PROGRESSIVE EDUCATION SOCIETY'S MODERN COLLEGE OF PHARMACY, NIGDI, PUNE

(AUTONOMOUS)

AFFILIATED TO

SAVITRIBAI PHULE PUNE UNIVERSITY

FACULTY OF SCIENCE AND TECHNOLOGY

RULES & SYLLABUS

FIRST YEAR BACHELOR OF PHARMACY (B. Pharm.) COURSE

As per NEP-2020 (WITH EFFECT FROM ACADEMIC YEAR 2026-2027)

GRADUATE ATTRIBUTES (GA's)

Graduate Attributes (GAs) represent the key competencies and professional qualities expected from every pharmacy graduate, irrespective of the program such as D.Pharm, B.Pharm,Pharm.D or M.Pharm. While the level of mastery may vary, these attributes remain common and guide the overall outcomes of pharmacy education.

1. **Pharmaceutical Knowledge Proficiency**

Strong grounding in core and applied pharmaceutical sciences and practice.

2. **Scientific and Analytical Thinking**

Ability to critically analyze data, processes, and clinical information.

3. **Ethical and Professional Integrity**

Commitment to ethical conduct, patient safety, and regulatory compliance.

4. **Patient-Centered Orientation**

Sensitivity to patient needs, cultural diversity, and healthcare outcomes.

5. **Industry and Practice Readiness**

Preparedness for roles in industry, hospitals, community pharmacy, research, and regulation.

6. **Digital and Technological Awareness**

Familiarity with AI, data analytics, automation, and modern pharmaceutical technologies.

7. **Effective Communication Skills**

Clear, empathetic, and professional interaction across healthcare settings.

8. **Teamwork and Leadership Skills**

Ability to collaborate, lead, and contribute constructively in teams.

9. **Innovation and Problem-Solving Mindset**

Capability to identify problems and develop practical, evidence-based solutions.

10. **Lifelong Learning Orientation**

Motivation for continuous professional development and higher education.

PROGRAMME EDUCATIONAL OBJECTIVES

The Bachelor of Pharmacy (B. Pharm) programme aims to prepare graduates with strong knowledge of pharmaceutical sciences, practical skills, professional ethics, and a commitment to patient care and public health. The graduates of the programme are expected to achieve the following Programme Educational Objectives (PEOs):

PEO 1: Apply fundamental knowledge of pharmaceutical sciences to work effectively in pharmacy practice, pharmaceutical industry, research, and related healthcare fields.

PEO 2: Demonstrate practical skills in drug formulation, manufacturing, pharmaceutical analysis, quality control, and pharmacy practice.

PEO 3: Use scientific reasoning and problem-solving skills to address challenges related to medicines, drug development, and patient care.

PEO 4: Practice pharmacy with ethical responsibility, good communication, teamwork, and concern for patient safety and public health.

PEO 5: Pursue continuous learning and professional development to keep pace with advances in pharmaceutical sciences and healthcare.

PROGRAMME OUTCOMES (POs)

Bachelor of Pharmacy (B. Pharm)

PO1. Pharmacy Knowledge

Apply comprehensive knowledge of pharmaceutical sciences, biomedical sciences, pharmacology, pharmacognosy, pharmaceutical chemistry, pharmacy practice, and manufacturing processes to understand drug actions, disease mechanisms, and therapeutic interventions and solve professional problems across diverse pharmacy domains.

PO2. Problem Analysis, Critical Thinking and Evidence-Based Decision Making

Identify, formulate, analyze, and interpret complex pharmaceutical problems using principles of scientific inquiry, critical thinking, biostatistics, and evidence-based reasoning to arrive at defensible solutions and informed decision-making.

PO3. Pharmaceutical Skills & Practice

Demonstrate proficiency in formulation development, analysis, quality assurance, pharmacovigilance, clinical pharmacotherapy, and pharmacy practice through laboratory work, simulations, internships, and experiential learning.

PO4. Modern Tools, AI & Digital Competence

Select, apply, and evaluate modern pharmaceutical tools, analytical instruments, digital technologies, artificial intelligence, machine learning, and computational techniques with awareness of their limitations and ethical use.

PO5. Research & Innovation

Design and conduct basic research, analyze data, interpret results, and contribute to innovation through research projects, startup initiatives, and problem-based learning relevant to industry, healthcare, and society.

PO6. Professional Ethics & Human Values

Apply ethical principles, professional integrity, regulatory frameworks, intellectual property rights, and universal human values while addressing professional, legal, and societal responsibilities in pharmacy practice.

