# COURSE STRUCTURE AND SYLLABUS

**[W.e.f. Session 2025-26]**

# BACHELOR OF PHARMACY

## SARALA BIRLA UNIVERSITY

**Birla Knowledge City, Mahilong, Purulia Road**
**Ranchi - 835103**
**Jharkhand, INDIA**

**2025-2029**

## Vision & Mission of Sarala Birla University

### Vision

To build an egalitarian global society based on national integrity, equality, social justice, secularism, freedom & fraternity, international understanding and scientific approach to the problems of the society, as enshrined in the constitution of India through various modes of teaching-learning process and supported by curricular and co-curricular activities.

### Mission

To Develop Well-Motivated Global Leaders Who Will Be Intellectually Competent, Morally Upright, Socially Committed, Spiritually Inspired and 'स्वान्तः सुखाय' To Propagate the Philosophy Of 'वसुधैव कु टुम्बकम्'.

## Department of Pharmacy

### Vision

To develop a globally recognized center for academic excellence by imparting quality education and research in Pharmaceutical sciences for the benefit of the people, healthcare system and the growth of the Pharmaceutical Industry.

### Mission

- To focus on the Quality Education in the area of Pharmaceutical Sciences.
- To Develop Professional with Competitive Edge.
- To Promote Research for the Advancement of the Knowledge for the growth of the society.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

**PEO1:** Students should pursue lifelong learning in pharmacy with an emphasis on more relevant, modern, and hands-on laboratory experience in order to successfully compete in the regional, national, and international pharmaceutical industries

**PEO2:** To offer a broad, cutting-edge pharmaceutical education with solid foundations to support the various facets of the pharmaceutical industry.

**PEO3:** To cultivate entrepreneurial and leadership qualities in aspiring pharmacy professionals.

**PEO4:** The students are expected to instill in them a feeling of social duty, ethics, moral principles, and the authenticity of human touch.

## PROGRAMME OUTCOMES

After completing the B.Pharm course the students will have:

**PO1: 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.

**PO2:Drug Formulation and Development**

Understand and apply the principles of drug design, formulation, manufacturing, and quality assurance in the preparation of pharmaceutical products.

**PO3: 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.

**PO4: Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyse, evaluate and apply information systematically and shall make defensible decisions.

**PO5: Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

**PO6: Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

**PO7: Professional Identity:** Understand, analyse and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

**PO8: Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour 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.

**PO9: 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.

**PO10: 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.

**PO11: 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.

**PO12: 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-access and use feedback effectively from others to identify learning needs and to satisfy these needs on an on-going basis.

**PROGRAM SPECIFIC OUTCOME (PSOs)**

**PSO1:** Graduates in pharmacy will be familiar with the basics of creating both traditional and innovative pharmaceutical dosage forms, as well as how to dispense them and the most recent developments in the field of pharmaceutical product development.

**PSO2:** The graduates will gain the capacity to plan, carry out, and evaluate a variety of analytical studies and reports that the pharmaceutical industry uses for drug development, formulation design, production, and other related processes.

**PSO3:** Graduates in pharmacy will have a basic understanding of the ethics related to the pharmacy profession as well as a comprehension of the various regulations that regulate various elements of the pharmaceutical industry.

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Structure of B.Pharm Programme for 4 years

| S.No. | Types of Courses | Total Credits |
|---|---|---|
| 1 | Ability-Enhancement Compulsory Course (AECC) | 9 |
| 2 | Skill-Enhancement Course (SEC) | 7 |
| 3 | Core Course | 180 |
| 4 | Discipline Specific Elective (DSE) | 08 |
| 5 | Generic Elective (GE) | 2/3 |
| 6 | Project | 06 |
| **Total** | | **212/213** |
| Total Credits during Semester I | | 29/30 |
| Total Credits during Semester II | | 29 |
| Total Credits during Semester III | | 24 |
| Total Credits during Semester IV | | 28 |
| Total Credits during Semester V | | 26 |
| Total Credits during Semester VI | | 30 |
| Total Credits during Semester VII | | 24 |
| Total Credits during Semester VIII | | 22 |
| **Total Credits during 4 years** | | **212/213** |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Marks Structure of B.Pharm for 4 Years

| S.No | Semester | Total Credits | Total Classes per week | Total Internal Assessment Marks | Total External Assessment Marks | Total Marks |
|---|---|---|---|---|---|---|
| 1 | I | 29/30 | 38/40 | 200/210 | 525/540 | 725/750 |
| 2 | II | 29 | 36 | 205 | 520 | 725 |
| 3 | III | 24 | 32 | 160 | 440 | 600 |
| 4 | IV | 28 | 36 | 185 | 515 | 700 |
| 5 | V | 26 | 32 | 170 | 480 | 650 |
| 6 | VI | 20 | 36 | 195 | 555 | 750 |
| 7 | VII | 24 | 33 | 140 | 460 | 600 |
| 8 | VIII | 22 | 28 | 100 | 450 | 550 |
| **TOTAL** | | **202/203** | **271/273** | **1355/1365** | **3945/3960** | **5300/5325** |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

## Programme Structure [Semester- I]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP101T | Human Anatomy and Physiology I | 4 | Core | 25 | 75 | 100 | 3 |
| BP102T | Pharmaceutical Analysis I | 4 | Core | 25 | 75 | 100 | 3 |
| BP103T | Pharmaceutics I | 4 | Core | 25 | 75 | 100 | 3 |
| BP104T | Pharmaceutical Inorganic Chemistry | 4 | Core | 25 | 75 | 100 | 3 |
| BP105T | Communication skills | 2 | SEC | 15 | 35 | 50 | 1.5 |
| **BP106RBT / BP106RMT** | **Remedial Biology / Remedial Mathematics** | 2 | GE | 15 | 35 | 50 | 1.5 |
| **Lab/ Practical** | | | | | | | |
| BP107P | Human Anatomy and Physiology | 2 | Core | 15 | 35 | 50 | 4 |
| BP108P | Pharmaceutical Analysis I | 2 | Core | 15 | 35 | 50 | 4 |
| BP109P | Pharmaceutics I | 2 | Core | 15 | 35 | 50 | 4 |
| BP110P | Pharmaceutical Inorganic Chemistry | 2 | Core | 15 | 35 | 50 | 4 |
| BP111P | Communication skills | 1 | SEC | 10 | 15 | 25 | 2 |
| **BP112RBP** | **Remedial Biology** | 1 | GE | 10 | 15 | 25 | 2 |
| **Total** | | 29/30 | 0 | 200/210 | 525/540 | 725/750 | 33/35 |

| | |
|---|---|
| **Total Credits [Semester –I]** | 29/30 |
| **Ability Enhancement Compulsory** | 0 |
| **Core Course** | 24 |
| **Generic Elective** | 2/3 |
| **Skill-Enhancement** | 3 |
| **TOTAL** | 29/30 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- I]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP101T | Human Anatomy and Physiology I | Core | 3 | 1 | - | 4 | 4 |
| BP102T | Pharmaceutical Analysis I | Core | 3 | 1 | - | 4 | 4 |
| BP103T | Pharmaceutics I | Core | 3 | 1 | - | 4 | 4 |
| BP104T | Pharmaceutical Inorganic Chemistry | Core | 3 | 1 | - | 4 | 4 |
| BP105T | Communication skills | SEC | 2 | 0 | - | 2 | 2 |
| BP106RBT / BP106RMT | Remedial Biology / Remedial Mathematics | GE | 2 | 0 | - | 2 | 2 |
| **Lab/ Practical** | | | | | | | |
| BP107P | Human Anatomy and Physiology | Core | - | - | 2 | 2 | 8 |
| BP108P | Pharmaceutical Analysis I | Core | - | - | 2 | 2 | 8 |
| BP109P | Pharmaceutics I | Core | - | - | 2 | 2 | 8 |
| BP110P | Pharmaceutical Inorganic Chemistry | Core | - | - | 2 | 2 | 8 |
| BP111P | Communication skills | SEC | - | - | 1 | 1 | 4 |
| BP112RBP | Remedial Biology | GE | - | - | 1 | 1 | 2 |
| **Total** | | | 16 | 04 | 10 | 10 | 38 |

| | |
|---|---|
| Total Lecture per week | 16 |
| Total Tutorial per week | 04 |
| Total Practical/ Lab classes per week | 38 |
| **TOTAL CLASSES PER WEEK [Semester I]** | **58** |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- II]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP201T | Human Anatomy and Physiology II | 4 | Core | 25 | 75 | 100 | 3 |
| BP202T | Pharmaceutical Organic Chemistry I | 4 | Core | 25 | 75 | 100 | 3 |
| BP203T | Biochemistry | 4 | Core | 25 | 75 | 100 | 3 |
| BP204T | Pathophysiology | 4 | Core | 25 | 75 | 100 | 3 |
| BP205T | Computer Applications in Pharmacy | 3 | SEC | 25 | 50 | 75 | 2 |
| BP206T | Environmental sciences | 3 | AECC | 25 | 50 | 75 | 2 |
| **Lab/ Practical** | | | | | | | |
| BP207P | Human Anatomy and Physiology -II | 2 | Core | 15 | 35 | 50 | 4 |
| BP208P | Pharmaceutical Organic Chemistry I | 2 | Core | 15 | 35 | 50 | 4 |
| BP209P | Biochemistry | 2 | Core | 15 | 35 | 50 | 4 |
| BP210P | Computer Applications in Pharmacy | 1 | SEC | 10 | 15 | 25 | 2 |
| **Total** | | 29 | - | 205 | 520 | 725 | 30 |

| | |
|---|---|
| **Total Credits [Semester –II]** | 29 |
| **Ability Enhancement Compulsory** | 03 |
| **Core Course** | 22 |
| **Generic Elective** | 00 |
| **Skill-Enhancement** | 04 |
| **TOTAL** | 29 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- II]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP201T | Human Anatomy and Physiology II | Core | 3 | 1 | - | 4 | 4 |
| BP202T | Pharmaceutical Organic Chemistry I | Core | 3 | 1 | - | 4 | 4 |
| BP203T | Biochemistry | Core | 3 | 1 | - | 4 | 4 |
| BP204T | Pathophysiology | Core | 3 | 1 | - | 4 | 4 |
| BP205T | Computer Applications in Pharmacy | SEC | 3 | - | - | 3 | 3 |
| BP206T | Environmental sciences | AECC | 3 | - | - | 3 | 3 |
| **Lab/ Practical** | | | | | | | |
| BP207P | Human Anatomy and Physiology -II | Core | - | - | 2 | 2 | 8 |
| BP208P | Pharmaceutical Organic Chemistry I | Core | - | - | 2 | 2 | 8 |
| BP209P | Biochemistry | Core | - | - | 2 | 2 | 8 |
| BP210P | Computer Applications in Pharmacy | SEC | - | - | 1 | 1 | 4 |
| **Total** | | - | 18 | 04 | 07 | 07 | 28 |

| | |
|---|---|
| Total Lecture per week | 18 |
| Total Tutorial per week | 04 |
| Total Practical/ Lab classes per week | 28 |
| **TOTAL CLASSES PER WEEK [Semester II]** | 50 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

## Programme Structure [Semester- III]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP301T | Pharmaceutical Organic Chemistry II | 4 | Core | 25 | 75 | 100 | 3 |
| BP302T | Physical Pharmaceutics I | 4 | Core | 25 | 75 | 100 | 3 |
| BP303T | Pharmaceutical Microbiology | 4 | Core | 25 | 75 | 100 | 3 |
| BP304T | Pharmaceutical Engineering | 4 | Core | 25 | 75 | 100 | 3 |
| **Lab/ Practical** | | | | | | | |
| BP305P | Pharmaceutical Organic Chemistry II | 2 | Core | 15 | 35 | 50 | 4 |
| BP306P | Physical Pharmaceutics I | 2 | Core | 15 | 35 | 50 | 4 |
| BP307P | Pharmaceutical Microbiology | 2 | Core | 15 | 35 | 50 | 4 |
| BP308P | Pharmaceutical Engineering | 2 | Core | 15 | 35 | 50 | 4 |
| **Total** | | 24 | - | 160 | 440 | 600 | 28 |

| | |
|---|---|
| **Total Credits [Semester –III]** | 24 |
| **Ability Enhancement Compulsory** | 0 |
| **Core Course** | 24 |
| **Generic Elective** | 0 |
| **Skill-Enhancement** | 0 |
| **TOTAL** | 24 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [UGC - CBCS Scheme]

### Programme Structure [Semester- III]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP301T | Pharmaceutical OrganicChemistryII | Core | 3 | 1 | - | 4 | 4 |
| BP302T | Physical PharmaceuticsI | Core | 3 | 1 | - | 4 | 4 |
| BP303T | Pharmaceutical Microbiology | Core | 3 | 1 | - | 4 | 4 |
| BP304T | Pharmaceutical Engineering | Core | 3 | 1 | - | 4 | 4 |
| **Lab/ Practical** | | | | | | | |
| BP305P | Pharmaceutical OrganicChemistryII | Core | - | - | 2 | 2 | 8 |
| BP306P | Physical PharmaceuticsI | Core | - | - | 2 | 2 | 8 |
| BP307P | Pharmaceutical Microbiology | Core | - | - | 2 | 2 | 8 |
| BP308P | Pharmaceutical Engineering | Core | - | - | 2 | 2 | 8 |
| Total | | - | 12 | 4 | 8 | 24 | 48 |
| Total Lecture per week | | | | | | 12 | |
| Total Tutorial per week | | | | | | 4 | |
| Total Practical/ Lab classes per week | | | | | | 32 | |
| **TOTAL CLASSES PER WEEK [Semester III]** | | | | | | **48** | |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

## Programme Structure [Semester- IV]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP401T | Pharmaceutical Organic Chemistry III | 4 | Core | 25 | 75 | 100 | 3 |
| BP402T | Medicinal Chemistry I | 4 | Core | 25 | 75 | 100 | 3 |
| BP403T | Physical Pharmaceutics II | 4 | Core | 25 | 75 | 100 | 3 |
| BP404T | Pharmacology I | 4 | Core | 25 | 75 | 100 | 3 |
| BP405T | Pharmacognosy and Phytochemistry I | 4 | Core | 25 | 75 | 100 | 3 |
| **Lab/ Practical** | | | | | | | |
| BP406P | Medicinal Chemistry I | 2 | Core | 15 | 35 | 50 | 4 |
| BP407P | Physical Pharmaceutics II | 2 | Core | 15 | 35 | 50 | 4 |
| BP408P | Pharmacology I | 2 | Core | 15 | 35 | 50 | 4 |
| BP409P | Pharmacognosy and Phytochemistry I | 2 | Core | 15 | 35 | 50 | 4 |
| **Total** | | 28 | - | 185 | 515 | 700 | 31 |

| | |
|---|---|
| **Total Credits [Semester –IV]** | 28 |
| **Ability Enhancement Compulsory** | 00 |
| **Core Course** | 28 |
| **Generic Elective** | 00 |
| **Skill-Enhancement** | 00 |
| **TOTAL** | 28 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- IV]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP401T | Pharmaceutical Organic Chemistry III | Core | 3 | 1 | - | 4 | 4 |
| BP402T | Medicinal Chemistry I | Core | 3 | 1 | - | 4 | 4 |
| BP403T | Physical Pharmaceutics II | Core | 3 | 1 | - | 4 | 4 |
| BP404T | Pharmacology I | Core | 3 | 1 | - | 4 | 4 |
| BP405T | Pharmacognosy and Phytochemistry I | Core | 3 | 1 | - | 4 | 4 |
| **Lab/ Practical** | | | | | | | |
| BP406P | Medicinal Chemistry I | Core | - | - | 2 | 2 | 8 |
| BP407P | Physical Pharmaceutics II | Core | - | - | 2 | 2 | 8 |
| BP408P | Pharmacology I | Core | - | - | 2 | 2 | 8 |
| BP409P | Pharmacognosy and Phytochemistry I | Core | - | - | 2 | 2 | 8 |
| **Total** | | - | 15 | 05 | 08 | 28 | 52 |

| | |
|---|---|
| Total Lecture per week | 15 |
| Total Tutorial per week | 05 |
| Total Practical/ Lab classes per week | 32 |
| **TOTAL CLASSES PER WEEK [Semester IV]** | 52 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- V]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP501T | Medicinal Chemistry II | 4 | Core | 25 | 75 | 100 | 3 |
| BP502T | Industrial Pharmacy I | 4 | Core | 25 | 75 | 100 | 3 |
| BP503T | Pharmacology II | 4 | Core | 25 | 75 | 100 | 3 |
| BP504T | Pharmacognosy and Phytochemistry II | 4 | Core | 25 | 75 | 100 | 3 |
| BP505T | Pharmaceutical Jurisprudence | 4 | Core | 25 | 75 | 100 | 3 |
| **Lab/ Practical** | | | | | | | |
| BP506P | Industrial Pharmacy I | 2 | Core | 15 | 35 | 50 | 4 |
| BP507P | Pharmacology II | 2 | Core | 15 | 35 | 50 | 4 |
| BP508P | Pharmacognosy and Phytochemistry II | 2 | Core | 15 | 35 | 50 | 4 |
| **Total** | | 26 | - | 170 | 480 | 650 | 27 |

| | |
|---|---|
| **Total Credits [Semester –V]** | 26 |
| **Ability Enhancement Compulsory** | 00 |
| **Core Course** | 26 |
| **Generic Elective** | 00 |
| **Skill-Enhancement** | 00 |
| **TOTAL** | 26 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- V]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP501T | Medicinal Chemistry II | Core | 3 | 1 | - | 4 | 4 |
| BP502T | Industrial Pharmacy I | Core | 3 | 1 | - | 4 | 4 |
| BP503T | Pharmacology II | Core | 3 | 1 | - | 4 | 4 |
| BP504T | Pharmacognosy and Phytochemistry II | Core | 3 | 1 | - | 4 | 4 |
| BP505T | Pharmaceutical Jurisprudence | Core | 3 | 1 | - | 4 | 4 |
| **Lab/ Practical** | | | | | | | |
| BP506P | Industrial Pharmacy I | Core | - | - | 2 | 2 | 8 |
| BP507P | Pharmacology II | Core | - | - | 2 | 2 | 8 |
| BP508P | Pharmacognosy and Phytochemistry II | Core | - | - | 2 | 2 | 8 |
| **Total** | | - | 15 | 05 | 06 | 26 | 44 |

| | |
|---|---|
| Total Lecture per week | 15 |
| Total Tutorial per week | 05 |
| Total Practical/ Lab classes per week | 24 |
| **TOTAL CLASSES PER WEEK [Semester V]** | 44 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

