

Career Oriented Course in Industrial Process Biotechnology

Process Development in Industrial Biotechnology (PDIB-101)

Course Type: Certificate course

Duration: 12 months

No. Of Lectures: 06 / week

Credits: 6

Semester I

UNIT 1: Basic concept of fermentation biotechnology

- Definition and scope of fermentation biotechnology.
- Range of fermentation processes and products (Microbial metabolites, Primary and secondary metabolites, Microbial enzymes, Microbial transformations, Recombinant products, Elicitors-induced products).
- The fermentation process outline.
- Fermentation equipment and its use.

UNIT 2 Isolation, preservation and strain improvement

- Microbial screening (Primary and secondary screening)
- Preservation techniques
- Strain improvement by random mutagenesis and gene manipulation techniques. (Occurrence and expression of mutation, Isolation and types of microbial mutants, rational selection for mutants and its practical implications).

UNIT 3: Basis and development of fermentation biotechnology

- Kinetics of microbial growth and fermentation.
- Batch culture,
- continuous culture,
- fed batch culture,
- kinetic characteristics of microbial fermentation processes.

UNIT 4: Basic concept in bioreactor design and control of bioprocess parameters.

- Important criteria for designing bioreactor.
- Different types of bioreactors with design of sterile operations for e.g. sterilization in process (SIP) and cleaning in process (CIP), Air and media sterilization.
- Types of instruments used in bioprocess analysis. (On-line and Off-line operating instruments).
- Aeration and agitation, fluid rheology, foam formation and its control.

UNIT 5: Media for industrial fermentations

- Introduction, Typical media, medium formulation, water, energy sources,
- Carbon source and nitrogen source
- Medium engineering and fermentation media formulation. (Criteria for an ideal fermentation medium, medium formulation, medium optimization using statistical experimental design).

UNIT-6: Production of biological valuables by fermentation biotechnology.

- Fermentation of antibiotics, alcohol and organic acids.
- Fermentation of vitamins, growth stimulants, enzymes, microbial cells.
- Dual or multiple fermentations

➤ Fermentation economics.

Practical Modules for Process development in Industrial biotechnology course
Certificate course Syllabus

1. Introduction to laboratory instruments
 - a. Autoclave
 - b. Hot air oven
 - c. pH meter
 - d. Centrifuge
 - e. Orbital shaker
 - f. Incubators
 - g. Laminar air flow
 - h. Temperature controlled water baths
 - i. Compound microscope
2. Introduction to GLP / GMP
3. Sterilization and preparation of fermentation media and reagents and glasswares.
4. Waste disposable management of used media and reagents
5. Sterility testing of fermentation media and product for detection of contaminants.
6. Staining –Gram staining and wet mount preparation
7. Culturing of bacteria- Isolation techniques[Streak, spread, pour]
8. Screening of antibiotic, amylase and Organic acid producers
9. Assay of biotechnological fermented products (Biological and chemical):
Carbohydrates, proteins, Antibiotics, Vitamins and growth factors.

Career Oriented Course in Industrial Process Biotechnology **Process Development in Industrial Biotechnology (PDIB-201)**

Course Type: Diploma course
No. Of Lectures: 06 / Week

Duration: 1 Year + Certificate course
Total Credits: 12 (6+6)

UNIT 1: Introduction to industrial sterilization

- Introduction to microbial control and need for sterilization in fermentation industry.
- Principles of thermal kill.
- Concept of protected fermentation.
- Sterilization of fermentation media and air.

UNIT-2: Scale up in fermentation biotechnology

- Inoculum development
- Significance and criteria used for scale up
- Physical factors, chemical factors and microbial aspects of scale up.
- Scale down for fermentation process.

UNIT 3: Down stream processing quality control, quality assurance and bio-safety measures.

- Solid liquid separation, Cell disintegration and liquid liquid extraction of products.
- Concentration and purification of fermentation products.
- Definitions- (Quality, assurance, Quality control, Good manufacturing practice) sterility testing, LAL test.

UNIT 4: Effluent treatment

- Introduction
- Treatment and disposal of effluents
- Disposal methods
- Treatment processes and byproducts.

UNIT 5: Biosafety measures

- Introduction
- Biosafety considerations in fermentation biotechnology
- Physical and biological containment
- Biosafety levels, Biosafety guidelines and regulations
- Biosafety during industrial production

UNIT-6: Ethical issues in fermentation biotechnology.