PO7. Communication & Interpersonal Skills

Communicate effectively with patients, healthcare professionals, industry personnel, and society through clear documentation, reports, presentations, counseling, teamwork, and interdisciplinary collaboration.

PO8. Leadership, Management & Entrepreneurship

Demonstrate leadership, teamwork, planning, and managerial skills in pharmaceutical organizations, healthcare systems, quality systems, and entrepreneurial ventures, including innovation and startup ecosystems.

PO9. Pharmacist & Society

Evaluate public health, patient safety, legal, and societal issues related to pharmacy practice and contribute responsibly to healthcare delivery, rational use of medicines, and improvement of community health outcomes.

PO10. Environment and sustainability:

Recognize and address the environmental impact of pharmaceutical manufacturing, use, and disposal, and promote environmentally responsible practices, green pharmacy principles, and sustainable healthcare aligned with the United Nation's Sustainable Development Goals (SDGs).

PO11. Life-Long Learning & Professional Development

Recognize the need for continuous learning and demonstrate the ability to engage in self-directed, life-long learning to adapt to technological advancements, evolving healthcare needs, and professional growth.

REGULATION

1. Short title and commencement

This regulation shall be called as "The Regulation for the B. Pharm. Degree Programme Choice Based Credit System (CBCS) as per National Education Policy 2020 of the Pharmacy Council of India, New Delhi". It shall come into effect immediately upon notification by the Pharmacy Council of India. The regulations framed are subject to modification from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B. Pharm:

i. A candidate shall have passed the 10+2 examination conducted by the respective State or Central Government authorities, or any equivalent examination recognized by bodies such as the Association of Indian Universities (AIU) or the Council of Boards of School Education in India (COBSE), including wings such as IGNOU and NIOS, with English as one of the subjects and with Physics and Chemistry as compulsory subjects, along with either Mathematics or Biology.

ii. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B. Pharm lateral entry (to third semester):

Candidate shall have passed in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the Programme

The course of study for B. Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the Programme shall be prescribed from time to time by Pharmacy Council of India.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semester shall consist of not less than 90 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year. A break of not less than 7 days shall be provided between the semesters.

6. Attendance and progress

A candidate must maintain a minimum of 75% attendance in each individual course. Attendance for theory and practical components shall be considered separately. Only candidates who satisfactorily complete the prescribed course requirements shall be eligible to appear for the respective examinations.

7. Programme/Course credit structure

As per the Choice Based Credit System (CBCS), certain quantum of academic work viz. theory classes, practical classes etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is

dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra- curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1. Credit assignment

7.1.1. Theory and Practical courses

Courses are broadly classified as Theory, Practical, Project and Internship. Theory (T) courses consist of lecture (L) hours, while Practical (P) courses consist of hours spent in the laboratory. The Credits (C) assigned to a course dependent on the number of instructional hours per week and are calculated using a multiplier of one (1) for lecture hours, and a multiplier of one-half (1/2) for practical (laboratory) hours. For example, a theory course having three lectures per week throughout the semester carries 3credits. Similarly, a practical course with four laboratory hours per week throughout semester carries 2 credits. If the calculated credit value results in a fraction of 0.5 or below, the lower integer value will be assigned as the credit. Every 30 hours spent on internship (I) and projects shall be considered equivalent to 1 credit.

7.1.2 Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 193. These credits are distributed across Theory courses, Practical courses, Internship and Project over the duration of eight semesters. The semester-wise distribution of credits is presented in Table IX. Courses generally progress in sequences, building competencies and their positioning indicate certain levels of academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall take additional courses, namely Healthcare Psychology and Communication Skills (Theory and Practical) and Basics of Python Programming for Pharmaceutical Sciences (Theory) during Semester III, and Applied Biostatistics and Data Analytics for pharmaceutical Sciences (Theory) during Semester IV of the programme. The lateral entry student shall be awarded 47 credit points, equivalent to the cumulative credits earned as per the scheme of their Diploma in Pharmacy (D. Pharm.) programme, upon successful completion of the above-mentioned courses. Out of the total 47 credits, 41 credits shall be accounted for the Diploma programme, and the remaining 6 credits shall be awarded for the above-mentioned additional courses. The 41 credits accounted for the lateral entry students shall be recorded in the Semester III marks sheet.

