



Program Educational Objectives (PEO)

Bachelor of Pharmacy (B. Pharm)

Academic Year – 2021-22

B.Pharm

PEO 1: To provide basic and core knowledge and application in the field of pharmaceutical technology and abilities in organizational and management skills with a strong focus on analysis and problem-solving potential.

PEO 2: To identify and nurture the leadership qualities to facilitate improvement in the healthcare sector with a distinct professional identity and strong technical competence.

PEO 3: To inculcate ethical and moral values among the students to serve efficiently and contribute positively to society through effective and clear communication.

PEO 4: To understand and apply the strategies of pharmacy practice to support environmental sustainability and prepare the students as a lifelong learner to deliver pharmaceutical care in the ever-changing world.

A. Mohanlal

HOI



AMITY UNIVERSITY

MADHYA PRADESH

Established vide Government of Madhya Pradesh Act No. 27 of 2010

AMITY INSTITUTE OF PHARMACY

PROGRAMME OUTCOMES

Program Outcomes of B.Pharm

Programme Outcomes:

[PO.1]. Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

[PO.2]. Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

[PO.3]. Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

[PO.4]. Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

[PO.5]. Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

[PO.6]. Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

[PO.7]. Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

[PO.8]. Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

[PO.9]. The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

[PO.10]. Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.11]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess

and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

Programme Specific Outcomes:

PSO1: Pharmacy graduates will be familiar with the basics of developing both traditional and innovative pharmaceutical dosage forms, as well as the most recent developments in the field of pharmaceutical product development.

PSO 2: The graduates will be able to plan, design, and understand a variety of analytical studies and reports that the pharmaceutical industry uses for drug development, formulation design, production, and other related processes.

PSO 3: The graduates will be able to understand the pharmaceutical ethics related to the pharmacy profession by learning about the various laws and regulations that regulate various elements of the pharmacy field.

Note: - Correlation levels 1, 2 and 3 as defined below:

1: Slight (Low), 2: Moderate (Medium) and 3:

Substantial (High) If there is no correlation, put “-”

		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2	PSO 3
I SEM	BP101T	3	1	2	-	1	3	2	1	3	2	2	-	-	-
	BP102T	3	3	3	2	-	1	2	2	1	-	1	-	1	-
	BP103T	3	-	2	-	1	3	2	1	1	-	2	2	2	-
	BP104T	3	3	3	3	2	-	1	2	2	-	2	-	1	-
	BP105T	3	1	2	1	1	3	2	3	1	1	3	-	-	-
	BP106RBT	3	1	2	3	1	3	2	1	1	3	2	-	-	-
	BP107P	3	1	2	-	1	3	2	1	3	2	2	1	-	-
	BP108P	3	1	2	1	1	2	-	2	-	2	2	-	1	-
	BP109P	3	1	2	1	1	2	-	2	-	3	2	1	1	-
	BP110P	3	2	3	1	1	2	-	3	-	1	2	-	-	-
	BP111P	1	1	3	1	1	3	1	1	2	3	3	-	-	-
	BP112RBP	1	1	3	1	1	3	1	1	2	3	3	-	-	-
II SEM	BP201T	3	2	2	1	1	3	2	1	1	1	3	-	-	-
	BP202T	2	-	2	-	1	2	2	1	1	-	-	-	1	-

	BP203T	3	-	1	-	1	2	2	1	1	-	2	-	1	-
	BP204T	3	-	-	-	1	-	-	1	-	2	-	-	-	-
	BP205T	3	-	2	3	1	3	2	1	1	2	2	-	-	-
	BP206T	2	1	2	3	1	3	2	1	2	3	3	-	-	-
	BP207P	3	2	2	3	1	2	2	1	3	2	3	-	-	-
	BP208P	3	1	2	1	1	2	-	2	-	-	-	-	1	-
	BP209P	3	2	3	1	1	2	-	3	-	1	2	-	1	-
	BP210P	3	1	2	1	1	2	-	2	-	3	2	-	-	-
III SEM	BP301T	2	-	2	-	1	2	2	1	1	-	2	-	1	-
	BP302T	3	-	2	-	1	3	2	1	1	-	2	2	2	-
	BP303T	3	3	3	3	2	2	3	1	1	3	1	1	-	-
	BP304T	3	2	3	1	-	-	1	-	-	3	2	1	1	-
	BP305P	3	3	3	3	-	-	1	-	1	-	3	-	1	-
	BP306P	3	-	3	2	-	3	-	-	1	3	1	1	1	-
	BP307P	2	2	2	3	1	2	2	1	3	2	3	-	-	-
	BP308P	3	-	3	2	-	3	-	-	1	3	1	2	2	-
IV SEM	BP401T	3	3	2	2	-	-	2	2	1	-	2	-	1	-
	BP402T	3	-	2	-	1	3	2	1	1	-	2	-	-	-
	BP403T	3	3	3	3	1	2	2	1	3	1	1	2	2	-
	BP404T	-	3	2	1	-	1	3	2	1	3	2	-	-	-
	BP405T	3	2	2	1	-	-	2	-	2	2	1	1	-	-
	BP406P	3	1	2	1	1	2	-	2	-	3	2	-	-	-
	BP407P	3	2	2	1	1	-	-	-	-	-	1	2	2	-
	BP408P	3	1	2	-	1	3	2	1	3	2	2	-	-	-
	BP409P	3	1	3	2	1	2	2	2	2	2	3	-	-	-

V SEM	BP501T	3	2	1	1	-	1	-	-	1	1	-	-	-	-	
	BP502T	3	3	3	3	1	3	1	-	2	2	2	2	2	1	
	BP503T	3	3	3	3	2	2	3	1	1	3	1	-	-	1	
	BP504T	3	1	1	1	3	2	2	2	2	3	2	-	-	-	
	BP505T	3	-	1	-	2	3	3	-	3	-	-	-	-	3	
	BP506P	3	3	3	3	1	3	2	1	3	1	2	2	2	-	
	BP507P	3	3	3	3	1	3	2	1	3	1	2	-	-	-	
	BP508P	3	2	2	1	-	-	2	-	2	2	1	1	-	-	
VI SEM	BP601T	3	-	2	-	1	3	2	-	-	-	-	-	-	-	
	BP602T	3	3	3	3	2	2	3	1	1	3	1	-	-	-	
	BP603T	3	1	1	1	3	2	2	2	2	3	2	1	-	-	
	BP604T	3	1	1	1	3	2	2	2	2	3	2	1	-	-	
	BP605T	3	3	3	3	1	2	2	1	3	1	1	1	1	1	
	BP606T	3	2	3	3	3	2	3	3	1	1	2	1	1	1	
	BP607P	3	-	3	3	-	-	-	-	-	-	-	-	-	1	-
	BP 608 P	3	3	3	3	1	3	2	1	3	1	2	-	-	-	
BP609P	3	2	1	3	2	2	1	2	3	4	1	1	1	-		
VII SEM	BP701T	2	3	1	3	-	-	-	-	-	-	-	1	1	-	
	BP 702 T	3	3	3	3	2	2	3	1	1	3	1	3	3	-	
	BP703T	3	2	3	-	-	-	-	-	-	-	-	-	-	1	
	BP 704 T	3	3	3	3	2	2	3	1	1	3	1	3	2	-	
	BP705P	1	3	2	1	3	-	-	-	-	-	-	-	1	-	
	BP706PS	3	3	3	3	3	2	2	2	2	1	2	1	1	-	
VIII SEM	BP801T	2	2	1	3	1	1	2	-	-	-	-	-	-	-	
	BP802T	3	2	3	-	-	-	-	-	-	-	-	-	-	-	
	BP805ET	3	2	3	4	1	3	2	1	3	1	3	1	1	-	
	BP807ET	2	1	1	-	-	-	1	-	-	-	-	-	-	-	
	BP813ET	3	3	3	3	1	1	2	2	1	1	3	1	1	-	