## Programme Structure [Semester- VI]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP601T | Medicinal Chemistry III – Theory | 4 | Core | 25 | 75 | 100 | 3 |
| BP602T | Pharmacology III – Theory | 4 | Core | 25 | 75 | 100 | 3 |
| BP603T | Herbal Drug Technology – Theory | 4 | Core | 25 | 75 | 100 | 3 |
| BP604T | Biopharmaceutics and Pharmacokinetics – Theory | 4 | Core | 25 | 75 | 100 | 3 |
| BP605T | Pharmaceutical Biotechnology– Theory | 4 | Core | 25 | 75 | 100 | 3 |
| BP606T | Quality Assurance– Theory | 4 | Core | 25 | 75 | 100 | 3 |
| **Lab/ Practical** | | | | | | | |
| BP607P | Medicinal chemistry III | 2 | Core | 15 | 35 | 50 | 4 |
| BP608P | Pharmacology III | 2 | Core | 15 | 35 | 50 | 4 |
| BP609P | Herbal Drug Technology | 2 | Core | 15 | 35 | 50 | 4 |
| **Total** | | 30 | - | 195 | 555 | 750 | 30 |

| | |
|---|---|
| **Total Credits [Semester –VI]** | 30 |
| **Ability Enhancement Compulsory** | 00 |
| **Core Course** | 30 |
| **Generic Elective** | 00 |
| **Skill-Enhancement** | 00 |
| **TOTAL** | 30 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- VI]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP601T | Medicinal Chemistry III – Theory | Core | 3 | 1 | - | 4 | 4 |
| BP602T | Pharmacology III – Theory | Core | 3 | 1 | - | 4 | 4 |
| BP603T | Herbal Drug Technology – Theory | Core | 3 | 1 | - | 4 | 4 |
| BP604T | Biopharmaceutics and Pharmacokinetics – Theory | Core | 3 | 1 | - | 4 | 4 |
| BP605T | Pharmaceutical Biotechnology– Theory | Core | 3 | 1 | - | 4 | 4 |
| BP606T | Quality Assurance– Theory | Core | 3 | 1 | - | 4 | 4 |
| **Lab/ Practical** | | | | | | | |
| BP607P | Medicinal chemistry III | Core | - | - | 2 | 2 | 8 |
| BP608P | Pharmacology III | Core | - | - | 2 | 2 | 8 |
| BP609P | Herbal Drug Technology | Core | - | - | 2 | 2 | 8 |
| **Total** | | - | 18 | 06 | 06 | 30 | 48 |

| | |
|---|---|
| Total Lecture per week | 18 |
| Total Tutorial per week | 06 |
| Total Practical/ Lab classes per week | 24 |
| **TOTAL CLASSES PER WEEK [Semester VI]** | 48 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- VII]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP701T | Instrumental Methods of Analysis | 4 | Core | 25 | 75 | 100 | 3 |
| BP702T | Industrial Pharmacy II | 4 | Core | 25 | 75 | 100 | 3 |
| BP703T | Pharmacy Practice | 4 | Core | 25 | 75 | 100 | 3 |
| BP704T | Novel Drug Delivery System | 4 | Core | 25 | 75 | 100 | 3 |
| **Lab/ Practical** | | | | | | | |
| BP705P | Instrumental Methods of Analysis | 2 | Core | 15 | 35 | 50 | 4 |
| BP706PS | Practice School | 6 | AECC | 25 | 125 | 150 | 5 |
| **Total** | | 24 | - | 140 | 460 | 600 | 21 |

| | |
|---|---|
| **Total Credits [Semester –VII]** | 24 |
| **Ability Enhancement Compulsory** | 06 |
| **Core Course** | 18 |
| **Generic Elective** | 00 |
| **Skill-Enhancement** | 00 |
| **TOTAL** | 24 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- VII]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP701T | Instrumental Methods of Analysis | Core | 3 | 1 | - | 4 | 4 |
| BP702T | Industrial Pharmacy II | Core | 3 | 1 | - | 4 | 4 |
| BP703T | Pharmacy Practice | Core | 3 | 1 | - | 4 | 4 |
| BP704T | Novel Drug Delivery System | Core | 3 | 1 | - | 4 | 4 |
| **Lab/ Practical** | | | | | | | |
| BP705P | Instrumental Methods of Analysis | Core | - | - | 2 | 2 | 8 |
| BP706PS | Practice School | AECC | - | - | 6 | 6 | 12 |
| **Total** | | - | 12 | 4 | 8 | 24 | 36 |

| | |
|---|---|
| Total Lecture per week | 12 |
| Total Tutorial per week | 04 |
| Total Practical/ Lab classes per week | 20 |
| **TOTAL CLASSES PER WEEK [Semester VII]** | 36 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

## Programme Structure [Semester- VIII]

| Course Code | Course Title | Course Credit | Course Type | Marks | | | Exam Duration (Hrs.) |
|---|---|---|---|---|---|---|---|
| | | | | IA | EA | Total | |
| **Theory** | | | | | | | |
| BP801T | Biostatistics and Research Methodology | 4 | Core | 25 | 75 | 100 | 3 |
| BP802T | Social and Preventive Pharmacy | 4 | Core | 25 | 75 | 100 | 3 |
| BP803ET | Pharma Marketing Management | 8 | DSE | 25+25= 50 | 75+75= 150 | 100+100= 200 | 3+3=6 |
| BP804ET | Pharmaceutical Regulatory Science | | | | | | |
| BP805ET | Pharmacovigilance | | | | | | |
| BP806ET | Quality Control and Standardization of Herbals | | | | | | |
| BP807ET | Computer Aided Drug Design | | | | | | |
| BP808ET | Cell and Molecular Biology | | | | | | |
| BP809ET | Cosmetic Science | | | | | | |
| BP810ET | Experimental Pharmacology | | | | | | |
| BP811ET | Advanced Instrumentation Techniques | | | | | | |
| BP812ET | Dietary Supplements and Nutraceuticals | | | | | | |
| **Lab/ Practical** | | | | | | | |
| BP813PW | Project Work | 6 | Project | - | 150 | 150 | 4 |
| **Total** | | 22 | - | 100 | 450 | 550 | 16 |

| | |
|---|---|
| **Total Credits [Semester –VIII]** | 22 |
| **Ability Enhancement Compulsory** | 08 |
| **Core Course** | 08 |
| **Generic Elective** | 00 |
| **Skill-Enhancement** | 00 |
| **Project** | 06 |
| **TOTAL** | 22 |

# SARALA BIRLA UNIVERSITY

## B.Pharm [PCI - CBCS Scheme]

### Programme Structure [Semester- VIII]

| Course Code | Course Title | Course Type | Course Credits | | | | Classes per week |
|---|---|---|---|---|---|---|---|
| | | | Lecture | Tutorial | Practical | Total | |
| **Theory** | | | | | | | |
| BP801T | Biostatistics and Research Methodology | Core | 3 | 1 | - | 4 | 4 |
| BP802T | Social and Preventive Pharmacy | Core | 3 | 1 | - | 4 | 4 |
| BP803ET | Pharma Marketing Management | DSE | 3+3=6 | 1+1=2 | - | 4+4=8 | 8 |
| BP804ET | Pharmaceutical Regulatory Science | | | | | | |
| BP805ET | Pharmacovigilance | | | | | | |
| BP806ET | Quality Control and Standardization ofHerbals | | | | | | |
| BP807ET | Computer Aided Drug Design | | | | | | |
| BP808ET | Cell and Molecular Biology | | | | | | |
| BP809ET | Cosmetic Science | | | | | | |
| BP810ET | Experimental Pharmacology | | | | | | |
| BP811ET | Advanced Instrumentation Techniques | | | | | | |
| BP812ET | Dietary Supplements and Nutraceuticals | | | | | | |
| **Lab/ Practical** | | | | | | | |
| BP813PW | Project Work | Project | - | - | 12 | 12 | 12 |
| **Total** | | - | 12 | 4 | 12 | 28 | 28 |

| | |
|---|---|
| Total Lecture per week | 12 |
| Total Tutorial per week | 4 |
| Total Practical/ Lab classes per week | 12 |
| **TOTAL CLASSES PER WEEK [Semester VIII]** | 28 |

## Human Anatomy and Physiology-I
## BP101T

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP101T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Human Anatomy and Physiology-I** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **I** |
| **Pre-Requisites** | **Basic Knowledge of Human Anatomy and Physiology** | | | | |

**Lectures: 45**

**Course Objectives:** The objective of this course is to:

1. This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body.
2. It also helps to know both homeostatic mechanisms.
3. The subject provides the basic knowledge required to know the various disciplines of pharmacy.
4. This course deals with the anatomy and physiology of the human body.
5. To understand the various system of the body.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Students should be able explain the gross morphology, structure and functions of various organs of the human body.

**CO2:** Students should be able to describe the various homeostatic mechanisms and their imbalances.

**CO3:** Students should be able to Identify the various tissues and organs of different systems of human body.

**CO4:** Students should be able to perform the various experiments related to special senses and nervous system.

**CO5:** Students should be able to appreciate coordinated working pattern of different organs of each system.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 |
| **CO3** | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |

# Human Anatomy and Physiology-I (Practical)
# BP107P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP107P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Human Anatomy and Physiology-I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | I |
| Pre-Requisites | Basic Knowledge of Human Anatomy and Physiology-I (Practical) | | | | |

**Lectures: 4Hr/Week**

**Course Objective:** The objective of this course is to:

1. To describe the general blood collection techniques and carrying out various haematological assessments and interpreting the results.
2. To gain knowledge on recording and monitoring the vital physiological parameters in human subjects and the basic interpretations of the results.
3. To be able to describe the microscopic examinations of the various tissues permanently mounted in glass slides.
4. To discuss the anatomical and physiological characteristics of various organ systems of the body using models, charts, and other teaching aids.
5. To discuss the anatomical features of the important human organs and tissues.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Student should be able to perform the haematological tests in human subjects and interpret the results.

**CO2:** Student should be able to record, monitor and document the vital physiological parameters of human subjects and interpret the results.

**CO3:** Student should be able to describe the anatomical features of the important human tissues under the microscopical conditions

**CO4:** Student should be able to discuss the significance of various anatomical and physiological characteristics of the human body.

**CO5.** Student should be able to discuss the anatomical features of the important human organs and tissues.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 3 | 1 | 2 | 3 | 3 | 2 |
| **CO2** | 3 | 1 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO4** | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |
| **CO5** | 3 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 1 | 2 | 2 | 2 | 2 |

# Pharmaceutical Analysis
# BP102T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP102T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Analysis | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | I |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Analysis | | | | |

**Lectures: 45**

**Course Objective:** Objective of this course is to:

1. Understand the basic principles and significance of pharmaceutical analytical chemistry.
2. Explain the theoretical concepts and practical approaches of volumetric analytical techniques.
3. Perform various volumetric titrations including acid-base, redox, precipitation, complexometric, and non-aqueous titrations.
4. Understand the fundamentals of electrochemical methods such as conductometry, potentiometry, and polarography and their pharmaceutical applications.
5. Develop essential analytical skills for accurate analysis, solution preparation, standardization, and interpretation of results in pharmaceutical quality control.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** Demonstrate a clear understanding of the fundamentals of pharmaceutical analysis, including various analytical techniques, solution preparations, and standardizations.

**CO2:** Identify and apply appropriate volumetric titration methods (acid-base, redox, precipitation, complexometric, and non-aqueous) for the estimation of pharmaceutical substances.

**CO3:** Analyze and interpret results with accuracy and precision, minimizing analytical errors and understanding the significance of significant figures.

**CO4:** Evaluate and utilize electrochemical methods such as conductometry, potentiometry, and polarography in pharmaceutical analysis.

**CO5:** Develop critical thinking and analytical skills necessary for quality control, including impurity testing and adherence to pharmacopoeial standards.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 3 |

# Pharmaceutical Analysis (Practical)
# BP108P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP108P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Analysis (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | I |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Analysis (Practical) | | | | |

**Lectures: 4Hr/Week**

**Course Objectives:** The objective of this course is to:

1. To perform qualitative and quantitative pharmaceutical analysis techniques
2. To understand and apply limit tests for detecting impurities in pharmaceutical substances.
3. To learn the preparation and standardization of commonly used volumetric solutions.
4. To conduct various types of titrations used in drug assay methods.
5. To apply electro-analytical methods for determining the normality and concentration of analytes.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Perform limit tests to determine impurities in pharmaceutical substances.

**CO2:** Prepare and standardize various volumetric solutions used in analytical procedures.

**CO3:** Analyze and assay pharmaceutical compounds using different titrimetric methods.

**CO4:** Apply electrochemical techniques like conductometric and potentiometric titrations for pharmaceutical analysis.

**CO5:** Demonstrate practical skills in pharmaceutical quantitative analysis as per pharmacopoeial standards.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 |
| **CO2** | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 1 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 1 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

**Pharmaceutics-I**
**BP103T**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP103T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmaceutics-I** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **I** |
| **Pre-Requisites** | **Basic Knowledge of Pharmaceutics-I** | | | | |

**Lectures: 45**

**Course Objective:** The objective of this course is to:

1. This subject is designed to Know about the career opportunities in pharmacy, Pharmacopoeias and history of profession of Pharmacy in India.
2. Get the fundamental of different types of dosage form, prescription along with their parts and calculation of dose on the basis of age, body weight and body surface area.
3. To understand the Pharmaceutical calculations, its different system along with methods of calculation.
4. Get the Information about powders and liquid dosage forms, excipients used gin formulation of liquid dosage forms and solubility enhancement techniques.
5. Gain knowledge about the principle and preparation procedure related to solutions, suspensions, emulsions and suppositories.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** To remember the history of the pharmacy profession in India as it relates to pharmacy education, careers, industry, and organizations.

**CO2:** To know about the details of the prescription and remember every parts and handling process of the prescription with the correction of errors and include posology for the dose calculation with respects of different factors.

**CO3:** To understand the principles of dosage forms and incompatibilities, use pharmaceutical calculations in the design and assessment phases of various formulations, such as liquid and powder dosage forms.

**CO4:** Understand the concept of each biphasic and monophasic formulation including suspension, emulsion, estimation and formulation incompatibilities.

**CO5:** To know about the concept of solid and semisolid dosage form and analyse their evaluation parameter and incompatibilities.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 2 | 2 | 1 | 2 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

# Pharmaceutics-I (Practical)
# BP109P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP109P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutics-I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | I |
| Pre-Requisites | Basic Knowledge of Pharmaceutics-I (Practical) | | | | |

**Lectures: 4Hr/Week**

**Course Objective:** The objective of this course is to:

1. To understand and perform basic pharmaceutical preparations such as powders, mixtures, ointments, creams, and emulsions, following standard operating procedures.
2. To develop skills in weighing, measuring, compounding, and packaging of pharmaceutical formulations using appropriate tools and techniques.
3. To understand the physical and chemical principles involved in the formulation of different dosage forms like suspensions, emulsions, and topical products.
4. To learn and apply concepts of dosage form design and patient compliance, considering stability, compatibility, and route of administration.
5. To ensure quality control and evaluation of pharmaceutical products, including tests for appearance, viscosity, sedimentation rate, and spreadability.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Understand and apply the principles of formulation and preparation of various conventional dosage forms such as powders, ointments, creams, and emulsions.

**CO2:** Demonstrate the ability to compound and dispense pharmaceutical formulations accurately using proper techniques and equipment.

**CO3:** Apply techniques of weighing, measuring, mixing, and packaging of pharmaceutical products accurately.

**CO4:** Apply knowledge of pharmaceutical excipients and their roles in dosage form design to enhance therapeutic effectiveness and patient compliance.

**CO5:** Interpret experimental data and correlate it with theoretical knowledge for formulation optimization.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

# Pharmaceutical Inorganic Chemistry
# BP104T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP104T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Inorganic Chemistry | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | I |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Inorganic Chemistry | | | | |

**Lectures: 45**

**Course Objective:** The objective of this course is to:

1. To understand the sources and types of impurities in pharmaceutical substances, explore the historical evolution of pharmacopoeias, and learn the principles and procedures of limit tests for detecting common impurities such as chlorides, sulphates, iron, arsenic, lead, and heavy metals.
2. To gain knowledge of the general methods of preparation, assay, properties, and medicinal uses of important inorganic pharmaceutical compounds, including acidifiers, antacids, expectorants, haematinics, astringents, emetics, and antimicrobial agents.
3. To study the concept of acids, bases, and buffers with emphasis on buffer capacity, pharmaceutical buffer systems, isotonic solutions, and methods for adjusting and measuring tonicity, relevant to physiological and formulation requirements.
4. To understand the physiological roles and pharmaceutical applications of major electrolytes used in replacement therapy, such as sodium, potassium, calcium, and oral rehydration salts, and to explore dental care products and their active inorganic components.
5. To learn about radiopharmaceuticals, their properties, handling precautions, and pharmaceutical applications, including understanding radioactivity, types of radiation, half-life, and specific radioisotopes like Sodium Iodide I-131.

**Course Outcomes:** Upon successful completion of the course, students will be able to

**CO1:** Students will understand the sources and types of impurities in inorganic pharmaceuticals and the principles of limit tests for chloride, sulphate, iron, arsenic, lead, and heavy metals as per pharmacopoeial standards.

**CO2:** Students will demonstrate the ability to prepare and assay selected inorganic pharmaceutical compounds, and explain their physicochemical properties and medicinal applications.

**CO3:** Students will be able to explain the role of acids, bases, buffers, and isotonic solutions in pharmaceutical systems, and apply buffer equations and isotonicity adjustment methods in formulations.

**CO4:** Students will gain knowledge of the therapeutic uses and pharmaceutical applications of electrolytes, gastrointestinal agents, dental products, antimicrobials, expectorants, emetics, haematinics, and antidotes.