- Intellectual property and patenting
- Use of genetically modified organisms.
- Industrial report writing.

Practical Modules for Process development in Industrial biotechnology course

Diploma course Syllabus

1. Cell lysis techniques for isolation of desired proteins or enzymes
2. Concentration of proteins
 - a. Ultra filtration
 - b. Precipitation
3. Chromatography techniques
 - a. Ion-exchange
 - b. Gel filtration
 - c. Hydrophobic interaction chromatography
 - d. Affinity chromatography
4. Characterization of proteins
 - a. SDS-PAGE
 - b. IEF
 - c. HPLC
 - d. Western blotting
5. Immobilization of enzymes and cells [Alginate immobilization]
6. Use and operation of Fermenter
 - a. Assembling of fermenter
 - b. Seed preparation
 - c. Seeding of fermenter
 - d. Fermentation – Batch and Fed-Batch Modes
 - e. Monitoring and analysis of biomass and productivity
 - f. Harvesting of culture
7. Typical fermentation of penicillin and ethanol fermentation
8. Laboratory report preparation using Microsoft office tools
9. Statistical Analysis of data / results of typical fermentation process.

Certificate course in

PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY

Course Duration:-12 months

Course Fees: - Rs. 6000/-

Sr.No.	Paper No	Title	Credit
		Year-I	
01	PDIB-101	theory	06
02	PDIB-102	Practicals	06
03	PDIB-103	Project work	08
		Total credits	20

Diploma course in

PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY

Course Duration: - Certificate course +12 months

Course Fees: - Rs. 6000/-

Sr.No.	Paper No	Title	Credit
		Year - II	
01	PDIB-201	Theory	06
02	PDIB-202	Practical	06
03	PDIB-203	Project work / Industrial training	08
04		Certificate course	20
		Total Credits	40

Certificate course in

PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY

Sr. No	Course No	No. Of Paper	classes / week		Total hours	Total Credit	Distribution of marks				Total Marks	Duration of Exam
			Th	Pr			Theory Ext. Int.		Practical Ext. Int.			
1	PDIB-101	01	06 hr		90	06	70	30			100	3 hr
2	PDIB-102	01		06 hr	90	06			70	30	100	3 hr
3	PDIB-103	-		10 hr	120	08					100	
						20					300	6hr

Diploma course in

PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY

Sr. No	Course No	No. Of Paper	classes / week		Total hours	Total Credit	Distribution of marks				Total Marks	Duration of Exam	
			Th	Pr			Theory Ext. Int.		Practical Ext. Int.				
	Certificate course : 1 year				300	20					300		
	Year : II												
1	PDIB-201	01	06 hr		90	06	70	30			100	3 hr	
2	PDIB-202	01		06 hr	90	06			70	30	100	3 hr	
3	PDIB-203	-		10 hr	120	08					100		
						20					300	6hr	
	Total credits for Diploma course (Certificate course + 1Year)						40					600	

To,
The Registrar,
Sardar Patel University,
Vallabh Vidyanagar.

Subject: Issuing of Certificate and mark sheet by university in the course of
PROCESS DEVELOPMENT IN INDUSTRIAL
BIOTECHNOLOGY
(Certificate and Diploma)

Dear Sir,

The college has been granted a career oriented course by the UGC in
PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY.

Kindly, issue the marksheet and certificate for the same from the university
from academic year 2010-2011.

Thanking you,

Sincerely yours,

Dr. Basudeb Bakshi
Principal

To,
The Deputy Registrar,
Sardar Patel University,
Vallabh Vidyanagar.

Subject: Resubmission of the syllabus passed in academic council for career oriented course by the UGC in PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY

Dear Sir,

The college has been granted a career oriented course by the UGC in PROCESS DEVELOPMENT IN INDUSTRIAL BIOTECHNOLOGY. I am herewith enclosing the syllabus passed in academic council for career oriented course. The fees for the same is Rs. 3000/- per term

Kindly, circulate the revised syllabus which is to be started from academic year 2010-2011.

Thanking you,

Sincerely yours,

Dr. Basudeb Bakshi
Principal

Enclosures:

- 1 Sanctioned letter from UGC
- 2 Syllabus