Amity Institute of Pharmacy
Amity University Madhya Pradesh
PO Mapping of B.Pharm syllabus with the SDGs

Sr No	Program Outcome [PO]	Program Outcome	Mapping with SDGs.
1	PO-1 (Pharmacy Knowledge)	Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.	SDG 04 (Quality Education) as it aims to provide comprehensive knowledge about pharmacy and exposure of hands-on pharmaceutical practical's
2	PO-2 (Planning Abilities)	Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines	SDG 08 (Decent Work and Economic Growth) and SDG 11 (Sustainable Cities and Communities) by preparing students to participate for various outreach activities.
3	PO-3 (Problem analysis)	Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions	SDG 12 (Responsible Consumption and Production) by preparing students to thinking analytically, clearly and critically, while solving problems and making decisions during daily practice
4	PO-4 (Modern tool usage)	Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations	SDG 9 (Industry, Innovation, and Infrastructure) as it focuses on practical experiences in the era of modern tool use in various pharmaceutical industries.
5	PO-5 (Leadership skills)	Understand and consider the human reaction to change, motivation issues, leadership and team building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing	SDG 8 (Decent Work and Economic Growth) and SDG 4 (Quality Education) by preparing students for fulfillment of practice, professional and societal responsibilities.
6	PO-6 (Professional Identity)	Understand, analyze, and communicate the value of their professional roles in society (e.g., health care professionals, promoters of health, educators, managers, employers, employees	SDG 03 (Good Health and Wellbeing) by preparing students, and communicate the value of their professional

			roles in society
7	PO-7 Pharmaceutical Ethics	Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication, and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.	SDG 4 (Quality Education) and SDG 16 (Peace, Justice, and Strong Institutions) by promoting awareness, enlightenment, and commitment to ethics and professionalism.
8	PO-8 Communication	Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions	SDG 9 (Industry, Innovation, and Infrastructure) and SDG 4 (Quality Education) by focusing on ICT skills and literacy.
9	PO-9 The Pharmacist and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice	SDG 01 (No Poverty) and SDG 02 (Zero Hunger) SDG 05 (Gender Equality) by emphasizing objectivity and critical thinking about society.
10	PO-10 Environment and sustainability	Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	SDG 06 (Clean water and sanitation) and SDG 13 (Climate action) and SDG 07 (Affordable clean energy) by demonstrate the knowledge of, and need for sustainable development
11	PO-11 Life-long learning	Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.	SDG04 (Quality Education) and SDG 09 (Industry, Innovation, and Infrastructure) by life-long learning in the broadest context of technological change.

Courses Mapped with various National Missions

Sr. No.	Name of School	Program Name	Semester	Course Code	Course Name	National Mission
1.	Amity Institute of Pharmacy	B. Pharm	II	BP206T	Environmental Sciences	National Mission for Green India
2.	Amity Institute of Pharmacy	B.Pharm	VI	BP604T	Biopharmaceutics and Pharmacokinetics	National Biopharma Mission (NBM)
3.	Amity Institute of Pharmacy	B.Pharm	VI	BP605T	Pharmaceutical Biotechnology	National Mission for BioScience for human Health
4.	Amity Institute of Pharmacy	B.Pharm	VI	BP606T	Quality Assurance	Startup India
5.	Amity Institute of Pharmacy	B.Pharm	VII	BP702T	Industrial Pharmacy-II	Atal Innovation Mission (AIM)
6.	Amity Institute of Pharmacy	B.Pharm	VIII	BP802T	Social and Preventive Pharmacy	Ayushman Bharat-National Health Protection Mission (AB-NHPM) & Mission Indradhanush (MI)

ENVIRONMENTAL SCIENCE

Course Code: BP206T

Credit Units: 03

Course Objective:

Upon completion of the course the student shall be able to:

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Learning outcomes:

At the end of the course, students will be able to:

BP206T: 1. Create the awareness about environmental problems among learners.

BP206T: 2. Impart basic knowledge about the environment and its allied problems.

BP206T: 3. Develop an attitude of concern for the environment.

BP206T: 4. Motivate learner to participate in environment protection and environment improvement.

BP206T: 5. Acquire skills to help the concerned individuals in identifying and solving environmental issues.

Course content:

Unit-I

The Multidisciplinary nature of environmental studies, Natural Resources

Renewable and non-renewable resources: Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food

resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II

Ecosystems

Concept of an ecosystem.

Structure and function of an ecosystem.

Introduction, types, characteristic features, structure and function of

the ecosystems: Forest ecosystem; Grassland ecosystem; Desert

ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit- III 10hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

This subject deals with the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/ Quiz/student- teacher interaction	EE
Weightage (%)	15	4	6	50

Recommended Books (Latest edition):

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers,Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd.,Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment

BIOPHARMACEUTICS AND PHARMACOKINETICS

Course Code: BP604T

Credit Units: 04

Course Objective:

Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. Understand various pharmacokinetic parameters, their significance & applications.

Learning outcomes:

BP604.1 Know [Applying] and understand the processes and terms related to the fate of drug in human body also explain and describe [Remembering] the physicochemical, dosage form and patient related factors affecting absorption, distribution, metabolism and excretion of drugs, Describe [L2: Understanding] the basic concept in Biopharmaceutics and its importance in dosage form design

BP604.2 To analyses the bioavailability of a drug and compare the bioequivalence between formulations, Describe [L1: Remembering] and evaluate [L5: Evaluating] bioavailability, bioequivalence and its regulatory requirements for conducting bioequivalence study

BP604.3 Apply [L3: Application] the concept of compartment modelling and estimate [L5: Evaluating] the quantity/concentration of drug in body at any point of time.

BP604.4 To evaluate various pharmacokinetic parameters for the drugs exhibiting saturation kinetics.

BP604.5 Apply [L3: Application] Pharmacokinetics in Clinical Situations

Course content:

UNIT-I

Introduction Biopharmaceutics to Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption through GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

UNIT- II

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - KE , $t_{1/2}$, V_d , AUC , K_a , Cl_t and CLR - definitions methods of eliminations, understanding of their significance and Application

UNIT- IV

Multicompartment models: Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.