**CO5:** Students will evaluate the properties and applications of radiopharmaceuticals, understand the nature of radioactive decay, and assess the safe handling and usage of radiolabeled compounds in medical settings.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |

**Pharmaceutical Inorganic Chemistry (Practical)**
**BP110P**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP110P** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmaceutical Inorganic Chemistry (Practical)** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **0** | **0** | **4** | **2** | **I** |
| **Pre-Requisites** | **Basic Knowledge of Pharmaceutical Inorganic Chemistry (Practical)** | | | | |

**Lectures: 4Hr/Week**

**Course Objective:** The objective of this course is to:

1. To understand and perform limit tests for inorganic impurities such as chlorides, sulphates, iron, heavy metals, lead, and arsenic, including modified procedures where applicable, as per pharmacopeial standards.
2. To examine and analyze pharmaceutical substances through specific identification tests for compounds such as magnesium hydroxide, ferrous sulphate, sodium bicarbonate, calcium gluconate, and copper sulphate.
3. To explore and apply tests for the purity of pharmaceutical substances, including the swelling power of bentonite, the neutralizing capacity of aluminium hydroxide gel, and the determination of potassium iodate and iodine in potassium iodide.
4. To develop practical skills in the preparation of commonly used inorganic pharmaceuticals such as boric acid, potash alum, and ferrous sulphate by using pharmacopeial methods.
5. To build analytical thinking and laboratory techniques for assessing the quality and identity of pharmaceutical inorganic compounds in compliance with regulatory requirements and safety standards.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Students will be able to perform pharmacopeial limit tests for detecting inorganic impurities such as chlorides, sulphates, iron, heavy metals, lead, and arsenic, including their modified versions.

**CO2:** Students will demonstrate the ability to identify pharmaceutical inorganic substances through qualitative tests for compounds like magnesium hydroxide, ferrous sulphate, sodium bicarbonate, calcium gluconate, and copper sulphate.

**CO3:** Students will be able to evaluate the purity of pharmaceutical substances by conducting specific tests such as the swelling power of bentonite, neutralizing capacity of aluminium hydroxide gel, and iodate/iodine content in potassium iodide.

**CO4:** Students will gain practical skills in the preparation of selected inorganic pharmaceuticals, including boric acid, potash alum, and ferrous sulphate, using standard pharmacopeial procedures.

**CO5:** Students will be able to analyze and interpret experimental data to assess quality parameters, demonstrating proficiency in laboratory techniques and adherence to pharmaceutical standards.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |

# Communication Skills
## BP105T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP105T | | | | |
| Category | Core Courses | | | | |
| Course Title | Communication Skills | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 2 | 0 | 0 | 2 | I |
| Pre-Requisites | Basic Knowledge of Communication Skills | | | | |

**Lectures: 30**

**Course Objective:** The objective of this course is to:

1. To understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation.
2. To communicate effectively (Verbal and Non Verbal).
3. To effectively manage the team as a team player.
4. To develop interview skills.
5. To develop Leadership qualities and essentials.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** Understand the fundamentals of communication, types of barriers, and factors influencing communication.

**CO2:** Describe various elements and styles of communication, and apply them effectively in real-life interactions.

**CO3:** Develop active listening and effective written communication skills suited for academic and professional settings.

**CO4:** Demonstrate confidence and competence in interviews and presentations by applying appropriate techniques.

**CO5:** Participate effectively in group discussions with proper communication etiquette.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | - | 2 | 2 | - | - | 2 | 2 | 3 | 1 | - | 2 | - | - | 1 |
| **CO2** | 2 | - | 2 | 2 | 1 | 2 | 3 | 2 | 3 | - | - | 2 | - | - | 1 |
| **CO3** | 1 | - | 2 | 2 | 1 | - | 2 | 2 | 3 | - | - | 3 | - | - | - |
| **CO4** | 1 | - | 3 | 2 | - | 2 | 3 | 2 | 3 | - | - | 2 | - | - | - |
| **CO5** | - | - | 2 | 2 | - | 3 | 3 | 2 | 3 | 1 | - | 2 | - | - | - |

## Communication Skills (Practical)
## BP111P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP111P | | | | |
| Category | Core Courses | | | | |
| Course Title | Communication Skills | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 2 | 1 | I |
| Pre-Requisites | Basic Knowledge of Communication Skills (Practical) | | | | |

**Lectures: 2Hr/Week**

**Course Objectives:** The objective of this course is to:

1. To enhance students' ability to communicate effectively in social and professional settings.
2. To improve pronunciation through practice with consonant and vowel sounds.
3. To develop active listening and comprehension skills.
4. To train students in professional writing and email etiquette.
5. To build confidence in handling interviews and delivering presentations.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Demonstrate basic communication skills such as meeting, greeting, and making conversation.

**CO2:** Apply correct pronunciation techniques in spoken English.

**CO3:** Use listening comprehension to respond appropriately in conversations.

**CO4:** Exhibit professional writing skills including formal emails.

**CO5:** Perform effectively in interviews and oral presentations.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | 2 | 2 | - | 2 | 2 | 2 | 3 | - | - | 2 | - | - | - |
| CO2 | 1 | - | 1 | 2 | - | - | - | - | 3 | - | - | 2 | - | - | - |
| CO3 | 1 | - | 1 | 2 | - | - | - | - | 3 | - | - | 2 | - | - | - |
| CO4 | 2 | - | 2 | 2 | - | - | 2 | 2 | 3 | - | - | 2 | - | - | 2 |
| CO5 | 2 | - | 3 | 2 | - | 2 | 3 | 2 | 3 | - | - | 2 | - | - | - |

# Remedial Biology

## BP106RBT

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP106RBT | | | | |
| Category | Core Courses | | | | |
| Course Title | Remedial Biology | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 2 | 0 | 0 | 2 | I |
| Pre-Requisites | Basic Knowledge of Remedial Biology | | | | |

**Lectures: 30**

**Course Objective:** To enable the students to:

1. Introduce basic concepts of cell biology, plant biology, and human anatomy and physiology essential for pharmaceutical sciences.
2. Familiarize students with the structure and function of cells, tissues, and organ systems in both plants and animals.
3. Explain the morphology and modifications of various plant organs such as roots, stems, leaves, and flowers.
4. Provide a fundamental understanding of key physiological systems in humans including circulatory, respiratory, digestive, nervous, and reproductive systems.
5. Lay a strong conceptual foundation to support further learning in Pharmacognosy, human anatomy and physiology, and related biosciences within the pharmacy curriculum.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** Describe different types of plant tissues and their roles in plant physiology.

**CO2:** Classify and describe the morphology and modifications of plant roots, stems, leaves, and flowers.

**CO3:** Explain the anatomy and function of major human organ systems including circulatory, digestive, respiratory, nervous, and reproductive systems.

**CO4:** Illustrate the process of plant and animal reproduction and growth.

**CO5:** Correlate basic biological concepts with applications in pharmacy, especially in pharmacognosy and human physiology.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | - | - | - | - | 1 | - | 1 | 2 | 3 | 2 | - |
| **CO2** | 3 | 2 | - | 2 | - | - | - | - | - | - | 2 | 2 | 3 | 2 | - |
| **CO3** | 3 | 1 | - | 2 | - | - | - | - | - | - | 2 | 1 | 2 | 1 | - |
| **CO4** | 3 | 2 | - | 3 | - | - | 1 | - | 1 | 2 | 1 | 2 | 2 | 2 | 1 |
| **CO5** | 2 | 1 | - | 2 | - | - | - | - | - | - | - | 2 | 1 | 1 | - |

**Remedial Biology (Practical)**
**BP112RBP**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP112RBP** | | | | |
| **Category** | **Core Courses** | | | | |
| **Course Title** | **Remedial Biology (Practical)** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **0** | **0** | **2** | **1** | **I** |
| **Pre-Requisites** | **Basic Knowledge of Remedial Biology (Practical)** | | | | |

**Lectures: 2Hr/Week**

**Course Objective:** The objective of this course is to:

1. Introduce students to the fundamental concepts of plant and animal biology relevant to pharmaceutical sciences.
2. Familiarize students with the structure, functions, and classification of plant and animal cells.
3. Provide an understanding of plant tissues, morphology, and anatomy of commonly used medicinal plants.
4. Develop knowledge about human anatomy and physiology, including key systems such as circulatory, respiratory, digestive, nervous, and reproductive systems.
5. Enable students to relate biological structures and functions to their application in pharmacy and medicine.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Explain the structure and functions of prokaryotic and eukaryotic cells.

**CO2:** Describe different types of plant tissues and their roles in plant physiology.

**CO3:** Classify and describe the morphology and modifications of plant roots, stems, leaves, and flowers.

**CO4:** Explain the anatomy and function of major human organ systems including circulatory, digestive, respiratory, nervous, and reproductive systems.

**CO5:** Illustrate the process of plant and animal reproduction and growth.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | - | - | - | - | 1 | - | 1 | 2 | 3 | 2 | - |
| **CO2** | 3 | 2 | - | 2 | - | - | - | - | - | - | 2 | 2 | 3 | 2 | - |
| **CO3** | 3 | 1 | - | 2 | - | - | - | - | - | - | 2 | 1 | 2 | 1 | - |
| **CO4** | 3 | 2 | - | 3 | - | - | 1 | - | 1 | 2 | 1 | 2 | 2 | 2 | 1 |
| **CO5** | 2 | 1 | - | 2 | - | - | - | - | - | - | - | 2 | 1 | 1 | - |

# Remedial Mathematics

## BP106RMT

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP106RMT | | | | |
| Category | Core Courses | | | | |
| Course Title | Remedial Mathematics | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 2 | 0 | 0 | 2 | I |
| Pre-Requisites | Basic Knowledge of Remedial Mathematics | | | | |

**Lectures: 30**

**Course Objective:** The objective of this course is to:

1. To understand and apply the concepts of partial fractions, logarithms, and functions in pharmaceutical calculations.
2. To gain proficiency in matrix operations and determinants with applications in solving pharmacokinetic equations.
3. To learn the principles of differential calculus and its applications in analyzing rates of change and optimization problems.
4. To understand the basics of analytical geometry and integral calculus and apply them in pharmaceutical computations.
5. To explore differential equations and Laplace transforms for modeling and solving problems in pharmacokinetics and chemical kinetics.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Solve problems involving partial fractions, logarithms, and evaluate limits and continuity of functions.

**CO2:** Perform operations on matrices and determinants to solve systems of equations relevant to pharmacokinetics.

**CO3:** Apply differentiation techniques for solving mathematical and pharmaceutical problems involving rates and optimization.

**CO4:** Use integration and basic coordinate geometry to solve mathematical problems in pharmaceutical contexts

**CO5:** Solve differential equations and apply Laplace transforms to analyze chemical and pharmacokinetic systems.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 2 | - | 1 | - | 1 | 1 | 1 | 2 | 2 | 2 | 1 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 3 | 1 |
| **CO3** | 3 | 3 | 2 | 3 | 2 | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO4** | 3 | 2 | 1 | 2 | 2 | - | 1 | - | 1 | 1 | 1 | 2 | 2 | 2 | 1 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | - | 1 | - | 1 | 1 | 1 | 2 | 3 | 3 | 1 |
| **CO6** | 3 | 2 | 1 | 3 | 2 | - | 1 | - | 1 | 1 | 1 | 2 | 2 | 2 | 1 |

# Human Anatomy & Physiology-II

## BP-201T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-201T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Human Anatomy & Physiology-II | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | II |
| Pre-Requisites | Basic Knowledge of Human Organs and systems | | | | |

**Lectures: 45**

**Course Objectives:** To enable the students:

1. To explain the gross morphology, structure and functions of various organs of the human body. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body
2. To describe the various homeostatic mechanisms and their imbalances.
3. To identify the various tissues and organs of different systems of human body.
4. To 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.

5. To appreciate coordinated working pattern of different organs of each system

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Explain the structure and function of the nervous system including nerve impulses, neurotransmitters, and brain-spinal cord anatomy.

**CO2:** Describe the anatomy and physiology of the digestive system, energetics (ATP production), and GI-related disorders.

**CO3:** Illustrate the structure and physiology of the respiratory and urinary systems, including gas transport, urine formation, and kidney function.

**CO4:** Explain the endocrine system, hormone functions, glandular anatomy, and related disorders.

**CO5:** Understand the reproductive system, sex hormones, fertilization, and basic principles of genetics including DNA, gene expression, and inheritance patterns.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 3 | 2 | 2 | 2 |
| **CO2** | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 2 |
| **CO3** | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 2 |
| **CO4** | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| **CO5** | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |

# Human Anatomy & Physiology-II Practical
# BP-207P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-207P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Human Anatomy & Physiology-II Practical | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | II |
| Pre-Requisites | Basic Knowledge of Human Organs and systems | | | | |

**Practical Hours: 4Hrs/ Week**

**Course Objectives:** To enable the students:

1. To develop practical understanding of anatomical structures and physiological functions through the use of specimens, models, charts, and demonstrations.
2. To reinforce theoretical knowledge by correlating it with live demonstrations, experimental setups, and human-based practicals.
3. To enhance skills in clinical examination techniques, including reflex testing, sensory testing, and basic physiological measurements.
4. To introduce students to normal physiological parameters like body temperature, respiratory volumes, and BMI using appropriate tools and techniques.
5. To create awareness about reproductive health, family planning methods, and diagnostic tools related to human physiology.

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Identify and explain major human anatomical structures and special senses using models, specimens, and charts.

**CO2:** Demonstrate and interpret basic neurological and sensory functions such as reflexes, visual acuity, taste, and smell.

**CO3:** Record and analyze physiological data, including body temperature, tidal volume, vital capacity, and BMI.

**CO4:** Perform practical evaluations of the endocrine, cardiovascular, respiratory, digestive, and urinary systems using models and physiological tests.

**CO5:** Explain and evaluate reproductive physiology, perform pregnancy tests, and understand the working of family planning devices and diagnostic tools like a cell analyzer.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | - | 2 | - | - | 2 | - | 2 | - | 1 | 2 | 3 | 1 | 1 |
| **CO2** | 3 | 1 | - | 3 | 1 | - | 2 | - | 2 | - | 1 | 1 | 3 | 2 | 1 |
| **CO3** | 3 | 1 | 2 | 2 | 2 | - | 1 | - | 2 | - | 1 | 2 | 3 | 3 | 1 |
| **CO4** | 3 | 2 | 1 | 3 | 2 | - | 2 | - | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO5** | 2 | 1 | - | 2 | 1 | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |

# Pharmaceutical Organic Chemistry-I

## BP-202T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-202T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Organic Chemistry-I | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | II |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Organic Chemistry-I | | | | |

**Lecture: 45**

**Course Objectives:** The objective of this course is to:

1. Understand the IUPAC and Common Naming System of Organic Compound.
2. Write the structure, name and the type of isomerism of the organic.
3. Write the reaction, name the reaction and orientation of reactions.
4. Account for reactivity/stability of compounds.
5. Identify/confirm the identification of organic compound.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Classify organic compounds and apply IUPAC and common nomenclature system, Classify and Explain structural isomerism.

**CO2:** Explain hybridization in alkenes, alkenes and stabilities of alkenes, conjugated dienes.

**CO3:** Explain the mechanism, orientation of elimination, Electrophilic, free radical and Nucleophilic addition reaction.

**CO4:** Discuss the mechanism, kinetics, stereochemistry and factors affecting SN1 & SN2 reaction.

**CO5:** Understand the structure, uses, substituent effects, and chemical properties of carboxylic acids and aliphatic amines.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 1 | 3 | 1 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 2 | 1 | 3 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO3** | 3 | 2 | 1 | 3 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO4** | 3 | 2 | 1 | 3 | 2 | - | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 1 |
| **CO5** | 3 | 2 | 1 | 2 | 1 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 2 |

## Pharmaceutical Organic Chemistry-I (Practical)

## BP-208P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-208P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Organic Chemistry-I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | II |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Organic Chemistry-I (Practical) | | | | |

**Practical Hours: 4Hrs/ Week**

**Course Objectives:** The objective of this course is to:

1. Classify and identify organic compounds through solubility-based grouping and preliminary physical examination.
2. Detect the presence of elements (nitrogen, sulphur, halogens) in organic compounds using qualitative analysis.
3. Determine physical constants such as melting and boiling points to assess purity and identity of organic substances.
4. Identify functional groups such as carboxylic acids, phenols, aldehydes, ketones, alcohols, amines, and carbohydrates through systematic chemical tests.
5. Construction of molecular models of organic compounds using stereomodels.

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Conduct preliminary physical examination and classify organic compounds based on solubility characteristics.

**CO2:** Detect the presence of elements like nitrogen, sulfur, and halogens (Cl, Br, I) in organic compounds using systematic qualitative analysis.

**CO3:** Determine melting and boiling points of organic compounds to assess their identity and purity.

**CO4:** Identify functional groups such as –COOH, –OH (phenolic), –CHO, –CO–, and carbohydrates using specific chemical tests.

**CO5:** Apply safe laboratory practices, accurately handle organic reagents, and maintain proper documentation during experiments.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO3** | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO4** | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO5** | 3 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 3 |

**Biochemistry**
**BP203T**

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP203T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Biochemistry | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | II |
| Pre-Requisites | Basic Knowledge of Biochemistry | | | | |

**Lecture: 45**

**Course Objectives:**

1. Understand the catalytic role of enzymes and the significance of enzyme inhibitors in the development of drugs, as well as their therapeutic and diagnostic applications.
2. Comprehend the metabolism of carbohydrate, lipid, and protein molecules in normal and disease states.
3. Interpret the genetic organization and replication mechanisms of the mammalian genome.
4. Analyze the biochemical basis of metabolic disorders and inherited conditions.
5. Explore the biochemical principles behind bioenergetics, biological oxidation, and molecular biology processes.

**Course Outcomes (COs):**

**CO1:** Explain the biochemical structure and function of biomolecules and their significance in cellular metabolism.

**CO2:** Analyze metabolic pathways of carbohydrates, lipids, and proteins, and their regulatory mechanisms.

**CO3:** Understand the mechanism of enzyme action and interpret the clinical relevance of enzyme inhibitors.

**CO4:** Evaluate genetic processes such as replication, transcription, and translation, and their biochemical regulation.

**CO5:** Correlate biochemical changes with disease states and apply biochemical knowledge to clinical diagnostics.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | - | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 1 |
| **CO2** | 3 | 3 | 2 | 3 | 2 | - | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 2 | - | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 2 | - | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 2 | - | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 |

**Biochemistry (Practical)**
**BP209P**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP209P** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Biochemistry (Practical)** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **0** | **0** | **4** | **2** | **II** |
| **Pre-Requisites** | **Basic Knowledge of Biochemistry (Practical)** | | | | |

**Total Hours**: **4Hr/Week**

**Course Objectives:**

1. To perform qualitative and quantitative biochemical experiments for carbohydrates and proteins.
2. To analyze pathological and diagnostic parameters like blood glucose, cholesterol, and creatinine.
3. To understand the effect of environmental factors on enzyme activity.
4. To demonstrate enzymatic reactions and physiological biochemistry through practical methods.
5. To develop experimental skills for buffer preparation, pH measurement, and enzyme kinetics.

