st	**1st**	1.1 About Bioreactor
	2nd	1.1 General features of Bioreactor.
	3rd	1.1 What is downstream process?
	4th	1.2 Preservation of industrial microorganisms.
2nd	**1st**	1.2 Maintenance of industrial microorganisms.
	2nd	1.3 Kinetics of microbial growth and death.
	3rd	1.3 Phases of Growth.
	4th	1.3 Lag phase, Log phase and death phase
3rd	**1st**	1.4 Regarding Air Sterilization.
	2nd	1.4 Regarding Media Sterilization.
	3rd	2.1 Regarding Types of Fermentation.
	4th	2.1 Batches types of Fermentation.
4th	**1st**	2.1 Aerobic Fermentation.
	2nd	2.1 Anaerobic Fermentation.
	3rd	2.1 Anaerobic Fermentation.
	4th	2.2 Fed Batch and Continuous Bioreactor
5th	**A**	2.2 Characters of Fed Batch fermentation
	2nd	2. 2 Solid state fermentation.
	3rd	2.2 Continuous Bioreactor
	4th	2.3 Specialized Bioreactor: Pulsed
6st	**1st**	2.3 Specialized Bioreactor: Fluidized
	2nd	2.3 Specialized Bioreactor: Bubble Colum bioreactor.
	3rd	2.3 Specialized Bioreactor: Air lift Fermentation.
	4th	2.3 Photo bioreactor
7th	**1st**	2.4 Bioprocess Parameters: Measurement and Control.
	2nd	3.1 Introduction to General idea on downstream processing.
	3rd	3.2 Removal of microbial cells.
	4th	3.2 Removal of Solid matter
8th	**1st**	3.2 Methods of foam separation
	2nd	3.2 Methods of precipitation

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

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