UNIT- V

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity. c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/ Quiz/student- teacher interaction	EE
Weightage (%)	15	4	6	75

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition, Prentice-Hall International edition, USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmanekar and Sunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Gibaldi Donald, R. Marcel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company, Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Robert F Notari Marcel Dekker Inc, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvania

PHARMACEUTICAL BIOTECHNOLOGY

Course Code: BP605T

Credit Units: 04

Course Objective:

Upon completion of the course the student shall be able to:

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

Learning outcomes:

At the end of the course, students will be able to:

BP605T.1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries

BP605T.2. Genetic engineering applications in relation to production of pharmaceuticals

BP605T.3. Importance of Monoclonal antibodies in Industries

BP605T.4. Understand the humoral and cellular immunity

BP605T.5. Discuss the use of microorganisms in fermentation technology

Course content:

Unit-I

- a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.
- b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.
- c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.
- d) Brief introduction to Protein Engineering.
- e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.
- f) Basic principles of genetic engineering.

Unit-II

- a) Study of cloning vectors, restriction endonucleases and DNA ligase.
- b) Recombinant DNA technology. Application of genetic engineering in medicine.
- c) Application of r DNA technology and genetic engineering in the production of:
 - i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.
- d) Brief introduction to PCR

Unit- III

Types of immunity- humoral immunity, cellular immunity

- a) Structure of Immunoglobulins
- b) Structure and Function of MHC
- c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.
- d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.
- e) Storage conditions and stability of official vaccines
- f) Hybridoma technology- Production, Purification and Applications
- g) Blood products and Plasma Substitutes.

Unit- IV

- a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.
- b) Genetic organization of Eukaryotes and Prokaryotes
- c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.
- d) Introduction to Microbial biotransformation and applications.
- e) Mutation: Types of mutation/mutants.

Unit-V

- a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.
- b) Large scale production fermenter design and its various controls.
- c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,
- d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/ Quiz/student- teacher interaction	EE
Weightage (%)	15	4	6	75

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degrandland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

PHARMACEUTICAL QUALITY ASSURANCE

Course Code: BP606T

Credit Units: 04

Course Objective:

Upon completion of the course the student shall be able to:

1. Understand the cGMP aspects in a pharmaceutical industry
2. Appreciate the importance of documentation
3. Understand the scope of quality certifications applicable to pharmaceutical industries
4. Understand the responsibilities of QA & QC departments

Learning outcomes:

At the end of the course, students will be able to:

BP606T.1. Understand the cGMP aspects in a pharmaceutical industry.

BP606T.2. Appreciate the importance of documentation.

BP606T.3. Understand the scope of quality certifications applicable to pharmaceutical industries.

BP606T.4. Understand the responsibilities of QA & QC departments.

Course content:

Unit-I

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

Quality by design (QbD): Definition, overview, elements of QbD program, tools

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

NABL accreditation : Principles and procedures

Unit-II

Organization and personnel: Personnel responsibilities, training, hygiene and personal records.

Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

Unit- III

Quality Control: Quality control test for containers, rubber closures and secondary packing materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a

Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

Unit- IV

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

Unit-V

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: **Good warehousing practice, materials management**

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/ Quiz/student- teacher interaction	EE
Weightage (%)	15	4	6	75

Recommended Books (Latest edition):

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhan K Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Dekker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

INDUSTRIAL PHARMACY-II

Course Code: BP702T

Credit Units: 04

Course Objective:

Upon completion of the course the student shall be able to:

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

Learning outcomes:

At the end of the course, students will be able to:

BP702T.1. Explain the process of pilot plant scale up of pharmaceutical dosage forms and the process of technology transfer from lab scale to commercial.

BP702T.2. Demonstrate the practice and the process of technology transfer from lab scale to commercial.

BP702T.3. Recall the different laws and acts that regulate pharmaceutical industry and approval process and regulatory requirements of drug products.

BP702T.4. Outline the quality management systems and certifications for pharmaceutical product.

BP702T.5 Summarize the role and responsibility of Indian regulatory agencies in the approval of drugs.

Course content:

Unit-I

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

Unit-II

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

Unit- III

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

Unit- IV

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

Unit-V

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/ Quiz/student- teacher interaction	EE
Weightage (%)	15	4	6	75

Recommended Books (Latest edition):

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http://en.wikipedia.org/wiki/Regulatory_Affairs.
2. International Regulatory Affairs Updates, 2005. available at <http://www.iraup.com/about.php>
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at <http://www.cgmp.com/ra.htm>.

SOCIAL AND PREVENTIVE PHARMACY

Course Code: BP802T

Credit Units: 04

Course Objective:

Upon completion of the course the student shall be able to:

1. Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
2. Have a critical way of thinking based on current healthcare development.
3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues

Learning outcomes:

At the end of the course, students will be able to:

BP802.1. Discuss the concept of public health and diseases in Indian and International Scenario.

BP802.2. Explain the control measures for various preventable diseases.

BP802.3. Describe the objectives, functioning and outcome of various National Health Programmes.

BP802.4. Write about contemporary pharmacy and health-related concerns.

BP802.5. Explain the function of pharmacists in generalizing and promoting health.

Course content:

Unit-I

Concept of health and disease: Definition, concepts and evaluation of public health.

Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

Hygiene and health: personal hygiene and health care; avoidable habits

Unit-II

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

Unit- III

National health programs, its objectives, functioning and outcome of the following:

HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

Unit- IV

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

Unit-V

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar /Quiz/student- teacher interaction	EE
Weight age (%)	15	4	6	75

Recommended Books (Latest edition):

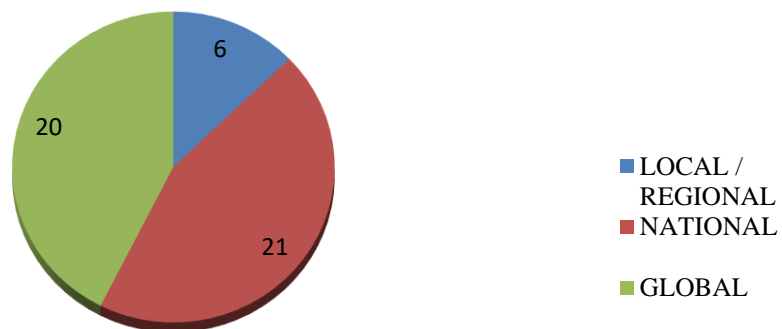
1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad



S.No.	Name of Institute/School	Programme Name	Semester	Course Code	Course Name	1.1.1 Curricula developed and implemented have relevance to the local/regional, national and global developmental needs, which is reflected in the Programme outcomes (POs), Programme Specific Outcomes(PSOs) and Course Outcomes(COs) of the Programmes offered by the University.		
						LOCAL / REGIONAL	NATIONAL	GLOBAL
B.Pharm (Academic Session 2021-22)								
1	Amity Institute of Pharmacy	UG; B.Pharm	I	BP101 T	Human Anatomy and Physiology I–Theory		1	1
2				BP102 T	Pharmaceutical Analysis I – Theory		1	1
3				BP103 T	Pharmaceutics I – Theory		1	1
4				BP104 T	Pharmaceutical Inorganic Chemistry-Theory			1
5				BP105 T	Communication skills – Theory *	1		
6			II	BP202 T	Pharmaceutical Organic Chemistry I – Theory			1
7				BP203 T	Biochemistry – Theory			1
8				BP205 T	Computer Applications in Pharmacy – Theory *	1		
10				BP206 T	Environmental sciences – Theory *	1		
15			III	BP303 T	Pharmaceutical Microbiology – Theory		1	1
16				BP304 T	Pharmaceutical Engineering – Theory	1	1	
18			IV	BP403 T	Physical Pharmaceutics II – Theory		1	
19				BP404 T	Pharmacology I – Theory		1	

