

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**(Established by Govt. of A.P., Act. No. 30 of 2008)**  
**ANANTHAPURAMU – 515 002 (A.P) INDIA**

**Course Structure for B. Pharmacy. - R13 Regulations**  
**B. Pharmacy**

**IV-II Semester**

S.No	Course code	Subject	Th	Tu/Drg/Lab	Credits
1.	13R00801	Novel Drug Delivery Systems	3	1 - -	3
2.	13R00802	Pharmaceutical Biotechnology	3	1 - -	3
3.	13R00803	<b>MOOC - I</b> (Intellectual Property Rights)	3	1 - -	3
4.	13R00804	<b>MOOC - II</b> (Biostatistics and Design of Experiments)	3	1 - -	3
5.	13R00805	Comprehensive Viva Voce	-	- - -	3
6.	13R00806	Project Work &Seminar	-	- - 20	12
			12	4 20	27

**Note:** MOOC-I - NPTEL (<http://nptel.iitm.ac.in>) General  
MOOC-II - NPTEL (<http://nptel.ac.in>) Biotechnology

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR  
ANANTHAPURAMU**

<b>Subject</b>	NOVEL DRUG DELIVERY SYSTEMS	<b>Code</b>	13R00801
<b>Course year</b>	B. Pharmacy IV year	<b>Semester</b>	II
<b>Theory</b>	3 hrs/week	<b>Tutorial</b>	1hr/week
<b>End exam</b>	70 marks	<b>Internal exam</b>	30 marks
<b>Credits</b>	3		

**Scope:** The novel drug delivery systems course provide the knowledge about various novel and targeted systems- formulation, evaluation and applications

**Objectives:** To learn the novel technologies in drug delivery systems

**Outcomes:** Student must able to formulate the drug delivery systems for drugs.

**UNIT I**

Concepts of controlled release, sustained release, extended release, timed release and delayed release. Rationale behind the design of above delivery systems. Factors influencing the design and performance of sustained and controlled release dosage forms.

**UNIT II**

**Oral Control Drug Delivery Systems:** Fundamentals, Dissolution Controlled, Diffusion Controlled, Ion Exchange Resins, Osmotic based systems, pH Independent Systems, altered density systems and use of polymers in controlled drug delivery.

**UNIT III**

**Targeted Drug Delivery Systems:** Fundamentals and applications, formulation and evaluation of nano particles, resealed erythrocytes and liposomes and niosomes.

**UNIT IV**

**Transdermal Drug Delivery Systems:** Fundamentals, permeation of drugs across the skin, types of TDDS, Materials employed and Evaluation of TDDS.

**UNIT V**

**Mucoadhesive Delivery Systems:** Mechanism of bioadhesion, mucoadhesive materials, formulation and evaluation of Buccal and Nasal drug delivery systems.

**Text Books:**

1. Robinson JR and Vincent HL. *Controlled drug delivery fundamentals and applications*, 2ed, marcel dekker 2005.
2. Yiew Chien, *Novel drug delivery systems*, 2<sup>nd</sup>ed, marcel dekker 2003.

**Reference Books:**

1. N.K. Jain, *Advances in Control & Novel drug delivery*, CBS Publishers.
2. Lippincott Williams and Wilkins, *Remington Pharmaceutical Sciences*
3. E.A. Rawlkins, *Bentley's Text Book of Pharmaceutics*, Elbspubl

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

## ANANTHAPURAMU

<b>Subject</b>	PHARMACEUTICAL BIOTECHNOLOGY	<b>Code</b>	13R00802
<b>Course Year</b>	B.Pharmacy IV year	<b>Sem</b>	II
<b>Theory</b>	3hrs/week	<b>Tutorial</b>	1hr/week
<b>End exam</b>	70 Marks	<b>Internal exam</b>	30Marks
<b>Credits</b>	3		

**Scope:** To study the Fermentation, Recombinant and Enzyme Technology

**Objective:** To know the various technologies types, design, preparation and operation

**Outcome:** The Student has to know the Application of below mentioned technologies and uses of immunological preparations.

### UNIT I

**Fermentation Technology:** Isolation, Selection, Screening of Industrially important microbes, Strain improvement. Types, design & operation of Bioreactor. Types of fermentations, optimization of fermentation process, Principle and Procedure involving in downstream process and effluent treatment. **Specific Fermentations:** Selection of organism, fermentation & purification of antibiotics (penicillin, streptomycin, tetracycline, and erythromycin), vitamins (riboflavin and cyanocobalamine), lactic acid, alcohol and acetone.

### UNIT II

**Recombinant DNA Technology:** Introduction to r-DNA technology and genetic engineering, steps involved in isolation of enzymes, vectors, recombination and cloning of genes. Production of bio technology derived therapeutic proteins like humulin, humatrop, activase, intron a, monoclonal antibodies by hybridoma technique, recombivax HB (hepatitis b). Stem cells and their applications.

### UNIT III

**Immunology & Immunological Preparations:** Principles of Immunity, Humoral immunity, cell mediated immunity, antigen – antibody reactions, hypersensitivity and its applications. Active & passive immunizations vaccine preparation, standardization & storage of BCG, cholera, smallpox, polio, typhus, tetanus toxoid, immuno serum & diagnostic agents.

## **UNIT IV**

**Enzyme Technology:** Techniques of immobilization of enzymes, factors affecting enzyme kinetics, advantages of immobilization over isolated enzymes. Study of enzymes such as hyaluronidase, penicillinase, streptokinase, streptodornase, amylase, protease etc. immobilization of bacteria & plant cells.

## **UNIT V**

Introductory study & applications of bioinformatics, proteomics and genomics, Nanobiotechnology, Gene therapy.

### ***Text Books:***

1. Wulf Crueger and Anneliese Crueger, *Biotechnology*, 2<sup>nd</sup> Ed, Publ- Panima publication cooperation, New Delhi.
2. P. F. Stanbury & A. Whitaker, *Principles of fermentation technology*, Pergamon Press.
3. J. D. Watson, *Recombinant DNA technology*. 2<sup>nd</sup> Edition, W.H. Freeman 1992.
4. S.P. Vyas and Dixit, *Pharmaceutical Biotechnology*, CBS Publishers New Delhi.

### ***Reference Books:***

1. Prescott and Dunne, *"Industrial Microbiology"* MC Graw Hill Book Company.
2. K. Kielslich *"Biotechnology"* Vol 6, Verlegchemic, Switzerland.
3. PF Standury & A. Whitaker, *"Principles of fermentation Technology"* Pergamon Press, Oxford.
4. A. Wiseman, *Handbook of enzyme biotechnology*. 3<sup>rd</sup> Edition Elis Horwood.
5. Alexande M Moo-young, *Comprehensive Biotechnology*, Pergamon Press, New York.

**MOOC – I Intellectual Property Rights**

**MOOC – II Biostatistics and Design of Experiments**