**Course Outcomes:**

CO1: Identify carbohydrates and proteins through qualitative and quantitative experiments.

CO2: Analyze and interpret biochemical parameters like blood sugar, creatinine, and cholesterol.

CO3: Understand and apply principles of buffer preparation and pH measurement.

CO4: Perform and interpret enzyme activity experiments under various conditions.

CO5: Demonstrate competence in clinical biochemistry analysis for diagnostic applications.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | 0 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 1 |
| **CO2** | 3 | 3 | 2 | 3 | 2 | 0 | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 2 | 0 | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 2 | 0 | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 2 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 |

# Pathophysiology
# BP204T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP204T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pathophysiology | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | II |
| Pre-Requisites | Basic Knowledge of Pathophysiology | | | | |

**Lecture: 45**

**Course Objectives:** The objective of this course is to

1. To understand the basic principles of cell injury, adaptation, and homeostasis including cellular mechanisms involved in injury and repair.
2. To eexplain the pathophysiological mechanisms underlying inflammation, wound healing, and related vascular changes.
3. To describe the pathogenesis, clinical features, and complications of common cardiovascular, respiratory, and renal diseases.
4. To analyze hematological, endocrine, nervous system, and gastrointestinal disorders with respect to their causes and pathophysiology.
5. To understand the pathophysiology of inflammatory bowel diseases, liver diseases, bone and joint disorders, and principles of cancer development.

**Course Outcomes (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Apply foundational medical knowledge to understand disease mechanisms and clinical presentations.

**CO2:** Develop analytical and critical thinking skills to interpret pathological changes and laboratory findings

**CO3:** Integrate pathological knowledge with clinical scenarios to improve diagnosis and patient care.

**CO4:** Understand public health implications of diseases and contribute to preventive strategies.

**CO5:** Demonstrate competence in identifying and managing chronic and acute diseases.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 1 | 2 | - | - | - | 1 | - | - | - | 2 | 2 | - | 1 |
| **CO2** | 3 | - | - | 3 | 1 | - | - | 1 | 1 | - | - | 1 | 1 | 1 | - |
| **CO3** | 3 | - | 1 | 2 | 1 | - | - | - | 1 | 2 | - | 1 | 2 | 1 | 1 |
| **CO4** | 3 | - | 2 | 2 | - | - | 1 | 1 | - | 1 | - | 1 | 1 | 1 | 2 |
| **CO5** | 3 | - | 2 | 2 | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |

**Computer Application in Pharmacy**
**BP205T**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP205T** | | | | |
| **Category** | **Core Courses** | | | | |
| **Course Title** | **Computer Application in Pharmacy** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **0** | **0** | **3** | **II** |
| **Pre-Requisites** | **Basic Knowledge of Computer Application in Pharmacy** | | | | |

**Lecture: 30**

**Course Objectives:** The objective of this course is to:

1. To introduce basic concepts of number systems and computer arithmetic operations.
2. To explain the fundamentals of information systems, software development processes, and project planning.
3. To provide foundational knowledge of web technologies and database management systems.
4. To illustrate the application of computers in pharmacy operations such as drug design, hospital, and clinical systems.
5. To introduce bioinformatics and data analysis tools used in pharmaceutical research and development.

**Course Outcomes (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Demonstrate understanding of number systems, conversions, and binary arithmetic operations

**CO2:** Explain the components and life cycle of information systems and software development in healthcare

**CO3:** Utilize web technologies and databases for managing pharmacy-related information.

**CO4:** Apply computer technologies in pharmacy practice, including drug information retrieval and EP systems.

**CO5:** Describe the role of bioinformatics and data analysis tools in vaccine development and pharmaceutical research.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 3 | - | - | - | 1 | 1 | 1 | 2 | 2 | 2 | 1 |
| **CO2** | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 2 |
| **CO3** | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 |

# Computer Application in Pharmacy (Practical)
# BP210P

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP210P** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Computer Application in Pharmacy (Practical)** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **0** | **0** | **4** | **2** | **II** |
| **Pre-Requisites** | **Basic Knowledge of Computer Application in Pharmacy (Practical)** | | | | |

**Lecture: 2Hr/Week**

**Course Objectives:** The objective of this course is to:

1. To train students in using word processing tools for documentation and data collection related to healthcare.
2. To develop basic skills in web designing for presenting pharmaceutical or personal data using HTML.
3. To enable students to retrieve drug-related information and adverse effects using online resources.
4. To provide hands-on experience in creating, managing, and manipulating databases using MS Access.
5. To enhance the ability to generate reports, export data, and manage information systems in pharmaceutical contexts.

**Course Outcomes (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Design questionnaires and documents using MS Word for healthcare and pharmaceutical applications

**CO2:** Create and design basic HTML web pages to represent and communicate information

**CO3:** Use online tools to search, retrieve, and interpret drug information and its associated effects.

**CO4:** Construct and manage pharmaceutical databases using MS Access, including forms, queries, and reports.

**CO5:** Export and present pharmacy-related data using various formats including web pages and XML.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | 2 | 3 | - | - | - | 3 | - | - | 2 | - | 3 | 2 |
| **CO2** | 3 | - | - | - | 3 | - | - | - | 2 | - | - | 2 | 2 | 3 | 1 |
| **CO3** | 3 | - | - | 3 | 3 | - | - | - | 1 | 2 | - | 2 | 1 | 3 | 2 |
| **CO4** | 3 | - | 2 | 3 | 3 | - | - | - | 2 | - | - | 2 | 2 | 3 | 2 |
| **CO5** | 3 | - | - | 1 | 3 | - | - | - | 2 | - | - | 2 | 2 | 2 | 2 |

**Environmental Science**
**BP206T**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP206T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Environmental Science** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **0** | **0** | **3** | **II** |
| **Pre-Requisites** | **Basic Knowledge of Environmental Science** | | | | |

**Lecture: 30**

**Course Objectives:** The objective of this course is to:

1. To create the awareness about environmental problems among learners.
2. To impart basic knowledge about the environment and its allied problems.
3. To develop an attitude of concern for the environment.
4. To motivate learner to participate in environment protection and environment improvement.
5. To acquire skills to help the concerned individuals in identifying and solving environmental problems.

**Course Outcomes (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Understand the multidisciplinary nature of environmental studies and the significance of natural resources**.**

**CO2:** Identify and analyse various renewable and non-renewable resources, their problems, and the role of individuals in resource conservation.

**CO3:** Explain the structure, functions, and types of ecosystems including forest, grassland, desert, and aquatic systems.

**CO4:** Describe major environmental issues such as air, water, and soil pollution and their effects on ecosystems and human health.

**CO5:** Apply environmental knowledge to support sustainable practices and promote awareness for environmental protection and conservation.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | - | - | 1 |
| **CO2** | 3 | - | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | - | 1 | 2 |
| **CO3** | 2 | - | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | - | 1 | 2 |
| **CO4** | 3 | - | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 1 | 1 | 2 |
| **CO5** | 2 | - | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 1 | 1 | 2 |

# Pharmaceutical Organic Chemistry-II
# BP301T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP301T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Organic Chemistry-II | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | III |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Organic Chemistry-II | | | | |

**Lecture: 45**

**Course Objectives:** The objective of this course is to:

1. To write the structure, name and the type of isomerism of the organic compound.
2. To write the reaction, name the reaction and orientation of reactions.
3. Apply Analytical Techniques to Fats and Oils
4. Account for reactivity/stability of compounds.
5. To prepare organic compounds and its derivative.

**Course Outcomes (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Analyze the structure, nomenclature, isomerism, and reactivity of organic compounds, including benzene and its derivatives**.**

**CO2:** Understand the synthesis, reactions, and applications of phenols, aromatic amines, and aromatic acids.

**CO3:** Evaluate the properties and quality of fats and oils, including their analytical constants.

**CO4:** Study the synthesis, reactions, and medicinal uses of polynuclear hydrocarbons.

**CO5:** Assess the stability and reactivity of cycloalkanes using various theoretical models.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO3** | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 3 | 2 | 1 |
| **CO5** | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 2 |

**Pharmaceutical Organic Chemistry-II (Practical)**
**BP305P**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP305P** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmaceutical Organic Chemistry-II (Practical)** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **0** | **0** | **4** | **2** | **III** |
| **Pre-Requisites** | **Basic Knowledge of Pharmaceutical Organic Chemistry-II (Practical)** | | | | |

**Lecture: 4Hr/Week**

**Course Objectives:** The objective of this course is to:

1. Develop proficiency in fundamental organic chemistry laboratory techniques, including recrystallization and steam distillation, to purify organic compounds effectively
2. Determine key quality parameters of oils such as acid value, saponification value, and iodine value, including the standardization of reagents, to assess their suitability for pharmaceutical applications.
3. Apply reaction mechanisms to synthesize medicinally significant organic compounds through various reactions, including acylation, halogenation, nitration, oxidation, hydrolysis, diazotization, and coupling reactions.
4. Analyze and interpret the reaction mechanisms involved in the synthesis of organic compounds, focusing on the effects of substituents on the stability and reactivity of aromatic rings.
5. Utilize scientific inquiry and critical thinking to solve practical problems encountered during laboratory experiments, fostering analytical and evaluative skills.

**Course Outcomes (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Demonstrate proficiency in laboratory techniques such as recrystallization and steam distillation to purify organic compounds**.**

**CO2:** Identify and analyze the physical properties of organic compounds including melting point and boiling point determination

**CO3:** Evaluate the quality of fats and oils by determining various parameters like acid value, saponification value, and iodine value.

**CO4:** Synthesize medicinally important organic compounds through various reactions.

**CO5:** Analyze the reaction mechanisms involved in the synthesis of organic compounds, understanding the effect of substituents on the stability and reactivity of aromatic rings.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 1 | 1 | 3 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

## Physical Pharmaceutics-I (Theory)

## BP-302T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-302T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Physical Pharmaceutics-I | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | III |
| Pre-Requisites | Basic Knowledge of Physical Pharmaceutics-I | | | | |

**Lectures: 45**

**Course Objectives:** To enable the students:

1. To understand the types, properties, and pharmaceutical applications of colloidal systems, with emphasis on their stability and formulation.
2. To understand how physicochemical properties such as solubility, pKa, and lipophilicity influence drug action and delivery.
3. To evaluate the use of surface-active agents in the design of emulsions, foams, and colloidal drug delivery systems.
4. To understand protein-drug binding interactions and their effect on pharmacokinetics and pharmacodynamics.
5. To explain the fundamental concepts of buffer systems, including buffer action and buffer capacity

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will be able to understand and apply the physical principles of different states of matter and their relevance in pharmaceutical formulation and drug stability.

**CO2:** Students will be able to explain how the physicochemical and physiological properties of drugs influence their absorption, distribution, metabolism, and therapeutic effectiveness.

**CO3:** Students will be able to analyze the role of surface and interfacial phenomena in the design and stability of pharmaceutical formulations such as emulsions and suspensions**.**

**CO4:** Students will be able to evaluate the significance of complexation and protein binding on drug solubility, bioavailability, and pharmacokinetics.

**CO5:** Students will be able to design and apply appropriate buffer systems to maintain pH stability in pharmaceutical formulations for enhanced drug efficacy and safetyText Books

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 1 | 2 | 2 | - | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 3 | 1 | 3 | 2 | - | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 1 | 3 | 2 | - | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 1 |
| **CO4** | 3 | 3 | 1 | 3 | 2 | - | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 1 | 3 | 2 | - | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 1 |

# Physical Pharmaceutics-I (Practical)
# BP-306P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-306P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Physical Pharmaceutics-I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | III |
| Pre-Requisites | Basic Knowledge of Physical Pharmaceutics-I (Practical) | | | | |

**Lectures: 4Hrs/week**

**Course Objectives:** To enable the students:

1. To understand and apply the basic principles of physical pharmacy in the development and evaluation of pharmaceutical dosage forms.
2. To perform and interpret experiments related to solubility, partition coefficient, surface tension, viscosity, and other physicochemical properties of drugs and excipients.
3. To determine and analyse physicochemical constants such as pKa, interfacial phenomena, and rheological behaviour of pharmaceutical substances.
4. To gain hands-on experience in techniques such as surface tension measurement, viscosity determination, and phase rule studies.
5. To enhance laboratory skills and scientific reasoning through accurate observations, data interpretation, and report writing.

**Course Outcome (COs)**

**CO1:** Describe and explain fundamental physicochemical principles involved in drug formulation and delivery systems.

**CO2:** Analyse the role of solubility, pKa, and partition coefficient in drug absorption and bioavailability.

**CO3:** Determine and interpret surface and interfacial properties relevant to pharmaceutical systems.

**CO4:** Apply principles of rheology to evaluate the flow behaviour of pharmaceutical liquids and semi-solids.

**CO5:** Relate physical pharmacy concepts to practical pharmaceutical product development and quality control.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | – | – | – | – | – | – | – | – | – | 2 | 3 | – | – |
| **CO2** | 3 | 3 | – | 2 | – | – | – | – | – | – | – | 2 | 3 | 2 | – |
| **CO3** | 3 | 3 | – | 2 | 2 | – | – | – | – | – | – | 2 | 3 | 2 | – |
| **CO4** | 3 | 3 | 2 | 3 | 3 | – | – | – | – | – | 2 | 3 | 3 | 3 | – |
| **CO5** | 3 | 2 | 2 | 3 | 3 | – | – | – | 3 | – | – | 3 | 2 | 3 | – |

# Pharmaceutical Microbiology

## BP-303T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-303T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Microbiology | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | III |
| Pre-Requisites | Basic Knowledge of Microbes | | | | |

**Lectures: 45**

**Course Objectives:** To enable the students:

1. To understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry
3. To learn sterility testing of pharmaceutical products.
4. To carried out microbiological standardization of Pharmaceuticals.
5. To understand the cell culture technology and its applications in pharmaceutical industries.

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Explain the history, scope, and classification of microorganisms including detailed structure and growth parameters of bacteria and demonstrate and interpret microbial growth patterns, apply techniques for cultivation and preservation of pure cultures, and perform microscopic analysis using various advanced methods.

**CO2:** Identify bacteria using staining techniques and biochemical tests; evaluate different sterilization techniques and sterility indicators used in pharmaceutical settings.

**CO3:** Describe the morphology and replication of fungi and viruses, apply disinfectants appropriately, and conduct sterility testing as per pharmacopoeial standards.

**CO4:** Design and maintain aseptic areas, apply knowledge of microbiological assays for standardization and evaluation of antibiotics, vitamins, and amino acids.

**CO5:** Assess microbial spoilage and contamination in pharmaceutical products; evaluate antimicrobial preservation and explore the applications of cell culture techniques in Pharma research.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 1 | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |

## Pharmaceutical Microbiology (Practical)
## BP-307P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-307P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Microbiology | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | III |
| Pre-Requisites | Basic Knowledge of Microbes | | | | |

**Practical Hours: 4Hrs/week**

**Course Objective:** To enable the students:

1. To familiarize students with common microbiological equipment and their applications in pharmaceutical microbiology.
2. To train students in proper sterilization techniques and preparation of culture media.
3. To develop skills in culturing, isolating, and maintaining bacterial and fungal microorganisms.
4. To introduce essential staining methods and microscopy for microbial identification.
5. To equip students with practical knowledge of microbiological quality control tests including antibiotic assay and sterility testing.

**Course Outcome:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will be able to efficiently operate microbiological instruments such as autoclaves, incubators, and laminar flow cabinets.

**CO2:** Students will demonstrate competence in media preparation, sterilization, and aseptic techniques.

**CO3:** Students will successfully isolate pure cultures and perform sub-culturing of microorganisms.

**CO4:** Students will perform staining procedures and interpret microscopic findings of microbes.

**CO5:** Students will conduct microbiological assays, sterility tests, and water analysis relevant to pharmaceutical applications.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 1 | 3 | - | - | - | 2 | - | - | 1 | 3 | 2 | - |
| **CO2** | 3 | 3 | - | 2 | 2 | - | - | 1 | 1 | - | - | 1 | 3 | 2 | 1 |
| **CO3** | 2 | 2 | 1 | 3 | 2 | - | - | 1 | - | - | - | 2 | 3 | 3 | 1 |
| **CO4** | 2 | 1 | - | 3 | 2 | - | - | - | 1 | - | - | 2 | 2 | 2 | 1 |
| **CO5** | 3 | 2 | - | 3 | 2 | - | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |

**Pharmaceutical Engineering**

**BP-304T**

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-304T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Engineering | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | III |
| Pre-Requisites | Basic Knowledge of Pharmaceutical tools and techniques | | | | |

**Lecture: 45**

**Course Objective:**

1. To understand principles of fluid flow, manometers, Reynolds number, Bernoulli's theorem, and fluid flow measuring instruments.
2. To explain objectives, laws, mechanisms of size reduction & size separation, and analyze related equipment with pros and cons.
3. To describe heat transfer mechanisms, evaporators, and distillation methods applied in pharmaceutical processing.
4. To explain drying and mixing processes including types of dryers, mixers, and their applications in pharmaceuticals.
5. To understand filtration and centrifugation processes, types of equipment, and factors affecting their efficiency.

**Course Outcome (COs)**

After completing this course, the student will be able to:

CO1: Pharmacy Knowledge: Apply knowledge of basic sciences and pharmaceutical engineering principles.

CO2: Problem Analysis: Identify and analyze problems related to pharmaceutical manufacturing processes and equipment.

CO3: Modern Tool Usage: Use appropriate tools and techniques in pharmaceutical processing and equipment analysis.

CO4: Professional Ethics: Understand and apply ethical principles in pharmaceutical manufacturing and plant operations.

CO5: Environment and Sustainability: Recognize the impact of pharmaceutical processes on environment and sustainability.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | - | - | 1 | - | - | 1 | - | - | 3 | 1 | - |
| **CO2** | 1 | 3 | 2 | 3 | - | - | - | - | 1 | 2 | - | - | 1 | 3 | - |
| **CO3** | - | 1 | 3 | 2 | - | - | - | - | 2 | 1 | - | 2 | - | 3 | - |
| **CO4** | - | - | - | 1 | - | 2 | 2 | 3 | 1 | 2 | - | - | - | - | 1 |
| **CO5** | - | - | - | - | 3 | - | - | 2 | - | 2 | 3 | - | - | - | - |

## Pharmaceutical Engineering (Practical)

## BP-308P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-308P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Engineering (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | III |
| Pre-Requisites | Basic Knowledge of Pharmaceutical tools and techniques | | | | |

**Lectures: 4Hr/Week**

**Course Objective:**

1. To understand and determine thermal properties and heat transfer mechanisms.
2. To apply principles of distillation, drying, and moisture content analysis in formulations
3. To analyze pharmaceutical processes involving humidity, filtration, and crystallization.
4. To understand operation, construction, and application of pharmaceutical equipment.
5. To perform and analyze size reduction, blending, and granulation processes effectively.