20				BP405 T	Pharmacognosy and Phytochemistry I– Theory	1	1	
21			V	BP505 T	Pharmaceutical Jurisprudence – Theory		1	
22			VI	BP601 T	Medicinal Chemistry III – Theory			1
24		BP603 T		Herbal Drug Technology – Theory		1	1	
25		BP606 T		Quality Assurance – Theory		1	1	
26			VI I	BP702 T	Industrial Pharmacy II – Theory		1	1
28				BP703 T	Pharmacy Practice – Theory	1		
30			VI II	BP801 T	Biostatistics and Research Methodology		1	1
31				BP802 T	Social and Preventive Pharmacy	1	1	1
32				BP803 ET	Pharma Marketing Management		1	
33				BP804 ET	Pharmaceutical Regulatory Science		1	1
34				BP805 ET	Pharmacovigilance		1	1
35				BP806 ET	Quality Control and Standardization of Herbals			1
36				BP807 ET	Computer Aided Drug Design			1
37				BP809 ET	Cosmetic Science		1	1
38				BP810 ET	Experimental Pharmacology		1	1
39				BP811 ET	Advanced Instrumentation Techniques			1
40				BP812 ET	Dietary Supplements and Nutraceuticals		1	
	AI P	B.Pha rm		Total No of Courses relevance to the local, national, regional and global developmental needs			6	21

Total number of Courses relevance to the local/regional, national, and global developmental needs in B.Pharm



Course Outcomes:

First Semester:

S. No.	Course Code	Course Title	Outcome
1	BP101T	Human Anatomy and Physiology – I (Theory)	<ul style="list-style-type: none">• Explain the gross morphology, structure and functions of various organs of the human body. Define and explain the anatomy and physiology, various levels of organizations basic homeostatic mechanism.• Describe the various process of cell communication and homeostatic mechanisms and their imbalances. Explain the morphology, physiology of skeletal system along with the physiology of muscle contraction in co-ordination with the joints, their articulation and skin.• Identify the various tissues and organs of different systems of human body and give the protection to human body as integument, support as skeleton system. Explain and describe the composition, function of various body fluids like blood and lymph, their significance and related disorders.• Perform the various experiments related to special senses and nervous system. Classify the peripheral nervous system, nerves and morphology of special senses.• Appreciate coordinated working pattern of some vital organs of specific system. Explain the anatomy and physiology and parameters related to CVS and related disorders.
2	BP102T	Pharmaceutical Analysis - I (Theory)	<ul style="list-style-type: none">• Able to discuss principles of volumetric analysis.• Able to explain the basics of different titration methodologies.• Able to compare various electrochemical methods of analysis.• Able to ensure quality of product by titrations.• Able to develop methods for the estimation and determination of drugs and pharmaceuticals.
3	BP103T	Pharmaceuticals – I (Theory)	<ul style="list-style-type: none">• Relate pharmacy education, and pharmacy history with pharmacy career options.• Classify the different types of dosage forms based on uses, physical form, and pharmaceutical incompatibilities.• Experiment in the development of various conventional dosage forms such as solid, liquid, and semisolid

			<p>dosage forms.</p> <ul style="list-style-type: none"> • Able to analyze the prescription, stability issues in emulsion and suspension. • Solve the dose calculation, pharmaceutical calculations.
4	BP104T	Pharmaceutical Inorganic Chemistry (Theory)	<ul style="list-style-type: none"> • Able to discuss the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals. • Able to study the monographs of inorganic drugs and pharmaceuticals. • Able to understand the medicinal and pharmaceutical importance of inorganic compounds. • Able to learn about preparations, properties, chemical reactions and assay of inorganic compounds. • Able to discuss radio activity, measurement of radioactivity, properties and pharmaceutical applications of radiopharmaceuticals.
5	BP105T	Communication Skills (Theory)	<ul style="list-style-type: none"> • Understand the behavioral needs for a pharmacist to function effectively in the areas of pharmaceutical operation. • Communicate effectively (Verbal and Non-Verbal). • Effectively manage the team as a team player. • Develop interview skills. • Develop Leadership qualities and essentials.
6	BP106R BT	Remedial Biology (Theory)	<ul style="list-style-type: none"> • Know the classification and salient features of five kingdoms of life. • Understand the basic components of anatomy & physiology of plant. • Know the basic components of anatomy & physiology animal with special reference to human. • Know about the Essential mineral, macro and micronutrients. • Understand the basics of plant respiration and requirements and procedures of plant growth.
7	BP107P	Human Anatomy and Physiology – I (Practical)	<ul style="list-style-type: none"> • Effectively use the microscope for microscopic study of various tissues. • Identify axial and appendicular bones of human skeleton. • Explain the gross morphology, structure and functions of various organs of human body. • Identify different tissues and organs of different systems of human body. • Perform the haematological test like CT-BT, blood cell count, haemoglobin estimation, bleeding/clotting time,

			<p>ESR etc.</p> <ul style="list-style-type: none"> Record the blood pressure, heart rate, pulse rate and respiratory volume.
8	BP108P	Pharmaceutical Analysis - I (Practical)	<ul style="list-style-type: none"> Understand the principles of volumetric and electrochemical analysis. Operate equipment used in electrochemical analysis. Carryout various volumetric titrations. Carryout various electrochemical titrations. Develop analytical skills.
9	BP109P	Pharmaceuticals - I (Practical)	<ul style="list-style-type: none"> To recall the principles used in the preparation of solid, liquid, and semi-solid dosage forms. Operate equipment used in the manufacturing of different dosage forms. Formulate various conventional dosage forms such as solid dosage forms. Design various liquid dosage forms and semi-solid dosage forms. Estimate the ingredients calculation for preparation of dosage form.
10	BP110P	Pharmaceutical Inorganic Chemistry (Practical)	<ul style="list-style-type: none"> To recognize various sources of impurities and carry out limit test of ions in inorganic compounds. Describe the effects of impurities in pharmacopeial substances. Perform the identification test of various inorganic compounds as per Indian pharmacopeia. Carry out the test for purity of inorganic compounds. Prepare various inorganic pharmaceuticals preparation.
11	BP111P	Communication Skills (Practical)	<ul style="list-style-type: none"> Practice different types of skills such as presentation skills, communications skills, and listening skills. Practice of basic communication. Interview handling skills. Practice of pronunciations. Communicate effectively (Verbal and Non-Verbal).
12	BP112R BP	Remedial Biology (Theory)	<ul style="list-style-type: none"> Know about several type of microscopes, staining techniques. Study of types and components of cell. Study about the modifications of Stem, Root, Leaf, seed, fruit etc. Give detailed study of frog by using computer models. Microscopic study and identification of tissues pertinent to stem, root, leaf, seed, fruit and flower. Identify types of bones.