8. Academic work

A regular record of attendance in Theory, Practical, Internship and Research Projects shall be maintained by the teaching staff of respective courses.

9. Course of study

The course of study for B. Pharm shall include Semester wise Theory & Practical as given in Tables– I to VIII. The number of hours allotted to each theory and practical course in any semester shall not be less than that shown in Tables – I to VIII.

Table-I: Course of study for semester I

Course Code	Name of the course	No. of hours per week (L/P)	Credit points
BP101T	Basics of Python Programming for Pharmaceutical Sciences (Theory)	2	2
BP102T	General Pharmacy (Theory)	3	3
BP103T	Healthcare Psychology and Communication Skills (Theory)	1	1
BP104T	Human Anatomy, Physiology and Pathophysiology I (Theory)	4	4
BP105T	Introduction to Pharmacognosy (Theory)	3	3
BP106T	Pharmaceutical Inorganic and Analytical Chemistry (Theory)	3	3
BP107P	General Pharmacy (Practical)	3	1
BP108P	Healthcare Psychology and Communication Skills (Practical)	2	1
BP109P	Human Anatomy, Physiology and Pathophysiology I (Practical)	3	1
BP110P	Introduction to Pharmacognosy (Practical)	3	1
BP111P	Pharmaceutical Inorganic and Analytical Chemistry (Practical)	3	1
Total		**30**	**21**

Table-II: Course of study for semester II

Course Code	Name of the course		No. of hours per week (L/P)	Credit points
BP201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)		2	2
BP202T	Biochemistry (Theory)		3	3
BP203T	Human Anatomy, Physiology and Pathophysiology II (Theory)		4	4
BP204T	Pharmaceutical Organic Chemistry (Theory)		4	4
BP205T	Pharmacognosy and Phytochemistry (Theory)		4	4
BP206T	Physical Pharmaceutics (Theory)		3	3
BP207P	Biochemistry (Practical)		3	1
BP208P	Human Anatomy, Physiology and Pathophysiology II (Practical)		3	1
BP209P	Pharmaceutical Organic Chemistry (Practical)		3	1
BP210P	Pharmacognosy and Phytochemistry (Practical)		3	1
BP211P	Physical Pharmaceutics (Practical)		3	1
BP212P SEC*	BP212P SEC1	Communication Skills	2	1
	BP212P SEC2	Mental Well-Being, Stress & Conflict Management		
	BP212P SEC3	Fundamentals of Computer Operations		
Total			**37**	**26**

Table-III: Course of study for semester III

Course Code	Name of the course		No. of hours per week (L/P)	Credit points
BP301T	Introduction to Machine Learning in Pharmaceutical Sciences (Theory)		2	2
BP302T	Environmental Sciences (Theory)		1	1
BP303T	Ethics and Universal Human Values (Theory)		1	1
BP304T	General Pharmacology (Theory)		3	3
BP305T	Heterocyclic Compounds and Stereochemistry (Theory)		3	3
BP306T	Pharmaceutical Dosage Forms I (Theory)		3	3
BP307T	Pharmaceutical Engineering (Theory)		3	3
BP308T	Pharmaceutical Microbiology (Theory)		3	3
BP309P	General Pharmacology (Practical)		4	2
BP310P	Heterocyclic Compounds and Stereochemistry (Practical)		4	2
BP311P	Pharmaceutical Dosage Forms I (Practical)		3	1
BP312P AEC*	BP312P AEC1	Nutraceuticals and Functional Foods	2	1
	BP312P AEC2	Food Analysis		
	BP312P AEC3	Yoga and Life Sciences		
Total			**32**	**25**

Table-IV: Course of study for semester IV

Course Code	Name of the course	No. of hours per week (L/P)	Credit points
BP401T	Herbal Drug Technology (Theory)	3	3
BP402T	Medicinal Chemistry (Theory)	3	3
BP403T	Pharmaceutical Biotechnology (Theory)	3	3
BP404T	Social Pharmacy and Public Health (Theory)	2	2
BP405T	Systemic Pharmacology I (Theory)	3	3
BP406P	Herbal Drug Technology (Practical)	3	1
BP407P	Medicinal Chemistry (Practical)	3	1
BP408P	Pharmaceutical Biotechnology (Practical)	3	1
BP409P	Social Pharmacy and Public Health (Practical)	2	1
BP410P	Systemic Pharmacology I (Practical)	3	1
BP411I	Internship (Mandatory)	8	4
Total		**28**	**23**