**Course Outcome (COs)**

CO1-Understand and determine thermal and heat transfer properties relevant to pharmaceutical processes.

CO2- Apply principles of distillation, drying, and moisture content determination in drug formulation.

CO3- Analyze processes involving air humidity, filtration, evaporation, and crystallization.

CO4- Describe the construction, working, and pharmaceutical applications of industrial equipment.

CO5- Perform and evaluate size reduction, blending, and sieving operations using pharmaceutical tools.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 3 | 2 | - | - | - | 1 | 1 | 2 | 1 | 3 | 2 | - |
| **CO2** | 3 | 3 | 1 | 2 | 2 | - | - | - | - | 1 | 1 | 2 | 3 | 3 | 1 |
| **CO3** | 3 | 2 | - | 3 | 2 | - | - | - | 1 | 1 | 2 | 2 | 3 | 2 | 1 |
| **CO4** | 2 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 2 | 1 | - | - | 2 | 1 | 1 | 2 | 3 | 3 | 2 |

# Pharmaceutical Organic Chemistry-III
# BP-401T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-401T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Organic Chemistry-III | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | IV |
| Pre-Requisites | Basic Knowledge of Pharmaceutical Organic Chemistry-III | | | | |

**Lecture: 45**

**Course Objective:** The objective of this course is to:

1. Understand the methods of preparation and properties of organic compounds.
2. Investigate the reactivity and stability of chiral molecules, including the resolution of racemic mixtures and the mechanisms of asymmetric synthesis.
3. Examine the nomenclature, configuration determination methods, and conformational analysis of geometrical isomers.
4. Learn the synthesis, reactions, and medicinal applications of various heterocyclic compounds.
5. Understand and apply important synthetic reactions.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** Understand the methods of preparation and properties of organic compounds.

**CO2:** Explain the stereochemical aspects of organic compounds and stereochemical reactions.

**CO3:** Know the medicinal uses and other applications of organic compounds.

**CO4:** Understand the important named reactions.

**CO5:** Understand the aromaticity and reactivity of heterocyclic compounds.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 1 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 2 | 1 | 3 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO3** | 3 | 2 | 1 | 2 | 1 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO4** | 3 | 2 | 1 | 3 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO5** | 3 | 2 | 1 | 3 | 1 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |

# Medicinal Chemistry– I

## BP402T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP402T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Medicinal Chemistry– I | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | IV |
| Pre-Requisites | Basic Knowledge of Medicinal Chemistry– I | | | | |

**Lectures: 45**

**Course Objective:**

1. To understand the chemistry of drugs in relation to their pharmacological activity, including physicochemical properties like ionization, solubility, partition coefficient, hydrogen bonding, and stereochemistry.
2. To understand drug metabolic pathways (Phase I & II), factors affecting metabolism, and their impact on adverse effects and therapeutic value of drugs.
3. To explain the Structure-Activity Relationship (SAR) of various drug classes acting on the autonomic and central nervous systems, including sympathomimetics, parasympathomimetics, sedatives, hypnotics, anticonvulsants, and analgesics
4. To write and outline the chemical synthesis of selected important drugs from different therapeutic categories covered in the syllabus.
5. To apply medicinal chemistry knowledge in evaluating the bioisosteric replacements, protein binding, chelation, and other chemical modifications in the development of safer and more effective drugs.

**Course Outcome:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will understand the fundamental concepts of medicinal chemistry, including its historical development and the relationship between physicochemical properties (ionization, solubility, partition coefficient, hydrogen bonding, protein binding, chelation, bioisosterism, and stereochemistry) and drug action.

**CO2**: students will demonstrate knowledge of drug metabolism by explaining Phase I and Phase II metabolic pathways and identifying the stereochemical and physiological factors that influence drug biotransformation and therapeutic outcomes.

**CO3:** Students will be able to analyze the structure-activity relationships (SAR), mechanisms of action, and therapeutic applications of drugs acting on the autonomic nervous system, including adrenergic and cholinergic agents and their antagonists.

**CO4**: Students will gain insight into the structural and pharmacological aspects of drugs acting on the central nervous system, including sedatives, hypnotics, antipsychotics, and anticonvulsants, through detailed SAR analysis and mechanism studies.

**CO5**: Students will evaluate the chemical structure, synthesis pathways, and pharmacological relevance of selected therapeutic agents, such as general anaesthetics, analgesics, and anti-inflammatory drugs, integrating their knowledge of medicinal chemistry

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |

## Medicinal Chemistry– I (Practical)

## BP406P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP406P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Medicinal Chemistry– I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | IV |
| Pre-Requisites | Basic Knowledge of Medicinal Chemistry– I (Practical) | | | | |

**Lectures: 4 Hr/Week**

**Course Objectives:** To enable the students to:

1. To enable students to synthesize heterocyclic compounds such as 1,3-pyrazole, 1,3-oxazole, benzimidazole, benzotriazole, and 2,3-diphenyl quinoxaline, which serve as vital scaffolds in drug design.
2. To familiarize students with the preparation and identification of therapeutic agents like benzocaine, phenytoin, phenothiazine, and barbiturates.
3. To equip students with skills in performing quantitative assays of pharmaceutical compounds such as chlorpromazine, phenobarbitone, atropine, ibuprofen, and aspirin using pharmacopoeial methods.
4. To introduce the concept and experimental determination of the partition coefficient of drugs to understand their lipophilicity and its implications on drug absorption and distribution.
5. To foster critical thinking and a scientific approach to laboratory work through observations, interpretation of results, and correlation with theoretical medicinal chemistry concepts.

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will be able to synthesize important heterocyclic compounds such as 1,3-pyrazole, 1,3-oxazole, benzimidazole, benzotriazole, and 2,3-diphenylquinoxaline used as key intermediates in drug design and development.

**CO2:** Students will be able to prepare and identify commonly used therapeutic agents including benzocaine, phenytoin, phenothiazine, and barbiturates.

**CO3:** Students will gain practical knowledge to perform standard assay procedures for drugs like chlorpromazine, phenobarbitone, atropine, ibuprofen, and aspirin using official pharmacopoeial methods.

**CO4:** Students will understand the concept and experimental determination of the partition coefficient and its significance in drug absorption, distribution, and bioavailability.

**CO5:** Students will develop critical thinking and practical laboratory skills to analyse, interpret, and correlate experimental results with theoretical principles in medicinal chemistry.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |

# Physical Pharmaceutics-II
# BP403T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP403T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Physical Pharmaceutics-II | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | IV |
| Pre-Requisites | Basic Knowledge of Pharmacy | | | | |

**Lectures: 45**

**Course Objective:**

1. To understand and describe the basic characteristics of solid, liquid, and gaseous states relevant to pharmaceutical applications.
2. To analyse and study the flow behaviour of liquids and semisolids, including Newtonian and non-Newtonian systems, for better design and quality control of dosage forms.
3. To understand the formulation, stability challenges, and evaluation techniques of pharmaceutical suspensions and emulsions.
4. To study fundamental properties such as particle size, shape, surface area, porosity, and their influence on formulation and drug performance.
5. To determine reaction rates and stability of pharmaceutical products by applying principles of chemical kinetics for shelf-life estimation and quality assurance.

**Course Outcome:**

**CO1:** Students will be able to classify and describe the characteristics of colloidal systems and evaluate their significance in pharmaceutical formulations.

**CO2:** Students will be able to analyze the rheological properties of pharmaceutical materials and apply the knowledge to enhance product performance and stability.

**CO3:** Students will be able to formulate and evaluate suspensions and emulsions, understanding the principles behind their physical stability and processing.

**CO4:** Students will be able to determine particle size and distribution, surface area, and flow properties, and assess their impact on drug formulation and bioavailability.

**CO5:** Students will be able to apply principles of chemical kinetics to predict drug degradation, calculate shelf-life, and recommend appropriate storage conditions.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | - | 2 | 2 | - | - | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | - | 3 | 3 | - | - | 1 | - | - | 1 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | - | 2 | 2 | - | - | 1 | - | 2 | 2 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | - | 3 | 3 | - | - | 1 | - | 1 | 1 | 2 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | - | 3 | 2 | - | - | 1 | - | 2 | 2 | 3 | 3 | 3 | 2 |

## Physical Pharmaceutics-II (Practical)

## BP407P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP407P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Physical Pharmaceutics-II (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | IV |
| Pre-Requisites | Basic Knowledge of Pharmacy | | | | |

**Lectures: 4Hr/week**

**Course Objective:**

1. To understand and apply the principles of micromeritics and powder flow in the formulation and manufacturing of solid dosage forms.
2. To study and evaluate the principles of diffusion and dissolution and their relevance to drug release and bioavailability.
3. To develop experimental skills and scientific thinking through hands-on laboratory experience in studying solid, liquid, and dispersed systems.
4. To analyse and interpret experimental data in relation to theoretical principles of physical pharmaceutics.
5. To gain practical insight into Preformulation studies essential for rational drug development and dosage form design

**Course Outcome (COs)**

**CO1:** Understand and demonstrate micromeritics properties such as particle size, shape, surface area, porosity, and powder flow behaviour.

**CO2:** Perform experiments to study diffusion and dissolution processes and interpret their role in drug absorption and bioavailability.

**CO3:** Record, interpret, and present experimental data accurately with proper scientific reasoning.

**CO4:** Develop laboratory skills necessary for Preformulation studies and apply them in formulation development.

**CO5:** Analyse and determine the stability of pharmaceutical compounds under different conditions.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | – | 2 | 2 | – | – | – | – | – | – | 2 | 3 | 2 | – |
| **CO2** | 3 | 3 | – | 3 | 2 | – | – | – | – | – | – | 2 | 3 | 2 | – |
| **CO3** | 3 | 2 | – | 3 | – | – | – | – | – | – | – | 1 | 3 | 2 | – |
| **CO4** | 3 | 3 | – | 3 | 2 | – | – | – | – | – | 2 | 3 | 3 | 3 | – |
| **CO5** | 3 | 2 | – | 2 | – | – | – | – | – | – | – | 2 | 2 | 2 | – |

# Pharmacology-I

## BP404T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP404T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacology-I | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | IV |
| Pre-Requisites | Basic Knowledge of Pharmacology-I | | | | |

**Lectures: 45**

**Course Objective:** The objective of this course is to:

1. To describe the history and scope of pharmacology, general pharmacology, and pharmacokinetics.
2. To gain knowledge on Pharmacodynamics, Drug Discovery and clinical evaluation of new drugs.
3. To be able to explain neurotransmission and the pharmacology of drugs acting on ANS like parasympathetics, local anaesthetics and drugs used for glaucoma.
4. To understand and explain the pharmacology of drugs acting on Central Nervous System like sedatives & hypnotics, General anaesthetics, alcohol &disulfiram.
5. To understand and explain the CNS disease and drugs used to treat them including anti psychotics, antidepressants, CNS stimulants and opioid drugs.

**Course Outcome (COs):** Upon successful completion of the course, students will be able to:

**CO1:** Students should be able to understand the pharmacological actions of different categories of drugs.

**CO2:** Students should be able to Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.

**CO3:** Students should be able to apply the basic pharmacological knowledge in the prevention and treatment of various diseases.

**CO4:** Students should be able to observe the effect of drugs on animals by simulated experiments.

**CO5:** Students should be able to appreciate correlation of pharmacology with other bio medical sciences.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 3 | 2 | - | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 2 | 1 | 3 | 2 | - | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 1 | - | 1 | 1 | 1 | 3 | 1 | 2 | 3 | 3 | 2 |
| **CO4** | 2 | 1 | 2 | 2 | 1 | - | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 1 |
| **CO5** | 2 | 1 | 1 | 2 | 1 | - | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |

## Pharmacology-I (Practical)

## BP408P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP408P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacology-I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | IV |
| Pre-Requisites | Basic Knowledge of Pharmacology-I (Practical) | | | | |

**Lectures: 4Hr/week**

**Course Objective:** The objective of this course is to:

1. To describe the history and scope of pharmacology, general pharmacology, and experimental pharmacology and CPCSEA.
2. To gain knowledge on Pharmacodynamics, Drug Discovery and clinical evaluation of new drugs and instruments used in the experimental pharmacology and common laboratory animals and various techniques of blood withdrawal in animals.
3. To be able to explain neurotransmission and the pharmacology of drugs acting on ANS like parasympathetics, local anaesthetics and drugs used for glaucoma and various routes of drug administrations in animals.
4. To understand and explain the pharmacology of drugs acting on Central Nervous System like sedatives & hypnotics, General anaesthetics, alcohol &disulfiram.
5. To understand and explain the CNS disease and drugs used to treat them including anti psychotics, antidepressants, CNS stimulants and opioid drugs.

**Course Outcome (COs):**

Upon successful completion of the course, students will be able to:

**CO1:** Student should be able to identify the appliances used in experimental pharmacology.

**CO2:** Student should be able to demonstrate routes of drug administration in animals.

**CO3:** Student should be able to choose suitable anaesthetics for animal studies.

**CO4:** Student should be able to demonstrate drug action using computer models.

**CO5:** Student should be able to perform common laboratory techniques in animals and procedures for laboratory animal maintenance

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 2 | 2 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 1 |
| **CO2** | 3 | 1 | 3 | 2 | 1 | - | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 1 |
| **CO3** | 3 | 1 | 2 | 2 | 1 | - | 1 | 3 | 1 | 2 | 1 | 2 | 2 | 2 | 2 |
| **CO4** | 2 | - | 1 | 3 | 3 | - | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 1 |
| **CO5** | 3 | 1 | 2 | 2 | 2 | - | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 1 |

## Pharmacognosy and Phytochemistry-I

## BP405T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP405T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacognosy and Phytochemistry-I | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | IV |
| Pre-Requisites | Basic Knowledge of Pharmacognosy and Phytochemistry-I | | | | |

**Lectures: 45**

**Course Objective:** The objective of this course is to:

1. To know the techniques in the cultivation and production of crude drugs.
2. To know the crude drugs, their uses and chemical nature.
3. To know the evaluation techniques for the herbal drugs.
4. To carry out the microscopic and morphological evaluation of crude drugs.
5. To study the physical form and internal structure of plant parts using tools like microscopes.

**Course Outcome (COs):**

Upon successful completion of the course, students will be able to:

**CO1:** Understand the basic principles of pharmacognosy, including the history, scope, and significance of medicinal plants in traditional and modern systems of medicine.

**CO2:** Identify various crude drugs of plant origin based on their morphological and microscopic characteristics.

**CO3:** Describe the cultivation, collection, processing, and storage techniques of medicinal plants to ensure the quality and efficacy of crude drugs.

**CO4:** Explain the classification, sources, chemical nature, and therapeutic uses of primary and secondary plant metabolites (e.g., alkaloids, glycosides, tannins, resins, etc.).

**CO5:** Perform morphological and microscopic evaluations of crude drugs for quality control and authentication.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | - | - | 2 | 2 | 1 | 2 | 1 | 2 | 3 | - | 3 |
| **CO2** | 3 | 3 | - | 3 | 2 | - | - | - | 1 | 2 | 1 | 2 | 3 | 2 | - |
| **CO3** | 3 | 3 | - | 2 | 3 | - | - | - | - | 1 | - | 2 | 3 | 3 | - |
| **CO4** | 2 | 3 | - | 3 | 3 | - | - | 2 | 1 | 2 | 2 | 3 | 3 | 3 | - |
| **CO5** | 2 | 2 | - | 2 | 2 | 1 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 |

**Pharmacognosy and Phytochemistry-I (Practical)**

**BP409P**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP409P** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmacognosy and Phytochemistry-I (Practical)** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **0** | **0** | **4** | **2** | **IV** |
| **Pre-Requisites** | **Basic Knowledge of Pharmacognosy and Phytochemistry-I (Practical)** | | | | |

**Lectures: 4Hr/week**

**Course Objective:** The objective of this course is to:

1. Performing chemical tests for the identification of various crude drug constituents such as tragacanth, acacia, agar, gelatin, starch, honey, and castor oil.
2. Measuring microscopic parameters like stomatal number and index, vein islet number and termination, palisade ratio, size of starch grains, and calcium oxalate crystals using an eyepiece micrometer.
3. Determining the morphological characteristics such as fiber length and width to aid in the identification of crude drugs.
4. Applying quantitative methods like the Lycopodium spore method for starch grain enumeration.
5. Evaluating quality control parameters including ash value, extractive values, moisture content, swelling index, and foaming index to assess the purity and quality of crude drugs.

**Course Outcome (COs):**

Upon successful completion of the course, students will be able to:

**CO1:** Perform chemical tests to identify various crude drugs of natural origin such as tragacanth, acacia, agar, gelatin, starch, honey, and castor oil.

**CO2:** Determine and interpret stomatal number, stomatal index, and other microscopic features of crude drugs.

**CO3:** Analyze venation characteristics such as vein islet number, vein termination number, and palisade ratio.

**CO4:** Use an eyepiece micrometer to measure starch grains and calcium oxalate crystals in crude drugs.

**CO5:** Determine fiber length and width to aid in the identification and standardization of crude drugs.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | 3 | 2 | - | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 2 | - | 3 | 2 | - | - | - | 1 | 2 | - | 2 | 3 | 2 | - |
| CO3 | 3 | 2 | - | 3 | 3 | - | - | - | - | 1 | - | 2 | 3 | 3 | - |
| CO4 | 3 | 2 | - | 3 | 3 | - | - | - | - | 1 | - | 2 | 3 | 3 | - |
| CO5 | 3 | 3 | - | 3 | 2 | - | - | 2 | 1 | 2 | 1 | 3 | 3 | 3 | 3 |

# Medicinal Chemistry– II

## BP501T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP501T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Medicinal Chemistry-II | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | V |
| Pre-Requisites | Basic Knowledge of Medicinal Chemistry-II | | | | |

**Lectures: 45**

**Course Objective:** To enable the students to:

1. To provide in-depth knowledge about the classification, chemical structure, and therapeutic applications of drugs acting on histaminergic receptors, gastric acid secretion, and cancer chemotherapy.
2. To explain the chemistry and pharmacological importance of cardiovascular agents, including anti-anginal, diuretics, antihypertensives, anti-arrhythmic, and antihyperlipidemic drugs.
3. To enable students to understand the chemistry and structure-activity relationship (SAR) of drugs acting on the endocrine system, such as corticosteroids, sex hormones, thyroid agents, oral contraceptives, and antidiabetics.
4. To impart knowledge about the synthetic and structural features of anticoagulants, drugs used in heart failure, and those affecting lipid metabolism, highlighting their clinical significance and metabolic fate.
5. To familiarise students with the chemical classification, SAR, and mechanism of action of local anaesthetics, and develop their ability to relate chemical structure to pharmacological activity across therapeutic categories.