			<ul style="list-style-type: none"> • Determination of blood group and blood pressure of human.
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Second Semester:

S. No.	Course Code	Course Title	Outcome
1	BP201T	Human Anatomy and Physiology – II (Theory)	<ul style="list-style-type: none"> • Explain the gross morphology, structure and functions of various organs of the human body. • Describe the various homeostatic mechanisms and their imbalances. • Identify the various tissues and organs of different systems of human body. • Identify the various tissues and organs of different systems of human body. • Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume. • Appreciate coordinated working pattern of different organs of each system.
2	BP202T	Pharmaceutical Organic Chemistry - I (Theory)	<ul style="list-style-type: none"> • Relate pharmacy education with pharmacy career options. • Classify the different types of organic compounds based on medicinal use. • Experiment in the preparation of various types organic compounds and their derivatives. • Able to analyse and also to write the structure, name and the type of isomerism of the organic compound. • Able to Solve and write the reaction, name the reaction and also orientation of reactions in different types of organic compounds.
3	BP203T	Biochemistry (Theory)	<ul style="list-style-type: none"> • Describe the concept of biomolecules and bioenergetics. • Explain the metabolic pathways of biomolecules in both physiological and pathological conditions. • Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes. • Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins. • Describe the clinical pathology of blood and urine.
4	BP204T	Pathophysiol	<ul style="list-style-type: none"> • Describe the etiology and pathogenesis of the selected

		ogy (Theory)	<p>disease states. Discuss the</p> <ul style="list-style-type: none"> • Name the signs and symptoms of the diseases • Mention the complications of the diseases. • Distinguish environmental factors, physical, psychosocial, and cognitive characteristics of various diseases and conditions. • Identify implications of therapeutic interventions for diseases and conditions.
5	BP205T	Computer Application in Pharmacy (Theory)	<ul style="list-style-type: none"> • Apply one's complement, and two's complement methods to solve various problems based on the binary system. • Illustrate data flow diagrams, product cycle and discover web technologies application in pharmacy. • Define the role of computer in various fields of pharmacy. • Explain the application of bioinformatics in various disciplines. • Outline the use of LIMS, TIMS and CDS in pre-clinical development.
6	BP206T	Environmental Sciences (Theory)	<ul style="list-style-type: none"> • Create the awareness about environmental problems among learners. • Impart basic knowledge about the environment and its allied problems. • Develop an attitude of concern for the environment. • Motivate learner to participate in environment protection and environment improvement. • Acquire skills to help the concerned individuals in identifying and solving environmental problems.
7	BP207P	Human Anatomy and Physiology – II (Practical)	<ul style="list-style-type: none"> • To study the human body systems using specimen, models, etc. • Recording of body temperature. • To demonstrate positive and negative feedback mechanism. • Determination of tidal volume and vital capacity. • Study of family planning devices and pregnancy diagnosis test. • Demonstration of total blood count by cell analyser.
8	BP208P	Pharmaceutical Organic Chemistry - I (Practical)	<ul style="list-style-type: none"> • Understand the principles of analysis. • Operate equipment used in chemical analysis. • Carryout various qualitative test for determination of unknown compound. • Carryout various functional group test. • Develop analytical skills.

9	BP209P	Biochemistry (Practical)	<ul style="list-style-type: none"> • Perform various qualitative analysis of biomolecules i.e. carbohydrates (glucose, fructose, lactose, maltose, sucrose and starch), proteins (albumin and casein). • Learn about the normal constituents of urine, blood and their significance in maintaining good health. • Learn qualitative and quantitative analysis of constituents of biological fluids such as urine, blood and their estimation using standard methods. • Prepare various buffer solution with specific pH value. • Perform various enzymatic activities.
10	BP210P	Computer Application in Pharmacy (Practical)	<ul style="list-style-type: none"> • Create and manage databases on the given information. • Design a questionnaire using various processing packages to gather information about a particular disease. • Generate, edit and print reports and webpage and XML pages based on patient information. • Explain drug information storage and retrieval system. • Utilize MS-office, MS-Access for data management.

Third Semester:

S. No.	Course Code	Course Title	Outcome
1	BP301T	Pharmaceutical Organic Chemistry - II (Theory)	<ul style="list-style-type: none"> • Relate pharmacy education with pharmacy career options. • Classify the different types of organic compounds based on medicinal use. • Experiment in the preparation of various types organic compounds and their derivatives. • Able to analyse and also to write the structure, name and the type of isomerism of the organic compound. • Able to Solve and write the reaction, name the reaction and also orientation of reactions in different types of organic compounds.
2	BP302T	Physical Pharmaceutics - I (Theory)	<ul style="list-style-type: none"> • Write the importance of solubility in designing of dosage forms and principles of diffusion in biological systems. • Classify the states of matter and understand the applications of various physiochemical properties to design dosage forms. • Explain the principles of interfacial tension and the applications of surface active agents in drug solubilization.

			<ul style="list-style-type: none"> • Make use of concepts of complexation and protein binding in pharmacy. • Function of pH, buffers and their use in the stabilization of pharmaceutical formulations.
3	BP303T	Pharmaceutical Microbiology (Theory)	<ul style="list-style-type: none"> • Understand methods of identification, cultivation and preservation of various microorganisms. • Importance of sterilization in microbiology and pharmaceutical industry. • Learn sterility testing of pharmaceutical products. • Microbiological standardization of pharmaceuticals. • Understand the cell culture technology and its applications in pharmaceutical industries.
4	BP304T	Pharmaceutical Engineering (Theory)	<ul style="list-style-type: none"> • Define various unit operations used in pharmaceutical industries. • Relate the material handling techniques according to the available materials. • Explain various processes & equipment involved in the pharmaceutical manufacturing process. • Analyse various conditions & precautions to prevent environmental pollution. • Analyse & Plan plant layout design for optimum use of resources. • Utilize various preventive methods used for corrosion control in pharmaceutical industries.
5	BP305P	Pharmaceutical Organic Chemistry - II (Practical)	<ul style="list-style-type: none"> • Students will be able to understand principle and procedure of melting point determination, purification and steam distillation. • Students will be able to estimate different analytical constants to find the quality of oils. • Students will be able to acquire knowledge about pharmaceutical organic compounds, with emphasis on their synthetic methods. • Students will be able to illustrate the experiments relating to preparations of organic compounds. • Students will be able to apply reagents and various named reactions for synthesis of organic compounds.
6	BP306P	Physical Pharmaceutics - I (Practical)	<ul style="list-style-type: none"> • To understand the significance of physical properties such as solubility, surface tension, partition coefficient and pKa in the design of dosage forms. • To explain adsorption isotherms and determine Freundlich- Langmuir constant using activated charcoal. • To apply Henderson – Hasselbalch equation for