Table-V: Course of study for semester V

Course Code	Name of the course	No. of hours per week (L/P)	Credit points
BP501T	Biomedicinal Chemistry (Theory)	3	3
BP502T	Industrial Pharmacognosy (Theory)	3	3
BP503T	Innovation and Startup Ecosystem (Theory)	2	2
BP504T	Pharmaceutical Dosage Form II (Theory)	2	2
BP505T	Pharmaceutical Quality Assurance (Theory)	3	3
BP506T	Systemic Pharmacology II (Theory)	3	3
BP507P	Biomedicinal Chemistry (Practical)	4	2
BP508P	Industrial Pharmacognosy (Practical)	3	1
BP509P	Pharmaceutical Dosage Form II (Practical)	3	1
BP510P	Systemic Pharmacology II(Practical)	4	2
Total		**30**	**22**

Table-VI: Course of study for semester VI

Course Code	Name of the course		No. of hours per week (L/P)	Credit points
BP601T	Advanced Pharmacognosy (Theory)		3	3
BP602T	Biopharmaceutics and Pharmacokinetics (Theory)		3	3
BP603T	Intellectual Property Rights (Theory)		2	2
BP604T	AI applications in Pharmaceutical Sciences (Theory)		2	2
BP605T	Pharmaceutical Analysis (Theory)		3	3
BP606T	Pharmaceutical Jurisprudence (Theory)		3	3
BP607T AEC*	BP607T AEC1	Green Chemistry	1	1
	BP607T AEC2	Materiovigilance and Hemovigilance		
	BP607T AEC3	Scientific Writing		
	BP607T AEC4	Drug Store and Business Management		
	BP607T AEC5	Career Building in Cultivation of Medicinal Plants		
	BP607T AEC6	Active Pharmaceutical Ingredients and Excipient Sciences		
BP608P	Biopharmaceutics and Pharmacokinetics (Practical)		3	1
BP609P	Pharmaceutical Analysis (Practical)		4	2
BP610P SEC*	BP610P SEC1	Computer-Aided Drug Design	2	1
	BP610P SEC2	Analytical Method Development and Validation		
	BP610P SEC3	Principles of Preclinical Studies		
BP611P VAC*	BP611P VAC1	Professional Skills	2	1
	BP611P VAC2	Process Analytical Technology (PAT) and QbD in Formulation Science		
BP612I	Internship (Mandatory)		8	4
Total			**28**	**26**

Table-VII: Course of study for semester VII

Course Code	Name of the course		No. of hours per week (L/P)	Credit points
BP701T	Biostatistics Research methodology (Theory)		3	3
BP702T	Cosmetics and Cosmeceuticals (Theory)		2	2
BP703T	AI in Clinical applications (Theory)		2	2
BP704T	Modern Analytical Techniques (Theory)		3	3
BP705T	Pharmacovigilance (Theory)		3	3
BP706T	Pharmacy Practice (Theory)		3	3
BP707T	Regulatory Affairs (Theory)		2	2
BP708T AEC	BP708T AEC1	Current Good Manufacturing Practices (cGMP)	1	1
	BP708T AEC2	Pharmaceutical Automation		
	BP708T AEC3	Modern Techniques in Cellular Biology		
	BP708T AEC4	Medical Devices		
	BP708T AEC5	Transformation of Food Waste into Medicinal Products		
	BP708T AEC6	Biosimilars, Vaccines & Macromolecules		
BP709P	Modern Analytical Techniques (Practical)		3	1
BP710RP	Research Project		-	6
Total			**22**	**26**

Table-VIII: Course of study for semester VIII

Course Code	Name of the course		No. of hours per week (L/P)	Credit points
BP801T	Ethical Considerations and Translational Applications of AI in Pharmacy (Theory)		2	2
BP802T	Clinical Pharmacotherapeutics (Theory)		2	2
BP803T	Industrial Pharmacy and Facility Design (Theory)		3	3
BP804T	Pharmaceutical Management (Theory)		2	2
BP805T	Sterile Dosage Forms and Novel Drug Delivery System (Theory)		3	3
BP806T AEC*	BP806T AEC1	Pharmaceutical Packaging	2	2
	BP806T AEC2	Supply Chain Management		
	BP806T AEC3	Industrial Safety and Waste Management		
	BP806T AEC4	Traditional Healing Practices of India		
	BP806T AEC5	Futuristic Pharma through AR/VR: Pharma 4.0		
	BP806T AEC6	Herbal Cosmetics for Industry Perspective		
BP807P	Pharmaceutical Marketing Skills (Practical)		2	1
BP808P	Sterile Dosage Forms and Novel Drug Delivery System (Practical)		4	2
BP809P VAC*	BP809P VAC1	Cleaning Validation	2	1
	BP809P VAC2	Basic Training in Aseptic Handling Techniques		
	BP809P VAC3	Impurity Profiling		
BP810RP	Research Project		-	6
Total			22	24