**Course Outcome:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will understand the classification, chemical structure, and mechanism of action of antihistamines, H2 blockers, proton pump inhibitors, and anti-neoplastic agents.

**CO2**: Students will be able to analyze the structure, function, and therapeutic importance of cardiovascular drugs, including anti-anginal agents, diuretics, antihypertensives, antiarrhythmics, and antihyperlipidemics.

**CO3**: Students will demonstrate knowledge of endocrine system drugs by explaining the stereochemistry, metabolism, and pharmacological roles of corticosteroids, sex hormones, thyroid drugs, and oral contraceptives.

**CO4:** Students will be able to compare and evaluate different classes of antidiabetic agents their chemical classification, mechanism of action, and clinical relevance.

**CO5:** Students will demonstrate the ability to interpret the structure–activity relationships (SAR) of local anesthetic agents and correlate them with their pharmacological actions and chemical classes.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | 1 | - | 2 | 2 | - | 1 | - | 1 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | - | 3 | 2 | - | 2 | 2 | 1 | 2 | - | 1 | 3 | 3 | 2 |
| **CO3** | 3 | 2 | - | 2 | 1 | - | 2 | 2 | - | 1 | - | 1 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | - | 3 | 2 | - | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | - | 3 | 3 | - | 2 | 2 | 1 | 1 | - | 2 | 3 | 3 | 2 |

# Industrial Pharmacy-I

## BP502T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP502T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Industrial Pharmacy-I | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | V |
| Pre-Requisites | Basic Knowledge of Pharmaceutics | | | | |

**Lectures: 45**

**Course Objective:**

1. To understand the basic concepts and principles of dosage form design.
2. To provide knowledge about large-scale manufacturing processes of different pharmaceutical dosage forms
3. To familiarize students with the operational principles, equipment, and processes used in unit operations
4. To introduce regulatory and quality assurance aspects involved in the production, packaging, and storage of pharmaceutical products.
5. To develop a strong foundation in the principles of Good Manufacturing Practices (GMP), process validation, and documentation required for compliance in pharmaceutical industries.

**Course Outcome:**

**CO1:** Students will be able to understand and explain the principles of dosage form design and the role of preformulation studies in the development of pharmaceutical products.

**CO2:** Students will be able to demonstrate knowledge of large-scale manufacturing techniques for various dosage forms like tablets, capsules, liquids, and semisolids.

**CO3:** Students will be able to operate and describe the function of equipment used in unit operations such as mixing, drying, filtration, and size reduction in pharmaceutical production.

**CO4:** Students will be able to apply principles of Good Manufacturing Practices (GMP), process validation, and in-process quality control (IPQC) during pharmaceutical manufacturing

**CO5:** Students will be able to analyze packaging techniques, storage conditions, and regulatory considerations for finished dosage forms to ensure product stability and patient safety

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 2 | - | - | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | - | - | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | - | - | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | - | 1 | 1 | 3 | 2 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | 2 | - | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 2 |

## Industrial Pharmacy-I (Practical)

## BP506P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP506P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Industrial Pharmacy-I (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | V |
| Pre-Requisites | Basic Knowledge of Pharmaceutics | | | | |

**Lectures: 4Hrs/week**

**Course Objective:**

1. To develop skills in preformulation studies.
2. To gain hands-on experience in formulation and evaluation.
3. To understand the principles of equipment operation.
4. To ensure compliance with good laboratory practices (GLP).
5. To analyse critical quality attributes and process parameters.

**Course Outcome (COs)**

**CO1:** Students will be able to carry out solubility, pH, and stability tests, and interpret data critical for formulation design.

**CO2:** Students will demonstrate proficiency in the formulation, processing, and quality evaluation of tablets and capsules.

**CO3:** Students will understand and practically operate machines like tablet presses, coating pans, and capsule filling machines used in industrial setups.

**CO4:** Students will prepare proper batch manufacturing records (BMR), standard operating procedures (SOPs), and adhere to regulatory compliance during practical sessions.

**CO5:** Students will assess critical quality attributes (CQAs) and identify factors influencing product quality and performance, applying a scientific approach to troubleshooting.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |
| **CO5** | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |

# Pharmacology-II

## BP-503T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-503T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacology-II | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | V |
| Pre-Requisites | Basic Knowledge of Pharmacological actions of drugs | | | | |

**Lectures: 45**

**Course Objectives:** To enable the students

1. To understand the pharmacological actions and therapeutic applications of drugs affecting the cardiovascular and urinary systems.
2. To gain knowledge of the classification, mechanism of action, and clinical uses of autacoids and their related drugs.
3. To learn the role of endocrine hormones and the pharmacology of hormone analogues and inhibitors.
4. To understand the principles, types, and procedures involved in bioassays.
5. To develop the ability to critically analyse drug action, adverse effects, and therapeutic uses in relevant disease conditions.

**Course Outcome**

**CO1:** Explain the mechanism of action, therapeutic uses, and adverse effects of drugs acting on the cardiovascular and urinary systems.

**CO2:** Classify autacoids and describe the pharmacological profile of histamine, serotonin, prostaglandins, leukotrienes, and related antagonists.

**CO3:** Describe the pharmacology of various endocrine hormones including insulin, corticosteroids, and reproductive hormones.

**CO4:** Demonstrate understanding of bioassay principles and perform basic bioassay techniques for selected drugs.

**CO5:** Correlate drug mechanisms with clinical indications and predict possible adverse effects and interactions.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 3 | 1 | - | 2 | 2 | - | 3 | - | 3 | 3 | 3 | 2 |
| **CO2** | 3 | - | - | 3 | 1 | - | 2 | 2 | - | 3 | - | 3 | 3 | 2 | 2 |
| **CO3** | 3 | - | - | 3 | 1 | - | 2 | 3 | - | 3 | - | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | 3 | 2 |
| **CO5** | 3 | - | - | 3 | 2 | - | 2 | 3 | 2 | 3 | - | 3 | 3 | 3 | 3 |

## Pharmacology-II (Practical)

## BP-507P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-507P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacology-II (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | V |
| Pre-Requisites | Basic Knowledge of Pharmacological actions of drugs | | | | |

**Practical Hours: 4Hrs/Week**

**Course Objectives:**

1. To understand the basic principles of in-vitro pharmacology and physiological salt solutions used in experimental setups.
2. To learn the pharmacological techniques to study drug effects on isolated tissues and organs using simulated software.
3. To acquire practical knowledge on dose-response curves and determination of parameters like $PA_2$ and $PD_2$ values.
4. To understand the principles and procedures of bioassays used for pharmacological evaluation of drugs.
5. To develop analytical and observational skills to interpret drug responses in experimental animal models for various pharmacological activities.

**Course Outcome**

**CO1:** Demonstrate understanding of in-vitro pharmacological techniques and the preparation of physiological salt solutions.

**CO2:** Simulate and interpret the effects of drugs on isolated tissues/organs such as frog heart, rat ileum, and guinea pig ileum using software-based models.

**CO3:** Analyze dose-response curves and calculate pharmacological constants like $PA_2$ and $PD_2$ to evaluate drug potency and antagonism..

**CO4:** Conduct virtual bioassays (e.g., histamine, oxytocin, serotonin, acetylcholine) and apply methods like matching, interpolation, and three/four-point techniques.

**CO5:** Evaluate anti-inflammatory, analgesic, and diuretic activities of drugs using simulated animal models and accurately interpret the pharmacological data.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | 2 | - | - | 2 | - | - | - | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 2 | - | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | - | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | - | - | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 2 |

**Pharmacognosy and Phytochemistry-II**
**BP-504T**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP-504T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmacognosy and Phytochemistry-II** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **V** |
| **Pre-Requisites** | **Basic Knowledge of Pharmacognosy and Phytochemistry-II** | | | | |

**Lecture: 45**

**Course Objectives:** The objective of this course is to:

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents.
2. To understand the preparation and development of herbal formulation.
3. To understand the herbal drug interactions.
4. To carryout isolation and identification of phytoconstituents.
5. To familiarize students with the chemistry and therapeutic significance of phytoconstituents derived from medicinal plants.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** Describe and classify various secondary metabolites (e.g., alkaloids, glycosides, terpenoids, steroids, and flavonoids) with reference to their biosynthesis, extraction, and pharmacological importance.

**CO2:** Explain the chemistry, isolation, identification, and estimation of various phytoconstituents using modern analytical techniques such as chromatography and spectroscopy.

**CO3:** Demonstrate knowledge of plant-based drugs and their active constituents used in the treatment of various diseases, correlating traditional and modern approaches.

**CO4:** Perform laboratory techniques related to extraction, isolation, and purification of phytoconstituents from natural sources, using standard procedures.

**CO5:** Apply principles of phytochemistry to identify bioactive compounds, assess quality, and control parameters of herbal drugs/formulations in alignment with pharmacopoeial standards.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 2 | 3 | 3 | 1 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |

## Pharmacognosy and Phytochemistry-II (Practical)

## BP-504T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-504T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacognosy and Phytochemistry-II (practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | V |
| Pre-Requisites | Basic Knowledge of Pharmacognosy and Phytochemistry-II | | | | |

**Lecture: 45**

**Course Objectives:** The objective of this course is to:

1. Develop practical skills for the identification and analysis of phytoconstituents from medicinal plants.
2. Train students in extraction and isolation techniques for secondary metabolites such as alkaloids, glycosides, flavonoids, tannins, and terpenoids.
3. Provide hands-on experience in using chromatographic techniques (TLC, paper chromatography, column chromatography) for separation and purification of herbal components.
4. Enable students to perform preliminary phytochemical screening and quantitative estimation of plant-derived compounds
5. Familiarize students with standardization and quality control procedures for herbal drugs and formulations.

**Course Outcome:** Upon successful completion of the course, students will be able to:

**CO1:** Perform qualitative and quantitative analysis of phytoconstituents such as alkaloids, glycosides, flavonoids, and tannins using standard laboratory techniques.

**CO2:** Isolate and identify phytochemicals from crude plant materials using classical methods such as solvent extraction and chromatographic separation.

**CO3:** Demonstrate proficiency in chromatographic techniques, including thin-layer chromatography (TLC), column chromatography, and paper chromatography, for the separation of herbal components.

**CO4:** Prepare and evaluate herbal extracts and formulations using appropriate standardization protocols and documentation procedures.

**CO5:** Prepare and evaluate herbal extracts and formulations using appropriate standardization protocols and documentation procedures.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |

## Pharmaceutical Jurisprudence

## BP505T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP505T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmaceutical Jurisprudence | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | V |
| Pre-Requisites | Basic Knowledge of Pharmacy | | | | |

**Lectures: 45**

**Course Objective:**

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice
5. To enable students to understand and comply with various pharmaceutical laws, regulations, and professional responsibilities essential for safe and lawful pharmacy practice.

**Course Outcome:**

**CO1:** Students will be able to understand the fundamental principles and significance of pharmaceutical legislation in India.

**CO2:** Students will be able to identify and interpret key provisions of major drug laws such as the Drugs and Cosmetics Act, Pharmacy Act, and Narcotic Drugs and Psychotropic Substances Act.

**CO3:** Students will be able to demonstrate awareness of regulatory authorities and their functions in the enforcement of drug laws.

**CO4:** Students will be able to apply legal and ethical principles in real-world scenarios related to pharmacy practice, manufacturing, and distribution.

**CO5:** Students will be able to analyze and address legal and ethical issues in pharmacy, ensuring compliance with professional standards and responsibilities.

**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | – | 2 | 2 | – | – | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | – | 3 | 3 | – | – | 1 | – | – | 1 | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | – | 2 | 2 | – | – | 1 | – | 2 | 2 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | – | 3 | 3 | – | – | 1 | – | 1 | 1 | 2 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | – | 3 | 2 | – | – | 1 | – | 2 | 2 | 3 | 3 | 3 | 2 |

**Medicinal Chemistry– III**

**BP601T**

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP601T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Medicinal Chemistry– III | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VI |
| Pre-Requisites | Basic Knowledge of chemistry | | | | |

**Lectures: 45**

**Course Objective:** To enable the students:

1. To provide students with a comprehensive understanding of the historical background, nomenclature, stereochemistry, and structure–activity relationships (SAR) of various classes of antibiotics, including β-lactams, aminoglycosides, tetracyclines, and macrolides.
2. To enable students to understand the chemistry, classification, and mechanism of action of antimalarial, antitubercular, urinary tract anti-infectives, antiviral, and antifungal agents, and their therapeutic applications.
3. To develop students' ability to analyse SAR and pharmacological significance of sulfonamides, sulfones, folate reductase inhibitors, and anti-protozoal and anthelmintic agents used in infectious disease management.
4. To introduce students to the concept of prodrugs and their applications in improving drug properties such as bioavailability, stability, and targeting.
5. To impart fundamental knowledge of drug design approaches, including QSAR, pharmacophore modelling, molecular docking, and combinatorial chemistry for identifying and optimising new drug candidates

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will understand the historical background, stereochemistry, nomenclature, and structure activity relationships (SAR) of different classes of antibiotics such as β-lactams, tetracyclines, aminoglycosides, and macrolides.

**CO2**: Students will be able to explain the chemical classification, mechanisms of action, and SAR of antimalarial, antitubercular, urinary tract anti-infectives, and antiviral agents.

**CO3**: Students will demonstrate knowledge of the chemistry, SAR, and therapeutic applications of antifungal, anti-protozoal, and anthelmintic drugs.

**CO4:** Students will be able to evaluate and interpret the SAR and clinical significance of sulfonamides, sulfones, and folate reductase inhibitors used in bacterial infections.

**CO5:** Students will apply concepts of rational drug design, including QSAR parameters, pharmacophore modelling, molecular docking, and combinatorial chemistry in the context of modern drug discovery.

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**CO-PO-PSO Matrix:**

| CO \ PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | 1 | - | 2 | 2 | - | 1 | - | 1 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | - | 3 | 2 | - | 2 | 2 | 1 | 2 | - | 1 | 3 | 3 | 2 |
| **CO3** | 3 | 2 | - | 2 | 1 | - | 2 | 2 | - | 1 | - | 1 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | - | 3 | 2 | - | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | - | 3 | 3 | - | 2 | 2 | 1 | 1 | - | 3 | 3 | 3 | 2 |

## Medicinal Chemistry– III (Practical)

## BP607P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP607P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Medicinal Chemistry– III (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | VI |
| Pre-Requisites | Basic Knowledge of chemistry | | | | |

**Lectures: 4Hr/Week**

**Course Objective:** To enable the students:

1. To develop practical skills in the synthesis of medicinally important drugs and intermediates, such as sulphanilamide, chlorobutanol, and tolbutamide, using conventional methods.
2. To enable students to perform quantitative and qualitative assays of various pharmaceutical compounds, including isoniazid, chloroquine, dapsone, and benzyl penicillin, using standard analytical techniques.
3. To introduce students to green chemistry approaches, particularly the use of microwave-assisted synthesis for the efficient preparation of drug intermediates.
4. To train students in drawing chemical structures and reaction mechanisms using ChemDraw® or similar chemical drawing software for accurate pharmaceutical documentation.
5. To familiarize students with computational drug design tools, including the prediction and evaluation of physicochemical properties (e.g., logP, molecular weight, hydrogen bonding) and drug-likeness screening based on Lipinski's Rule of Five (Ro5).

**Course Outcomes:** At the end of the course, the student will be able to

**CO1:** Students will be able to synthesize medicinally important drugs and intermediates such as sulphanilamide, chlorobutanol, triphenyl imidazole, and tolbutamide using conventional laboratory techniques.

**CO2:** Students will demonstrate the ability to perform accurate assays of pharmaceutical compounds, including isoniazid, chloroquine, dapsone, and benzyl penicillin using pharmacopoeial methods.

**CO3:** Students will be able to apply microwave-assisted synthesis techniques for the eco-friendly and efficient preparation of selected drug molecules or intermediates.

**CO4:** Students will develop proficiency in drawing chemical structures and reaction mechanisms using ChemDraw® and other molecular visualisation tools.

**CO5:** Students will be able to determine and interpret physicochemical properties (e.g., logP, molecular weight, hydrogen bond donors/acceptors) and assess drug-likeness using computational tools and Lipinski's Rule of Five.

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**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 2 | - | - | 2 | 2 | 1 | 1 | 1 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 2 | - | - | 3 | 2 | 1 | - | 1 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | - | - | 2 | 2 | - | 2 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | - | 2 | 3 | - | - | 2 | 2 | - | - | 2 | 2 | 2 | 1 |
| **CO5** | 3 | 3 | - | 3 | 3 | - | - | 2 | 2 | 1 | 2 | 3 | 3 | 3 | 2 |

# PHARMACOLOGY-III
## BP-602T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-602T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacology-III | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VI |
| Pre-Requisites | Basic Knowledge of Pharmacological actions of drugs | | | | |

**Lectures: 45**

**Course Objectives:**

1. To understand the pharmacological actions and therapeutic applications of drugs acting on the respiratory and gastrointestinal systems.
2. To gain knowledge of the general principles and classifications in chemotherapy, including specific drugs for bacterial, fungal, viral, and parasitic infections.
3. To acquire an understanding of immunopharmacological agents including monoclonal antibodies and biosimilars used in modern therapeutics.
4. To learn the basic concepts of toxicology, types of toxic effects, and general management strategies for poisonings.
5. To understand the principles of chronopharmacology and its applications in optimizing therapeutic outcomes.

**Course Outcome**

**CO1:** Explain the mechanism of action, therapeutic uses, and adverse effects of drugs acting on the respiratory and gastrointestinal systems.

**CO2:** Describe the principles of chemotherapy and classify various antimicrobial agents used against bacterial, viral, fungal, and parasitic infections.

**CO3:** Demonstrate knowledge of immunopharmacological drugs including immunostimulants, immunosuppressant's, and targeted therapies like monoclonal antibodies.