			<p>interpretation of pKa value of drugs.</p> <ul style="list-style-type: none"> • To determine the surface tension of sample liquids by drop count and drop weight methods. • To deduce the HLB value and critical micellar concentration of a surfactant. • To estimate the stability constants of complexes by solubility and pH titration methods.
7	BP307P	Pharmaceutical Microbiology (Practical)	<ul style="list-style-type: none"> • Understand working of different equipment's used in experimental microbiology. • Sterilization methods of glassware, preparation and sterilization of media. • Preparation of culture media and sub-culturing of bacteria and fungus. • Staining methods for identification of microorganisms. • Microbiological assays of antibiotics and amino acids. • Process of Sterility testing of pharmaceuticals.
8	BP308P	Pharmaceutical Engineering (Practical)	<ul style="list-style-type: none"> • To recall the principles used in the preparation of solid, liquid, and semi-solid dosage forms. • Operate equipment used in the manufacturing of different dosage forms. • Formulate various conventional dosage forms such as solid dosage forms. • Design various liquid dosage forms and semi-solid dosage forms. • Estimate the ingredients calculation for preparation of dosage form.

Fourth Semester:

S. No.	Course Code	Course Title	Outcome
1	BP401T	Pharmaceutical Organic Chemistry - III (Theory)	<ul style="list-style-type: none"> • Students will be able to study optical isomerism of compounds that could help the students to understand the chirality, sequence rules, racemic modification of organic compounds. • Students will be able to acquire knowledge about geometrical isomerism of pharmaceutical organic compounds, with emphasis on their synthetic process, physical and chemical properties. • Students will be able to write synthesis, reactions and medicinal uses different heterocyclic compounds. • Students will be able to analyze various reactions for the synthesis of higher organic compounds. • Students will be able to apply reagents and various

			named reactions for the design of organic medicinal compounds.
2	BP402T	Medicinal Chemistry - I (Theory)	<ul style="list-style-type: none"> • Knowledge on Physicochemical properties of drugs in relation to biological action. • Able to gain knowledge on autonomic nervous system like sympathomimetics, and sympatholytics. • To gain knowledge on cholinergic neurotransmitters like parasympathomimetic and lytics. • To gain knowledge on drugs acting on central nervous system like benzodiazepines and barbiturtes. • To gain knowledge on drugs acting on central nervous system like general anesthetics, narcotic and non-narcotic analgesics.
3	BP403T	Physical Pharmaceutics - II (Theory)	<ul style="list-style-type: none"> • Know the process of pilot plant and scale up of pharmaceutical dosage forms. • Understand the process of technology transfer from lab scale to commercial batch. • Know different Laws and Acts that regulate pharmaceutical industry. • Understand the approval process and regulatory requirements for drug products.
4	BP404T	Pharmacology - I (Theory)	<ul style="list-style-type: none"> • Introduction to Pharmacology. • Pharmacodynamics- Principles and mechanisms of drug action. • Pharmacology of drugs acting on peripheral nervous system. • Pharmacology of drugs acting on central nervous system. • Pharmacology of drugs acting on central nervous system.
5	BP405T	Pharmacognosy and Phytochemistry - I (Theory)	<ul style="list-style-type: none"> • Define pharmacognosy, classify the crude drugs and explain methods of drug evaluation. • Explain the techniques and methods involved in cultivation and collection production of crude drug. Illustrate the plant tissue culture and its applications. Brief note on edible vaccines. • Explain role of pharmacognosy in allopathy & traditional system of medicine (ayurveda, siddha, unani & homeopathy). • Study of primary & secondary metabolites from natural sources-carbohydrates, proteins, lipids, alkaloids, glycosides, steroids, volatile oils, tannins, resins and plant fibre products like cotton, jute & hemp &

			hallucinogens, teratogens, natural allergens.
6	BP406P	Medicinal Chemistry - I (Practical)	<ul style="list-style-type: none"> • Preparation of drugs/intermediates like 1,3-pyrazole, 1,3-oxazole, benzimidazole, benzotriazole, 2,3-diphenyl quinoxaline, benzocaine, phenytoin, phenothiazine and barbiturate. • Assay of chlorpromazine, phenobarbitone, atropine, ibuprofen, aspirin and furosemide.
7	BP407P	Physical Pharmaceutics - II (Practical)	<ul style="list-style-type: none"> • To determine the particle size, particle size distribution using sieving method or microscopic method. • To understand various physicochemical properties of drug molecules in the designing the dosage forms. • To know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations. • To Determine the angle of repose and influence of lubricant on angle of repose. • To determine of reaction rate constant. • To demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.
8	BP408P	Pharmacology - I (Practical)	<ul style="list-style-type: none"> • Introduction to experimental pharmacology. • Study of different routes of drugs administration in mice/rats. • Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice. • Effects of skeletal muscle relaxants using rota-rod apparatus. • Study of stereotype and anti-catatonic activity of drugs on rats/mice. • Study of local anesthetics by different methods.
9	BP409P	Pharmacognosy and Phytochemistry - I (Practical)	<ul style="list-style-type: none"> • To know the techniques in the cultivation and production of crude drugs. • To know the crude drugs, their uses and chemical nature. • To know the evaluation techniques for the herbal drugs. • To carry out the microscopic and morphological evaluation of crude drugs. • To know the classification, identification and medicinal properties of herbal drugs.

Fifth Semester:

S. No.	Course Code	Course Title	Outcome
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1	BP501T	Medicinal Chemistry - II (Theory)	<ul style="list-style-type: none"> • Understand the chemistry of drugs with respect to their pharmacological activity. • Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs. • Understand the mechanism of action. • Know the Structural Activity Relationship of different class of drugs. • Study the chemical synthesis of selected drugs.
2	BP502T	Industrial Pharmacy - I (Theory)	<ul style="list-style-type: none"> • Outline the assessment of physicochemical properties of drugs as a tool in the optimization of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms. • Demonstrate tablets, capsules, liquid orals, cosmetics using established procedures and technology. • Examine the facilities and standards necessary for the industrial production of sterile dosage forms and ophthalmic preparations. • Analyze appropriate packaging materials for various pharmaceutical dosage forms. • Identify containers, closures, valves and propellants for different types of aerosol systems.
3	BP503T	Pharmacology - II (Theory)	<ul style="list-style-type: none"> • Discuss the pharmacology of the drugs affecting the cardiovascular system. • Explain the pharmacology of diuretics and anti-coagulants. • Explain mechanism of actions and pharmacological actions of autacoids. • Explain the pharmacology of the drugs acting on the endocrine system. • Describe the various methods and applications of bioassay.
4	BP504T	Pharmacognosy and Phytochemistry - II (Theory)	<ul style="list-style-type: none"> • To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents • To understand the preparation and development of herbal formulation • To understand the herbal drug interactions • To carryout isolation and identification of phytoconstituents • To impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify
5	BP505T	Pharmaceutical	<ul style="list-style-type: none"> • Interpret the Pharmaceutical legislations and their implications in the development, manufacturing, and

