

Lesson Plan

Name of the Faculty : Dr. Vikas Sharma
Discipline : Biotechnology
Semester : 6th
Subject : Nano-Biotechnology (OEC-BTE-302A)
Lesson Plan Duration : 15 Weeks (From Feb, 2021 to Jun, 2021)

Work Load(Lecture/Practical) per week(in hours): Lecture- 03; Practical- 00

Week	Theory	
	Lecture Day	Topic(including assignment /test)
1 st	1 st	Introduction to Nanotechnology: Definition of Nano biotechnology, A brief history of the Super small
	2 nd	-do-
	3 rd	Bottom-up versus top-down, discussion on nanofabrication, nanolithography
2 nd	4 th	-do-
	5 th	Nano biotechnology, Structure property relations in materials, materials characterization techniques,
	6 th	-do-
3 rd	7 th	Microelectronic fabrication, scanning tunneling and atomic force microscopy
	8 th	-do-
	9 th	-do-
4 th	10 th	Biomolecule-surface interactions, DNA microarrays.
	11 th	-do-
	12 th	BioMEMS: Introduction and overview
Assignment I/Test 1 of Unit I		
5 th	13 th	Biosignal transduction mechanisms. Electromagnetic transducers: basic sensing mechanisms
	14 th	-do-
	15 th	Basic actuating mechanisms. Case studies in biomagnetic sensors.
6 th	16 th	-do-
	17 th	Mechanical transducers: basic sensing mechanisms, basic actuating mechanisms.
	18 th	-do-
7 th	19 th	Case studies in microfluidic devices. Chemical transducers: basic sensing mechanism, basic actuating mechanism,
	20 th	-do-
		Ultimate limits of fabrication and measurement. Recent developments in BioMEMS.
8 th	21 st	-do-
	22 nd	Assignment II/Test 1 of Unit II
	23 rd	Nanomaterials: Buckyballs and buckytubes
	24 th	-do-
9 th	25 th	Fluidics, manufacturing, diagnostics and sensors
	26 th	Nanobiosensors, Fullerenes, Carriers
	27 th	-do-
10 th	28 th	Dendrimers, nanoparticles, membrane/matrices
	29 th	-do-
	30 th	Nanoshells, quantum dot nanocrystals, nanotubes and hybrid biological/ inorganic devices.

		-do-
		-do-
11 th	31 st	-do-
	32 nd	Assignment III/Test III of Unit III
	33 rd	Applications of nanotechnology in the life science: Leading applications of nanobiotechnology: drug delivery
12 th	34 th	-do-
	35 th	Bioavailability, sustained and targeted release, nanorobots
	36 th	-do-
13 th	37 th	Benefits of nano drug delivery. Drug delivery using nanocrystals
	38 th	-do-
	39 th	Drug discovery using Resonance Light Scattering (RLS) technology, rapid ex-vivo diagnostics
14 th	40 th	-do-
	41 st	Benefits of nano-imaging agents, nanoscale biosensors
	42 nd	-do-
15 th	43 rd	Nanosensors, nanosensors as diagnostics, nanotherapeutics
	44 th	-do-
	45 th	-do-

Lesson Plan

Name of the Faculty : Dr. Vikas Sharma

Discipline : Biotechnology
Semester : 8th
Subject : BIOCATALYSIS AND BIOTRANSFORMATION(BT402N)
Lesson Plan Duration : 15 Weeks (From January, 2020 to April, 2020)

Work Load(Lecture/Practical) per week(in hours): Lecture- 03; Practical- 00

Week	Theory	
	Lecture Day	Topic(including assignment /test)
1 st	1 st	Introduction to biocatalysis,
	2 nd	-do-
	3 rd	Current market of biocatalysis , fermentation and applied biocatalysis,
2 nd	4 th	Types of bioconversion reactions, limitation of Biocatalysis
	5 th	Procedure for biotransformation, Use of cells and enzymes for biotransformation,
	6 th	Use of cells and enzymes for biotransformation,
3 rd	7 th	Biotransformation reactions: Types of bioconversion reactions,
	8 th	Procedure for biotransformation,
	9 th	Genetic manipulations of organism for biotransformation, applications of bioconversions.
4 th	10 th	Reaction types of microbial transformation from steroids
	11 th	-do-
	12 th	microbial breakdown of sterols side chain
		OBT-1
5 th	13 th	Transformation of non- steroidal compounds: ascorbic acid,
	14 th	dihydroxy acetone from glycerol, prostaglandins,
	15 th	hydantoinases, carbamylases,
6 th	16 th	hydantoinases, carbamylases, catalytic antibodies.
	17 th	Transformation of antibiotics: Acylases and peptidases,
	18 th	reaction of penicillin
7 th	19 th	penicillin and cephalosporin substrates,
	20 th	protection of amino groups
	21 st	Transformation of pesticides: Accumulation of pesticides
8 th	22 nd	pesticides as carbon source,
	23 rd	conjugate formation
	24 th	Biotransformation of nitrile group: Nitrile Hydratase and Nitrilases,
9 th	25 th	Biotechnology of Nitrile transformation,
	26 th	Regio and stereo selective biotransformation of Nitriles,
	27 th	-do-
10 th	28 th	Commercial processes and redesign of existing enzymes by protein engineering,
	29 th	Search for Novel Nitrile biotransforming activities,
	30 th	metabolic engineering by multistep biotransformation,
11 th		Cyanide biotransformation.
	31 st	OBT-2
	32 nd	Biotransformation by lipases: Commercial lipases, properties and application of lipases,
12 th	33 rd	lipid or surfactant coated lipases, inter-esterification of fats and oils,
	34 th	enantioselective esterification by lipases,
	35 th	-do-
13 th	36 th	Commercial application (food ingredients and enantiomerically pure chemical and pharmaceutical intermediates)

	37 th	Alkaloid biotransformation: Tropane Alkaloid biosynthesis,
	38 th	Alkaloid biotransformation:: microbial metabolism of Tropane alkaloids,
14 th	39 th	Alkaloid biotransformation:: transformation of morphine alkaloid by <i>Pseudomonas putida</i> M10
	40 th	-do-
	41 st	microbial transformation of heroin.
15 th	42 nd	OBT-3
	43 rd	Revision
	44 th	Revision

Lesson Plan

Name of the Faculty : Dr Vikas Sharma
Discipline : Biotechnology Engineering
Semester : 8th
Subject : Advanced Techniques in Biotechnology Lab
Lesson Plan Duration : 15 Weeks (From January, 2020 to April, 2020)

**Work Load(Lecture/Practical) per week(in hours): 02

Week	Practical	
	Practical Day	Topic
1 st	1 st	Characteristics of Transducers(Temperature)
2 nd	2 nd	Characteristics of Transducers (Pressure)
3 rd	3 rd	Characteristics of Transducers (Flow)
4 th	4 th	Dynamics of First order system for step/ impulse input
5 th	5 th	Non Interacting system
6 th	6 th	Interacting system
7 th	7 th	Control of temperature in a bioprocess
8 th	8 th	Control of pH in a bioprocess
9 th	9 th	Control of Pressure in a bioprocess
10 th	10 th	Control of Flow rates in a bioprocess
11 th	11 th	Optical density measurement of bacterial culture
12 th	12 th	Measurement of dissolved oxygen in the growth media
13 th	13 th	Measurement of CO ₂ in a given sample
14 th	14 th	Measurement of Temperature, light & Humidity in growth chambers