**CO4:** Analyze different types of toxicity and outline the clinical symptoms and management of poisoning caused by commonly encountered toxic agents.

**CO5:** Describe the concept of chronopharmacology and its relevance in optimizing drug therapy based on biological rhythms.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 3 | - | - | 2 | 2 | - | 2 | - | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | - | 3 | 2 | - | 2 | 2 | - | 2 | - | 3 | 3 | 3 | 2 |
| **CO3** | 3 | - | - | 3 | - | - | 3 | 3 | - | 2 | - | 3 | 2 | 2 | 3 |
| **CO4** | 3 | 2 | - | 3 | - | - | 2 | 3 | - | 3 | 1 | 3 | 2 | 2 | 3 |
| **CO5** | 3 | - | - | 2 | - | - | - | 2 | - | 2 | 2 | 3 | 2 | 2 | 2 |

## Pharmacology-III (Practical)

## BP-608P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-608P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacology-III Practical | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | VI |
| Pre-Requisites | Basic Knowledge of Pharmacological actions of drugs | | | | |

**Practical Hours: 4Hrs/Week**

**Course Objectives:**

1. To understand principles of dose calculation and the experimental design used in pharmacological investigations.
2. To learn to simulate and interpret common animal models used in evaluating drug actions such as anti-ulcer, anti-allergic, and GI motility.
3. To acquire practical skills in the evaluation of drug effects on isolated tissue preparations using agonists and antagonists.
4. To develop proficiency in pharmacokinetic calculations, serum biochemistry, toxicity testing, and clinical assay interpretation.
5. To apply biostatistical tools such as t-test, ANOVA, and chi-square tests to analyze pharmacological data.

**Course Outcome**

**CO1:** Perform dose calculations and simulate drug responses in models like mast cell stabilization, GI motility, and hypoglycaemic studies.

**CO2:** Analyze the anti-ulcer effects and GI responses of drugs using different experimental animal models via simulation tools.

**CO3:** Demonstrate understanding of agonist-antagonist interactions on isolated guinea pig ileum and apply biochemical assays like serum estimations.

**CO4:** Evaluate drug toxicity (oral, dermal, ocular) and detect pyrogens using standard simulation-based testing protocols.

**CO5:** Apply pharmacokinetic principles and biostatistical methods (e.g., t-test, ANOVA, chi-square) for data interpretation in experimental pharmacology.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 2 | - | 3 | 2 | - | - | 2 | - | 2 | - | 3 | 3 | 3 | 2 |
| **CO3** | 3 | 2 | - | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | - | 3 | 2 | - | 2 | 3 | - | 3 | 1 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | - | - | - | 2 | - | - | 3 | 3 | 3 | 2 |

# Herbal Drug Technology

## BP-603T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-603T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Herbal Drug Technology | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VI |
| Pre-Requisites | Basic Knowledge of Herbal Drug Technology | | | | |

**Practical Hours: 45**

**Course Objectives:**

1. To understand raw material as source of herbal drugs from cultivation to herbal drug product.
2. To know the WHO and ICH guidelines for evaluation of herbal drugs.
3. To know the herbal cosmetics, natural sweeteners, nutraceuticals.
4. To appreciate patenting of herbal drugs, GMP.
5. To impart knowledge on preparation and quality assessment of herbal formulations**,** such as powders, tablets, syrups, ointments, and herbal cosmetics.

**Course Outcome**

**CO1:** Understand the fundamentals of traditional systems of medicine (Ayurveda, Siddha, Unani, and Homeopathy) and their role in herbal drug development.

**CO2:** Explain various quality control and standardization methods for evaluating raw materials and finished herbal products in accordance with WHO and pharmacopoeial guidelines.

**CO3:** Describe the formulation and preparation of various herbal dosage forms including powders, tablets, syrups, ointments, and herbal cosmetics.

**CO4:** Apply Good Manufacturing Practices (GMP), Good Agricultural Practices (GAP), and Good Laboratory Practices (GLP) in the manufacture and quality assurance of herbal products.

**CO5:** Evaluate and interpret regulatory requirements for herbal medicines, including labelling, safety, efficacy, and licensing procedures.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 3 |
| **CO2** | 3 | 2 | 3 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 |

## Herbal Drug Technology (practical)

## BP-609P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-609P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Herbal Drug Technology (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 0 | 0 | 4 | 2 | VI |
| Pre-Requisites | Basic Knowledge of Herbal Drug Technology | | | | |

**Practical Hours: 4Hrs/Week**

**Course Objectives:**

1. To enable the preparation and standardization of various herbal formulations such as powders, tablets, syrups, creams, and herbal cosmetics.
2. To familiarize students with the protocols for quality control tests of raw materials and finished herbal products, as per WHO and pharmacopoeial standards.
3. To demonstrate the application of Good Manufacturing Practices (GMP) in the small-scale formulation of herbal products.
4. To enhance practical understanding of physical, chemical, and microbiological parameters relevant to herbal product quality and safety.
5. To promote good laboratory practices (GLP), documentation skills, and ethical handling of herbal materials and formulations.

**Course Outcome**

**CO1:** Identify and evaluate crude herbal drugs based on morphological and microscopic characters, including powdered drug analysis.

**CO2:** Formulate and prepare various herbal dosage forms such as tablets, syrups, creams, pastes, and herbal cosmetics.

**CO3:** Perform quality control and standardization tests on raw materials and finished herbal products as per pharmacopoeial and WHO guidelines.

**CO4:** Apply Good Manufacturing Practices (GMP) during the preparation and handling of herbal formulations.

**CO5:** Demonstrate Good Laboratory Practices (GLP), safety, and documentation skills in handling herbal drugs and equipment in the laboratory.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |
| **CO3** | 3 | 2 | 3 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 |

## Biopharmaceutics and Pharmacokinetics

## BP-604T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-604T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Biopharmaceutics and Pharmacokinetics | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VI |
| Pre-Requisites | Basic Knowledge of Biopharmaceutics | | | | |

**Practical Hours: 45**

**Course Objectives:**

1. Understand drug absorption mechanisms and factors affecting absorption through different routes.
2. Learn drug distribution concepts including tissue permeability, protein binding, and clinical significance.
3. Explore drug elimination via metabolism and excretion, and grasp bioavailability and bioequivalence principles.
4. Study pharmacokinetic models and parameters to analyze drug behavior in the body.
5. Understand advanced kinetics, including multi-compartment models, multiple dosing, and non-linear pharmacokinetics.

**Course Outcome**

**CO1:** Explain the fundamental principles of drug absorption, distribution, metabolism, and excretion (ADME) and factors influencing them.

**CO2:** Interpret pharmacokinetic parameters and compartmental models to understand drug concentration-time profiles.

**CO3:** Analyze bioavailability and bioequivalence data, and describe methods to enhance the bioavailability of poorly soluble drugs.

**CO4:** Apply knowledge of protein binding, clearance mechanisms, and steady-state kinetics in clinical and therapeutic settings.

**CO5:** Distinguish between linear and non-linear pharmacokinetics and use appropriate models (e.g., Michaelis-Menton) to estimate pharmacokinetic parameters.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | - | 1 | 2 | - | 1 |
| **CO2** | 3 | 1 | 2 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 1 | 1 |
| **CO3** | 2 | - | 1 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | - | 1 | 2 | - | - |
| **CO4** | 2 | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 3 | 2 | - | - | 3 | 1 | 1 |
| **CO5** | 3 | - | 2 | 3 | 2 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 2 | 1 | 1 |

# PHARMACEUTICAL BIOTECHNOLOGY
## BP-605T

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP-605T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmaceutical Biotechnology** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VI** |
| **Pre-Requisites** | **Basic Knowledge of Biotechnology** | | | | |

**Lectures: 45**

**Course Objectives:**

1. To understand the fundamental concepts of biotechnology and its applications in pharmaceutical sciences, especially enzyme and microbial biotechnology.
2. To gain knowledge about genetic engineering, recombinant DNA technology, and their applications in medicine and pharmaceutical production.
3. To study immune mechanisms, vaccines, and the production and use of immune-based products and hybridoma technology.
4. To learn about microbial genetics, blotting techniques, mutations, and microbial biotransformation processes relevant to pharmaceuticals.
5. To understand the principles and industrial application of fermentation, fermenter design, and production of biopharmaceutical products like antibiotics and vitamins.

**Course Outcome**

**CO1:** Describe the role of biotechnology in pharmaceutical sciences including enzyme immobilization, biosensors, and protein engineering.

**CO2:** Explain the principles and techniques of genetic engineering and its applications in the production of therapeutic proteins, vaccines, and hormones.

**CO3:** Illustrate the immune system functions, hypersensitivity reactions, and the preparation and storage of vaccines, sera, and immune products.

**CO4:** Demonstrate understanding of microbial genetics, blotting techniques, mutation types, and biotransformation applications in pharmaceuticals.

**CO5:** Explain the process of industrial fermentation and the large-scale production of pharmaceutical products including antibiotics, vitamins, and blood-derived products.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 3 | 2 | - | 2 | 2 | - | - | 1 | 3 | 3 | 2 | 2 |
| **CO2** | 3 | 2 | - | 3 | 3 | - | 2 | 2 | - | 2 | - | 3 | 3 | 3 | 2 |
| **CO3** | 3 | - | - | 2 | - | - | 2 | 3 | - | 2 | - | 3 | 2 | 2 | 3 |
| **CO4** | 3 | 2 | - | 3 | 3 | - | - | 2 | - | - | 1 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 3 | - | 3 | 2 | - | 2 | 2 | - | 3 | - | 3 | 3 | 3 | 3 |

## Pharmaceutical Quality Assurance

## BP606T

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP606T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Pharmaceutical Quality Assurance** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VI** |
| **Pre-Requisites** | **Basic Knowledge of pharmaceutical quality assurance** | | | | |

**Lectures:** 45

### Course Objectives

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
5. Learn about various quality audits and their significance in maintaining compliance.

### Course Outcomes (COs):

**CO1:** Describe the basic concepts of quality assurance, quality control, and GMP

**CO2:** Explain Total Quality Management (TQM), ICH, QbD, ISO and NABL accreditation

**CO3:** Understand personnel responsibilities, equipment, raw materials and GLP practices

**CO4:** Apply knowledge to handle documentation, complaints, and recall procedures

**CO5:** Demonstrate understanding of calibration, validation and good warehousing practices

### CO-PO-PSO Matrix:

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 3 |

## Instrumental Method of Analysis

## BP701T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP701T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Instrumental Method of Analysis | | | | |
| Scheme & Credits | L | T | P | Credit | SEMESTER |
| | 3 | 1 | 0 | 4 | VII |
| Pre-Requisites | Basic Knowledge of instrumental method of analysis | | | | |

**Lectures:** 45

### Course Objectives

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments
4. Understand the principles, working, and calibration of modern analytical instruments used in pharmaceutical analysis.
5. Interpret analytical data and validate analytical methods as per regulatory requirements.

### Course Outcomes (COs):

**CO1:** Understand interaction of matter with electromagnetic radiation and apply in UV, IR, and fluorescence techniques

**CO2:** Demonstrate knowledge on molecular spectroscopy and atomic techniques like AAS, flame photometry

**CO3:** Apply knowledge of separation techniques like TLC, paper chromatography and electrophoresis

**CO4:** Operate and understand gas and high-performance liquid chromatographic instruments

**CO5:** Explain principles and applications of advanced chromatographic techniques like Ion exchange, Gel, and Affinity chromatography

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 2 | 3 | 3 |

## Instrumental Methods of Analysis (Practical)

## BP705P

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP705P | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Instrumental Methods of Analysis (Practical) | | | | |
| Scheme & Credits | L | T | P | Credit | SEMESTER |
| | 0 | 0 | 4 | 2 | VII |
| Pre-Requisites | Basic Knowledge of instrumental methods of analysis | | | | |

**Lecture**: 4Hr/Week

### Course Objectives

1. Understand and apply spectrophotometric techniques including UV, colorimetry, and fluorimetry
2. Perform flame photometry and nepheloturbidometry for elemental analysis
3. Perform qualitative separation techniques such as paper chromatography and TLC
4. Demonstrate the use of advanced analytical instruments like HPLC and GC
5. Analyze pharmaceutical samples for qualitative and quantitative evaluation using modern instrumentation

### Course Outcomes (COs)

**CO1:** Understand and apply spectrophotometric techniques including UV, colorimetry, and fluorimetry

**CO2:** Perform flame photometry and nepheloturbidometry for elemental analysis

**CO3:** Perform qualitative separation techniques such as paper chromatography and TLC

**CO4:** Demonstrate the use of advanced analytical instruments like HPLC and GC

**CO5:** Analyze pharmaceutical samples for qualitative and quantitative evaluation using modern instrumentation

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 3 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 3 |

# Industrial Pharmacy-II

## BP702T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP702T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Industrial Pharmacy-II | | | | |
| Scheme & Credits | L | T | P | Credit | SEMESTER |
| | 3 | 1 | 0 | 4 | VII |
| Pre-Requisites | Basic Knowledge of Industrial Pharmacy | | | | |

**Lecture**: 45

### Course Objectives

1. To understand the process of pilot plant and scale up of pharmaceutical dosage forms.
2. To understand the process of technology transfer from lab scale to commercial batch
3. To familiarize students with the different Laws and Acts that regulate pharmaceutical industry
4. To introduce the approval process and regulatory requirements for drug products
5. To provide in-depth knowledge of advanced pharmaceutical manufacturing technologies, process validation, quality management systems, regulatory requirements, and industrial practices essential for the large-scale production and quality assurance of pharmaceutical products

### Course Outcomes (COs)

**CO1:** Students will be able to understand and explain the principles of dosage form design and the role of preformulation studies in the development of pharmaceutical products

**CO2:** Students will be able to demonstrate knowledge of large-scale manufacturing techniques for various dosage forms like tablets, capsules, liquids, and semisolids

**CO3:** Students will be able to operate and describe the function of equipment used in unit operations such as mixing, drying, filtration, and size reduction in pharmaceutical production

**CO4:** Students will be able to apply principles of Good Manufacturing Practices (GMP), process validation, and in-process quality control (IPQC) during pharmaceutical manufacturing

**CO5:** Students will be able to analyze packaging techniques, storage conditions, and regulatory considerations for finished dosage forms to ensure product stability and patient safety

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 2 | 2 | 2 | - | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 |

# Pharmacy Practice

## BP-703T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-703T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Pharmacy Practice | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VII |
| Pre-Requisites | Basic Knowledge of role of Pharmacists | | | | |

**Lectures: 45**

**Course Objectives:**

1. To understand the structure and functioning of hospitals and hospital pharmacies, including the roles of pharmacists in healthcare settings.
2. To learn the systems for drug distribution, formulary management, and therapeutic drug monitoring in institutional and community settings.
3. To acquire knowledge of community pharmacy operations, medication counseling, patient communication, and drug information services.
4. To understand principles of clinical pharmacy including prescription, interpretation, medication adherence, and pharmacist-led patient care.
5. To gain insights into budgeting, inventory control, over-the-counter drug use, investigational drugs, and interpretation of clinical lab tests.

**Course Outcome**

**CO1:** Describe hospital and community pharmacy organization, drug distribution systems, and the responsibilities of pharmacists in patient care.

**CO2:** Explain adverse drug reactions, drug interactions, and methods for detecting and reporting them in clinical settings.

**CO3:** Manage drug information services, therapeutic drug monitoring, medication counseling, and patient medication history interviews effectively.

**CO4:** Apply principles of clinical pharmacy, interpret prescriptions and lab results, and promote rational use of over-the-counter medications.

**CO5:** Demonstrate understanding of pharmacy budgeting, drug store management, inventory control techniques, and investigational drug use in hospitals.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | - | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 |
| **CO2** | 3 | 2 | - | 3 | - | - | 2 | 3 | 2 | 3 | 1 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 2 | - | 3 | 2 | 2 | 3 | 3 | 3 | 3 | - | 3 | 2 | 3 | 3 |
| **CO4** | 3 | 3 | - | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

# Novel Drug Delivery System

## BP704T

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP704T | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Novel Drug Delivery system | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VII |
| Pre-Requisites | Basic Knowledge of Pharmaceutics | | | | |

**Lectures: 45**

**Course Objective:**

1. To introduce the concept and need for novel drug delivery systems
2. To provide foundational knowledge on various drug carriers such as liposomes, niosomes, nanoparticles, microspheres,
3. To study the principles and formulation approaches of controlled, sustained, and targeted drug delivery systems.
4. To understand the design, development, and evaluation parameters for transdermal, mucosal, ocular, and implantable drug delivery systems.
5. To familiarize students with the regulatory, patent, and industrial aspects of novel drug delivery systems.

**Course Outcome:**

**CO1:** Students will be able to describe the need, advantages, and basic concepts of NDDS over conventional drug delivery.

**CO2:** Students will gain knowledge of different systems like transdermal, ocular, nasal, targeted, and controlled release formulations, along with their applications.

**CO3:** Students will be able to plan and design formulation strategies for NDDS considering physicochemical and biopharmaceutical aspects.

**CO4:** Students will learn to assess NDDS through in vitro, in vivo, and ex vivo methods, including pharmacokinetics and stability studies.

**CO5:** Students will understand regulatory guidelines, IPR issues, and industrial scale-up and marketing challenges related to NDDS

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 |
| **CO5** | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 3 | 2 | 3 |

**Biostatics and Research Methodology**

**BP801T**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP801T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Biostatics and Research Methodology** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VII** |
| **Pre-Requisites** | **Basic Knowledge of Biostatics** | | | | |

**Lectures: 45**

**Course Objective:**

1. Understand the fundamentals of biostatistics, including measures of central tendency, dispersion, and correlation, with pharmaceutical applications
2. Gain knowledge of probability distributions, sampling methods, hypothesis testing, and parametric tests relevant to pharmaceutical data analysis,
3. Explore non-parametric tests and research methodology, including study designs and data presentation techniques
4. Learn statistical modeling, regression analysis, and practical applications in industrial and clinical trials using statistical software.
5. Understand experimental design techniques such as factorial design and response surface methodology for pharmaceutical optimization.

**Course Outcome:**

**CO1:** Apply statistical methods like mean, median, standard deviation, and correlation to interpret pharmaceutical data.

**CO2:** Use probability theory and hypothesis testing techniques (e.g., t-tests, ANOVA) in pharmaceutical research and decision-making.