		Jurisprudence (Theory)	<p>marketing of pharmaceuticals.</p> <ul style="list-style-type: none"> • Relate various indian pharmaceutical Acts and Laws with the pharmacy profession. • Identify the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals. • Apply the code of ethics during the pharmaceutical practice. • Make use of guidelines for using animals for experimentation. • Distinguish various types of Intellectual Property Rights.
6	BP506P	Industrial Pharmacy - I (Practical)	<ul style="list-style-type: none"> • Understand the various pharmaceutical dosage forms and their manufacturing techniques. • Recall various considerations required in formulation of pharmaceutical dosage forms. • Formulate solid, liquid and semisolid dosage by using established procedures and technology. • Conclude the facilities and standards necessary for the industrial production of sterile dosage forms and ophthalmic preparations. • Select the glass containers required for the storage of the finished products.
7	BP507P	Pharmacology - II (Practical)	<ul style="list-style-type: none"> • Understand the various instruments and equipments used in the Pharmacology experiments and in vitro techniques of pharmacology. • Dose response curve of various drugs such as acetylcholine and histamine. • PA2 and PD2 value determination. • Bioassay of various drug using ex-pharm software. • Evaluation of various drugs for their analgesic, anti-inflammatory and diuretic activity.
8	BP508P	Pharmacognosy and Phytochemistry - II (Practical)	<ul style="list-style-type: none"> • Identify crude drugs by morphological and microscopical characteristics. • Isolate phytoconstituents from crude drugs, Perform Paper and Thin Layer Chromatography. • Isolate and analyse volatile oils. • Carryout chemical tests for the identification of unorganized crude drugs.

Sixth Semester:

S. No.	Course Code	Course Title	Outcome
1	BP601T	Medicinal	<ul style="list-style-type: none"> • Understand the chemistry of drugs with respect to their

		Chemistry - III (Theory)	<p>pharmacological activity.</p> <ul style="list-style-type: none"> • Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs. • Understand the mechanism of action. • Know the Structural Activity Relationship of different class of drugs. • Study the chemical synthesis of selected drugs.
2	BP602T	Pharmacology - III (Theory)	<ul style="list-style-type: none"> • Discuss the Pharmacology of the drugs affecting the Respiratory and GIT system. • Explain the pharmacology of chemotherapeutic agents. • Explain the pharmacology of mechanism of chemotherapeutic agents. • Explain the pharmacology of immunopharmacological agents. • Describe the various methods and applications of bioassay.
3	BP603T	Herbal Drug Technology (Theory)	<ul style="list-style-type: none"> • Understand raw material as source of herbal drugs from cultivation to herbal drug product. • Know the WHO and ICH guidelines for evaluation of Herbal drugs. • Know the herbal cosmetics, natural sweeteners, nutraceuticals. • Appreciate patenting of herbal drugs, GMP. • The knowledge of basic understanding of herbal drug industry.
4	BP604T	Biopharmaceutics and Pharmacokinetics (Theory)	<ul style="list-style-type: none"> • Know [Applying] and understand the processes and terms related to the fate of drug in human body also explain and describe [Remembering] the physicochemical, dosage form and patient related factors affecting absorption, distribution, metabolism and excretion of drugs, Describe [L2: Understanding] the basic concept in Biopharmaceutics and its importance in dosage form design. • To analyses the bioavailability of a drug and compare the bioequivalence between formulations, Describe [L1: Remembering] and evaluate [L5: Evaluating] bioavailability, bioequivalence and its regulatory requirements for conducting bioequivalence study. • Apply [L3: Application] the concept of compartment modelling and estimate [L5: Evaluating] the quantity/concentration of drug in body at any point of time. • To evaluate various pharmacokinetic parameters for the

			<p>drugs exhibiting saturation kinetics.</p> <ul style="list-style-type: none"> • Apply [L3: Application] Pharmacokinetics in Clinical Situations.
5	BP605T	Pharmaceutical Biotechnology (Theory)	<ul style="list-style-type: none"> • Understanding the importance of Immobilized enzymes in Pharmaceutical Industries. • Genetic engineering applications in relation to production of pharmaceuticals. • Importance of Monoclonal antibodies in Industries. • Understand the humoral and cellular immunity. • Discuss the use of microorganisms in fermentation technology.
6	BP606T	Pharmaceutical Quality Assurance (Theory)	<ul style="list-style-type: none"> • Understand the cGMP aspects in a pharmaceutical industry. • Appreciate the importance of documentation. • Understand the scope of quality certifications applicable to pharmaceutical industries. • Understand the responsibilities of QA & QC departments.
7	BP607P	Medicinal chemistry - III (Practical)	<ul style="list-style-type: none"> • To recall the principles used in Preparation of drugs and intermediates and assays. • Perform synthetics of drugs and intermediates by conventional method. • Perform synthetics of drugs and intermediates by microwave irradiation method. • Drawing structures and reactions using chem draw. • Determination of physicochemical properties drug like molecules.
8	BP608P	Pharmacology - III (Practical)	<ul style="list-style-type: none"> • Understand the various instruments and equipments used in the Pharmacology experiments and in vitro techniques of pharmacology. • Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test. • Estimation of serum biochemical parameters by using semi- auto analyser. • Determination of acute oral toxicity (LD₅₀, skin irritation, eye irritation) of a drug from a given data. • Calculation of pharmacokinetic parameters from a given drugs.
9	BP609P	Herbal Drug Technology (Practical)	<ul style="list-style-type: none"> • To understand the preliminary phytochemical screening of crude drugs, determination of alcohol content of ayurvedic formulations and evaluation of excipient of natural origins. • Preparation and standardization of different herbal

			<p>formulations, monograph analysis of herbal drugs.</p> <ul style="list-style-type: none"> • To apply monographic analysis of herbal drugs as per pharmacopoeias. • To evaluate & assess the parameters such as aldehyde, phenol contents and total alkaloid content.
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Seventh Semester:

S. No.	Course Code	Course Title	Outcome
1	BP701T	Instrumental Methods of Analysis (Theory)	<ul style="list-style-type: none"> • Investigate the pharmaceutical substances by UV Visible and fluorescence spectroscopy and IR spectroscopy. • Analyze the essentials of Nepheloturbidometry, flame photometry and atomic absorption spectroscopy. • Apprehend the analysis of a pharmaceutical substances by chromatographic techniques and electrophoresis. • Recognize the principle, instrumentation and applications of gas chromatography & high-performance liquid chromatography. • Deal with the fundamentals of ion exchange, affinity chromatography and gel chromatography.
2	BP702T	Industrial Pharmacy - II (Theory)	<ul style="list-style-type: none"> • Explain the process of pilot plant scale up of pharmaceutical dosage forms and the process of technology transfer from lab scale to commercial. • Demonstrate the practice and the process of technology transfer from lab scale to commercial. • Recall the different laws and acts that regulate pharmaceutical industry and approval process and regulatory requirements of drug products. • Outline the quality management systems and certifications for pharmaceutical product. • Summarize the role and responsibility of Indian regulatory agencies in the approval of drugs.
3	BP703T	Pharmacy Practice (Theory)	<ul style="list-style-type: none"> • Discuss the basic components in organization of hospital & hospital Pharmacy. • Explain in detail about adverse drug reactions and drug interactions. • Outline various drug distribution systems, Drug Information and concepts of inventory control followed in hospital. • Recognize the communication abilities in Patient Counselling and Prescription interpretation.
4	BP704T	Novel Drug Delivery System (Theory)	<ul style="list-style-type: none"> • Discuss various approaches for development of novel drug delivery systems (NDDS). • Understand the criteria for selection of drugs and polymers. • Discuss the methods of preparation of NDDS. • Discuss the evaluation of NDDS.

			<ul style="list-style-type: none"> • Discuss the application of NDDS
5	BP705P	Instrumental Methods of Analysis (Practical)	<ul style="list-style-type: none"> • Quantitative & qualitative analysis of drugs using various analytical instruments. • Operate equipment used in the Spectroscopy. • Chromatographic separation and analysis of drugs. • Applications of chromatography in drug analysis. • Learn to operate sophisticated analytical instruments.
6	BP706PS	Practice School*	<ul style="list-style-type: none"> • Plan research/review topic to create new knowledge. • Analyse and conduct the literature review on given topic. • Choose methodology, analyse data and interpret results. • Compile report for submission on given topic. • Defend viva-voice through presentation.

Eighth Semester:

S. No.	Course Code	Course Title	Outcome
1	BP801T	Biostatistics and Research Methodology	<ul style="list-style-type: none"> • Define, classify, and list the uses & applications of various bio-statistical tools and Experimental designs. Derive equations and solve problems related to various statistical technique • Appreciate statistical techniques in solving the problems. • Know the various statistical techniques to solve statistical problems. • Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment). • Application of Design and Analysis of experiments
2	BP802T	Social and Preventive Pharmacy	<ul style="list-style-type: none"> • Discuss the concept of public health and diseases in Indian and International Scenario. • Explain the control measures for various preventable diseases. • Describe the objectives, functioning and outcome of various National Health Programmes. • Write about contemporary pharmacy and health-related concerns. • Explain the function of pharmacists in generalizing and promoting health.
3	BP803E T	Pharma Marketing Management	<ul style="list-style-type: none"> • Describe the concept of marketing and pharmaceutical marketing. • Enumerate the concept of product management in pharmaceutical industry. • Discuss the various components of promotion of pharmaceutical products and public relations. • Discuss the roles pharmaceutical marketing channels and professional sales representative. • Discuss the roles and responsibilities of pricing authorities in India.
4	BP804E	Pharmaceuti	<ul style="list-style-type: none"> • Explain the process of drug discovery, development and

	T	cal Regulatory Science	<p>generic product development.</p> <ul style="list-style-type: none"> • Describe the regulatory approval process and registration procedures for API and drug products in various countries. • Learn the basic understanding of regulations of India with other global regulated markets. • Understand the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals. • Explain basic understanding of developing clinical trial protocols. • Understand the concept of pharmacovigilance and its significance. • Learn the basic understanding the importance of Orange book, Federal Register, Code of Federal Regulatory, and Purple book • Explain the Registration of Indian drug product in overseas market
5	BP805E T	Pharmacovigilance	<ul style="list-style-type: none"> • Why drug safety monitoring is important? • History and development of pharmacovigilance. • National and international scenario of pharmacovigilance. • Dictionaries, coding and terminologies used in pharmacovigilance. • Detection of new adverse drug reactions and their assessment. • International standards for classification of diseases and drugs. • Adverse drug reaction reporting systems and communication in pharmacovigilance.
6	BP806E T	Quality Control and Standardization of Herbals	<ul style="list-style-type: none"> • Know WHO guidelines for quality assurance & quality control of herbal drugs. • Know the regulatory approval process and their registration in Indian and international markets.
7	BP807E T	Computer Aided Drug Design	<ul style="list-style-type: none"> • Understand the understand Design and discovery of lead molecules. • Understand the role of drug design in the drug discovery process. • The concept of QSAR and docking. • Know the various strategies to develop a drug-like molecules. • Study the design of new drug molecules using molecular modeling.
8	BP808E T	Cell and Molecular Biology	<ul style="list-style-type: none"> • Summarize cell and molecular biology history. • Summarize cellular functioning and composition. • Summarize cellular functioning and composition. • Describe the chemical foundations of cell biology. • Summarize the DNA properties of cell biology.

9	BP809ET	Cosmetic Science	<ul style="list-style-type: none"> • Classify and define Cosmetics and Cosmeceuticals as per Indian and EU regulations. • Describe the role of cosmetic excipients and building blocks in the formulation of cosmetics. • Explain the structure and function of the skin, hair, teeth and gums. • Describe the fundamentals of sun protection and the formulation of Sunscreens, antiperspirants and deodorants. • Formulate cosmetics for skin care and hair care as well as dental and oral care. • Design cosmetics and cosmeceuticals that address the problems of dry skin, acne, dermatitis, prickly heat, wrinkles, blemishes, hair fall, Dandruff, body odour, bleeding gums, mouth odour, teeth discoloration and sensitive teeth.
10	BP810ET	Experimental Pharmacology	<ul style="list-style-type: none"> • Appreciate the applications of various commonly used laboratory animals. • Appreciate and demonstrate the various screening methods used in preclinical research. • Appreciate and demonstrate the importance of biostatistics and research methodology. • Design a research hypothesis independently. • Execute a research hypothesis independently.
11	BP811ET	Advanced Instrumentation Techniques	<ul style="list-style-type: none"> • Knowledge on Nuclear Magnetic Resonance spectroscopy, Mass spectroscopy. • Able to gain knowledge on Thermal Methods of Analysis, X-Ray Diffraction Methods. • To gain Knowledge on Calibration and validation-as per ICH and USFDA guidelines. • To gain Knowledge on Radio immune assay and solid phase extraction and liquid-liquid extraction. • To gain Knowledge on Drugs analysis by LC-MS/MS, GC-MS/MS, HPTLC-MS.
12	BP812ET	Dietary Supplements and Nutraceuticals	<ul style="list-style-type: none"> • Understand the need of supplements by the different group of people to maintain healthy life. • Understand the outcome of deficiencies in dietary supplements. • Appreciate the components in dietary supplements and the application. • Appreciate the regulatory and commercial aspects of dietary supplements including health claims. • Aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements.
13	BP813ET	Pharmaceutical Product Development	<ul style="list-style-type: none"> • Provide the enhanced product and process understanding and regulation in product development. • Achieve the goal of large-scale product with reproducible quality product.

			<ul style="list-style-type: none"> • Understand the advancement in pharmaceutical manufacturing and analytical techniques. • Understand design, development, optimization and stability of pharmaceutical products. • Provide the enhanced knowledge of excipients.
14	BP813P W	Project Work	<ul style="list-style-type: none"> • Plan research/review topic to create new knowledge. • Analyse and conduct the literature review on given topic. • Choose methodology, analyse data and interpret results. • Compile report for submission on given topic. • Defend viva-voice through presentation.

F. Hoshangabadi

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