**CO3:** Perform and interpret non-parametric tests and design appropriate clinical and observational studies.

**CO4:** Analyze clinical and industrial data using software tools like Excel, SPSS, R, and MINITAB for decision-making.

**CO5:** Design and optimize pharmaceutical experiments using factorial designs and response surface methodology.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | - | 1 | 2 | - | 1 |
| **CO2** | 3 | 1 | 2 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 1 | 1 |
| **CO3** | 2 | - | 1 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | - | 1 | 2 | - | - |
| **CO4** | 2 | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 3 | 2 | - | - | 3 | 1 | 1 |
| **CO5** | 3 | - | 2 | 3 | 2 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 2 | 1 | 1 |

**Social and Preventive Pharmacy**
**BP-802T**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP-802T** | | | | |
| **Category** | **Professional Core Courses** | | | | |
| **Course Title** | **Social and Preventive Pharmacy** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VIII** |
| **Pre-Requisites** | **Basic Knowledge of prevention of disease** | | | | |

**Lectures: 45**

**Course Objectives:**

1. To understand the fundamental concepts of health, disease, and public health from a social and preventive perspective.
2. To learn about the social, cultural, and economic factors influencing health, disease prevention, and the importance of health education.
3. To Study the causes, prevention, and control strategies of communicable and non-communicable diseases.
4. To acquire knowledge about national health programs and their roles in controlling major public health concerns.
5. To appreciate the role of pharmacists in promoting community health, hygiene, nutrition, and disease surveillance.

**Course Outcome**

**CO1:** Define and explain the concepts of health, disease, and public health with reference to social determinants.

**CO2:** Describe the principles of nutrition, hygiene, and health education in the prevention of diseases.

**CO3:** Identify preventive measures and control strategies for both communicable and non-communicable diseases.

**CO4:** Summarize the objectives, functions, and outcomes of key national health programs in India.

**CO5:** Demonstrate awareness of the pharmacist's role in community health promotion, surveillance, and public education.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | 2 | - | - | 3 | 3 | 2 | 3 | 2 | 3 | 2 | - | 3 |
| **CO2** | 3 | - | - | 2 | - | - | 3 | 3 | 3 | 3 | 3 | 3 | 2 | - | 3 |
| **CO3** | 3 | - | - | 3 | - | - | 2 | 3 | - | 3 | 2 | 3 | 2 | - | 3 |
| **CO4** | 3 | - | - | 2 | - | - | 2 | 3 | 2 | 3 | 3 | 3 | - | - | 3 |
| **CO5** | 3 | - | - | 2 | - | 2 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 3 |

# Pharma Marketing Management
## BP-803ET

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-803ET | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | Pharma Marketing Management | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VIII |
| Pre-Requisites | Basic Knowledge of Pharma Marketing | | | | |

**Lectures: 45**

**Course Objectives:**

1. Develop an understanding of core marketing concepts and how they apply specifically to the pharmaceutical sector.
2. Prepare students to take on challenging roles in sales and product management within pharma companies.
3. Foster the ability to make strategic marketing decisions, including product positioning, pricing, promotion, and distribution.
4. Introduce students to emerging trends such as rural marketing, global marketing, and digital promotion techniques.
5. Cultivate managerial skills necessary for analyzing market behavior**,** understanding consumer and prescriber motivations, and managing professional sales representatives.

**Course Outcome:**

**CO1:** Understand core marketing principles and their application in the pharmaceutical industry.

**CO2:** Analyze consumer and prescriber behavior to develop effective marketing strategies.

**CO3:** Design and evaluate promotional tools used in pharma marketing, including digital and traditional media.

**CO4:** Apply product management techniques such as product life cycle analysis, branding, and positioning.

**CO5:** Develop managerial and communication skills essential for leading sales teams and interacting with healthcare professionals.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 |
| **CO3** | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 3 |
| **CO4** | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |
| **CO5** | 2 | 1 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 2 | 1 | 3 |

# Pharmaceutical Regulatory Science

## BP804ET

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP804ET | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | Pharmaceutical Regulatory Science | | | | |
| Scheme & Credits | L | T | P | Credit | SEMESTER |
| | 3 | 1 | 0 | 4 | VIII |
| Pre-Requisites | Basic Knowledge of pharmaceutical regulatory science | | | | |

**Lectures:** 45

**Course Objectives**

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets
4. Understand the principles and practices involved in Good Manufacturing Practices (GMP) and their impact on pharmaceutical production.
5. Familiarize with the post-market surveillance and pharmacovigilance processes to ensure the safety and efficacy of pharmaceutical products.

**Course Outcomes (COs):**

**CO1:** Understand the stages and process of drug discovery and development.

**CO2:** Explain the roles of regulatory authorities in drug approval and marketing.

**CO3:** Describe the registration process for Indian drugs in regulated international markets.

**CO4:** Develop clinical trial protocols and apply ethical and regulatory principles.

**CO5:** Interpret key regulatory terminologies, databases, and documentation systems.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 2 | 2 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 3 | 3 | 3 |

# Pharmacovigilance

## BP-805ET

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-805ET | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | Pharmacovigilance | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VIII |
| Pre-Requisites | Basic Knowledge of Adverse Drug Reaction | | | | |

**Lectures: 45**

**Course Objectives:**

1. To understand the principles, history, and evolution of pharmacovigilance, including the global and Indian regulatory frameworks.
2. To learn about adverse drug reactions (ADRs), their classification, detection, reporting, and management strategies.
3. To gain knowledge of the classification of drugs and diseases, international terminologies, drug dictionaries, and pharmacovigilance data systems.
4. To understand the methodologies of vaccine safety monitoring, active and passive surveillance, and communication strategies in drug safety.
5. To acquire knowledge of safety data generation, regulatory guidelines (ICH, CIOMS, CDSCO), and ADRs in special populations including pharmacogenomic considerations.

**Course Outcome**

**CO1:** Explain the role and importance of pharmacovigilance and describe national and international drug safety monitoring programs (e.g., WHO, PvPI).

**CO2:** Identify and classify adverse drug reactions, assess their severity, causality, predictability, and apply reporting and management techniques.

**CO3:** Utilize drug dictionaries, coding systems (e.g., MedDRA, WHO-DD), and pharmacovigilance software tools in regulatory and industrial contexts.

**CO4:** Differentiate between passive and active surveillance methods, and apply pharmacovigilance principles in vaccine safety and observational studies.

**CO5:** Interpret regulatory guidelines for pharmacovigilance (ICH, CIOMS, CDSCO), and explain drug safety considerations in paediatrics, geriatrics, pregnancy, and pharmacogenomics.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | 2 | - | - | 3 | 3 | 2 | 3 | 2 | 3 | 2 | - | 3 |
| **CO2** | 3 | 2 | - | 3 | - | - | 2 | 3 | - | 3 | - | 3 | 3 | 2 | 3 |
| **CO3** | 3 | 2 | - | 2 | 3 | - | - | 2 | - | 2 | - | 3 | 3 | 3 | 2 |
| **CO4** | 3 | - | - | 3 | 2 | - | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 |
| **CO5** | 3 | - | - | 2 | - | - | 3 | 3 | - | 3 | 2 | 3 | - | 2 | 3 |

**Quality Control and Standardization of Herbals**
**BP806ET**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP806ET** | | | | |
| **Category** | **Professional Elective Courses** | | | | |
| **Course Title** | **Quality Control and Standardization of Herbals** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VIII** |
| **Pre-Requisites** | **Basic Knowledge of Quality Control** | | | | |

**Lectures: 45**

**Course Objective:** To enable the students:

1. To know WHO guidelines for quality control of herbal drugs.
2. To know Quality assurance in herbal drug industry.
3. To know the regulatory approval process and their registration in Indian and international markets.
4. To appreciate EU and ICH guidelines for quality control of herbal drugs.
5. To standardize of herbal drugs and formulations, ensuring their safety, efficacy, and regulatory compliance

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Understand the principles and importance of quality control and standardization in herbal drug development.

**CO2:** Identify and apply various pharmacognostic, physicochemical, and analytical techniques for the evaluation of herbal raw materials and formulations.

**CO3**: Perform quality control tests including identification, purity, potency, and contamination analysis of herbal products.

**CO4:** Interpret regulatory guidelines and quality standards applicable to herbal medicines.

**CO5**: Develop skills for documentation, stability testing, and shelf-life determination of herbal drugs ensuring safety and efficacy

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |
| **CO5** | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 |

**Computer Aided Drug Design**
**BP807 ET**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP807 ET** | | | | |
| **Category** | **Professional Elective Courses** | | | | |
| **Course Title** | **Computer aided drug design** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VIII** |
| **Pre-Requisites** | **Basic Knowledge of Chemistry & Computer** | | | | |

**Lectures: 45**

**Course Objective:** To enable the students:

1. To introduce students to the stages of drug discovery and development, with a focus on lead identification and analogue-based drug design using rational and serendipitous approaches.
2. 2.To enable students to understand and apply Quantitative Structure-Activity Relationship (QSAR) principles, including physicochemical parameters, Hansch and Free-Wilson analysis, and 3D-QSAR techniques like COMFA and COMSIA.
3. To develop knowledge and skills in molecular modelling and virtual screening, including pharmacophore mapping, molecular docking (rigid/flexible/manual), and de novo drug design approaches.
4. To familiarise students with bioinformatics and chemoinformatics tools, including the use of chemical, biochemical, pharmaceutical, and ADME databases in drug design.
5. To provide a foundational understanding of molecular mechanics and quantum mechanics**,** focusing on energy minimisation methods and conformational analysis techniques used to determine global minima in drug molecules

**Course Outcomes:** At the end of this course, students will demonstrate the ability to:

**CO1:** Students will be able to explain the various stages of drug discovery and development, including rational and serendipitous approaches to lead identification and analog-based drug design.

**CO2:** Students will demonstrate the ability to apply QSAR principles by using physicochemical parameters and analytical techniques such as Hansch analysis, Free-Wilson analysis, and 3D-QSAR methods like COMFA and COMSIA.

**CO3**: Students will be able to perform molecular modeling and virtual screening techniques, including pharmacophore mapping, drug-likeness screening, and molecular docking approaches.

**CO4:** Students will demonstrate understanding of informatics tools in drug design, including bioinformatics, chemoinformatics, and the use of ADME and pharmaceutical databases.

**CO5**: Students will be able to apply molecular mechanics and quantum mechanics concepts in conformational analysis and energy minimization for optimizing drug structures

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 2 | 1 | - | 2 | 2 | - | 1 | - | 1 | 3 | 2 | 2 |
| **CO2** | 3 | 3 | - | 3 | 3 | - | 1 | 2 | - | 1 | - | 2 | 3 | 3 | 2 |
| **CO3** | 3 | 3 | - | 3 | 3 | - | 1 | 2 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| **CO4** | 3 | 2 | - | 2 | 3 | - | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 2 |
| **CO5** | 3 | 2 | - | 3 | 3 | - | 1 | 2 | - | 1 | 1 | 3 | 2 | 3 | 2 |

**Cell and Molecular Biology**
**BP808ET**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP808ET** | | | | |
| **Category** | **Professional Elective Courses** | | | | |
| **Course Title** | **Cell and Molecular Biology** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VIII** |
| **Pre-Requisites** | **Basic Knowledge of Cell and Molecular Biology** | | | | |

**Lectures: 45**

**Course Objective:** The objective of this course is to:

1. To summarize cell and molecular biology history.
2. To summarize cellular functioning and composition.
3. To describe the chemical foundations of cell biology.
4. To summarize the DNA properties of cell biology.
5. To describe protein structure and function

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Explain the structure and function of prokaryotic and eukaryotic cells, including organelles and cellular compartments.

**CO2:** Describe and analyze the molecular mechanisms governing DNA replication, transcription, translation, and gene regulation.

**CO3**: Interpret experimental data from techniques such as PCR, gel electrophoresis, DNA sequencing, and microscopy.

**CO4:** Compare and contrast cellular signaling pathways and their roles in development, immunity, and disease.

**CO5**: Evaluate the principles of cell cycle regulation, apoptosis, and cancer biology at the molecular level

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 3 |
| **CO2** | 3 | 2 | 2 | 2 | 1 | 2 | - | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 3 |
| **CO3** | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

**Cosmetic Science**
**BP809ET**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP809ET** | | | | |
| **Category** | **Professional Elective Courses** | | | | |
| **Course Title** | **Cosmetic Science** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VIII** |
| **Pre-Requisites** | **Basic Knowledge of Cosmetic Science** | | | | |

**Lectures: 45**

**Course Objective:** The objective of this course is to:

1. To understand the classification and regulatory aspects of cosmetics and cosmeceuticals
2. To learn about various cosmetic excipients and their functional roles in formulation.
3. To explore the formulation principles and ingredients used in skincare, haircare, and oral care products.
4. To gain knowledge of herbal ingredients and their role in cosmetic preparations.
5. To understand cosmetic evaluation methods and problems associated with skin, hair, and oral cavity

**Course Outcomes:** Upon successful completion of the course, students will be able to:

**CO1:** Describe the classification, evolution, and regulatory aspects of cosmetics and cosmeceuticals as per Indian and EU standards.

**CO2:** Identify and explain the roles of various cosmetic excipients used in the formulation of skincare, haircare, and oral care products.

**CO3**: Formulate basic cosmetic products such as creams, shampoos, toothpastes, and deodorants, and understand their active ingredients and mechanisms of action.

**CO4:** Analyze the applications of herbal ingredients in cosmetic products and interpret BIS specifications and analytical methods for common cosmetics.

**CO5**: Evaluate cosmetic products using standard instruments and assess cosmetic conditions related to skin, hair, and oral cavity with appropriate treatment strategies

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 2 | 2 | 1 | 2 | 3 | 2 | 3 | 3 | - | 1 | 2 | - | 1 |
| **CO2** | 3 | 1 | 2 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 1 | 1 |
| **CO3** | 2 | - | 1 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | - | 1 | 2 | - | - |
| **CO4** | 2 | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 3 | 2 | - | - | 3 | 1 | 1 |
| **CO5** | 3 | - | 2 | 3 | 2 | 2 | 3 | 1 | 2 | 3 | 1 | 1 | 2 | 1 | 1 |

**Pharmacological Screening Method (Experimental Pharmacology)**
**BP-810ET**

| | | | | | |
|---|---|---|---|---|---|
| **Degree** | **Bachelor in Pharmacy** | | | | |
| **Course Code** | **BP-810ET** | | | | |
| **Category** | **Professional Elective Courses** | | | | |
| **Course Title** | **Pharmacological Screening Method** | | | | |
| **Scheme & Credits** | **L** | **T** | **P** | **Credit** | **Semester** |
| | **3** | **1** | **0** | **4** | **VIII** |
| **Pre-Requisites** | **Basic Knowledge of Experimental Pharmacology** | | | | |

**Lectures: 45**

**Course Objectives:**

1. To understand the ethical guidelines (CPCSEA and OECD) for handling laboratory animals and the use of various species in pharmacological research.
2. To learn techniques related to drug administration, blood collection, euthanasia, and preparation of drug formulations in preclinical models.
3. To gain knowledge of screening models used for evaluating drugs acting on CNS, ANS, CVS, and various other systems.
4. To understand the principles of designing and conducting preclinical experiments using appropriate control groups, species, and dosing strategies.
5. To develop skills in basic research methodology, data interpretation, statistical analysis, and graphical data presentation for preclinical studies.

**Course Outcome**

**CO1:** Describe the CPCSEA and OECD guidelines and explain the ethical use of animals, including species selection, handling, and experimental procedures.

**CO2:** Demonstrate knowledge of drug administration techniques, blood collection, and euthanasia methods in laboratory animals.

**CO3:** Select and apply appropriate preclinical screening models for evaluating drugs targeting CNS, ANS, CVS, and other physiological systems.

**CO4:** Design and conduct preclinical studies with proper controls, dose selection, and grouping based on pharmacological rationale.

**CO5:** Analyze and interpret preclinical data using biostatistical tools such as t-test and ANOVA, and effectively present findings using graphs.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | 2 | - | - | 3 | 3 | - | 3 | 2 | 3 | - | - | 3 |
| **CO2** | 3 | 2 | - | 2 | 2 | - | 2 | 2 | - | 2 | - | 3 | 2 | 3 | 3 |
| **CO3** | 3 | 3 | - | 3 | 2 | - | - | 2 | - | 3 | - | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 2 | 3 | 3 | - | - | 2 | - | 3 | - | 3 | 3 | 3 | 3 |
| **CO5** | 3 | - | 2 | 3 | 3 | - | - | 2 | 2 | 2 | - | 3 | 2 | 3 | 3 |

## Advanced Instrumentation Techniques

## BP-811ET

| Degree | Bachelor in Pharmacy | | | | |
|---|---|---|---|---|---|
| Course Code | BP-811ET | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | Advanced Instrumentation Techniques | | | | |
| Scheme & Credits | L | T | P | Credit | Semester |
| | 3 | 1 | 0 | 4 | VIII |
| Pre-Requisites | Basic Knowledge of Advanced Instrumentation | | | | |

**Lectures: 45**

**Course Objectives:**

1. Understand the principles and applications of advanced instruments used in qualitative and quantitative drug analysis.
2. Gain insights into chromatographic and spectroscopic techniques, including hyphenated methods like LC-MS/MS and GC-MS/MS.
3. Learn the calibration and validation procedures for instruments as per ICH and USFDA guidelines.
4. Apply knowledge of thermal analysis, X-ray diffraction, and radioimmunoassay in pharmaceutical contexts.
5. Master extraction techniques such as solid-phase and liquid-liquid extraction for sample preparation.

**Course Outcome:**

Upon successful completion of the course, students will be able to:

**CO1:** Understand the principles, instrumentation, and working of advanced analytical techniques such as UV-Vis, IR, NMR, Mass Spectrometry, and Chromatography.

**CO2:** Apply instrumental techniques to analyze pharmaceutical substances for identity, purity, and content determination.

**CO3:** Evaluate and interpret data obtained from various instrumental methods to ensure accuracy and precision in pharmaceutical analysis.

**CO4:** Compare the advantages, limitations, and applications of different analytical instruments used in drug testing and research.

**CO5:** Demonstrate problem-solving and decision-making skills in selecting appropriate instrumentation techniques for specific analytical challenges in the pharmaceutical industry.

**CO-PO-PSO Matrix:**

| CO / PO & PSO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | 2 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 2 |
| **CO3** | 3 | 2 | 2 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 3 | 2 |
| **CO4** | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 |
| **CO5** | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | 3 |