Table-IX: Total Credits per Semester

Semester	Total Credits
I	21
II	26
III	25
IV	23
V	22
VI	26
VII	26
VIII	24
Grand Total	193

Note: Earning total credits [193] as mentioned above are mandatory for award of the degree. However, Institute/University has the liberty to offer additional courses as per their mandates or may also offer additional credits through various MOOCs upon approval of their respective academic council.

10. Programme Committee and Internal Examination Committee

10.1Programme Committee

1. The B. Pharm. Programme shall have a Programme Committee constituted by the Head of the Institution/Principal in consultation with all the Heads of the Departments and reconstituted annually.

2. The composition of the Programme Committee shall be as follows:
   - The Principal/HoI shall serve as the Chairperson
   - One senior teacher from any department shall act as the B. Pharm Coordinator
   - One teacher from each department offering B. Pharm courses and
   - Four student representatives of the programme (one from each academic year), nominated by the Head of the Institution.

3. The Programme Committee shall meet at least twice in every semester to perform the following duties.

4. Duties of the Programme Committee (not limited to):
   i. Periodically reviewing the progress of classes and attendance.
   ii. Discussing problems concerning the curriculum, syllabus, and conduct of classes.
   iii. Communicating its recommendations on academic matters to the Head of the Institution, with such communications being duly recorded.
   iv. Periodically reviewing and monitoring the attainment of Programme Outcomes and Course Outcomes along with Bloom's Taxonomy Levels and/or Miller's Pyramid.
   v. Encouraging the use of ICT tools and providing e-learning resources for higher-order learning.
   vi. Ensuring effective implementation of participative, problem-based, experiential

learning, and innovative pedagogical approaches for effective outcomes.

10.2 Internal Examination Committee

1. The B. Pharm. Programme shall have an Internal Examination Committee constituted by the Principal / HoI in consultation with all the Heads of the Departments and may be reconstituted as and when necessary.
2. The composition of the Internal Examination Committee shall be as follows:
    - Principal / HoI – Chairperson
    - B. Pharm Programme Coordinator – Member Secretary
    - One senior faculty member from each department involved in B. Pharm teaching Members
    - Examination Cell In-charge – Member
3. The Committee shall meet periodically, before each Sessional Examination (Internal Assessment) and before the end-semester examination.
4. Duties of the Internal Examination Committee (not limited to):
    i. Plan and approve the internal assessment calendar for all semesters.
    ii. Ensure uniformity, transparency, and fairness in continuous assessment, sessional, and practical examinations.
    iii. Moderation of sessional question papers and assessment tools in alignment with programme and course outcomes, incorporating Bloom's Taxonomy Levels and/or Miller's Pyramid.
    iv. Monitor the conduct and evaluation of theory, practical, internship, and project assessments.
    v. Ensure compliance with PCI regulations, university ordinances, and NEP-2020 assessment reforms.
    vi. Promote outcome-based, skill-oriented, and innovative assessment methods.
    vii. Review, moderate, and finalize internal assessment marks prior to submission to the university.
    viii. Address student grievances related to internal assessments in a timely and structured manner.
    ix. Maintain proper records, reports, and minutes related to internal examinations and assessments.
    x. Recommend remedial measures and academic support as and when required.

10.3 Scheme for credit based marks distribution for assessment

The general scheme for credit wise marks distribution is as given below. The detailed scheme for internal assessment and end semester examinations is given in Table – X (a-h).

Credits	Maximum Marks	Internal Assessment	External Assessment
4	100	40	60
3	75	30	45
2 or 1	50	20	30

11. End semester examinations

The End Semester Examinations for each theory and practical course through semesters I to VIII shall be conducted by the university. (Table-X).

Table-Xa: Semester I

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	End Sem Exam Duration	Total Marks
BP101T	Basics of Python Programming for Pharmaceutical Sciences (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP102T	General Pharmacy (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP103T	Healthcare Psychology and Communication Skills (Theory)	1	10	10	1 Hr	20	30	1.5 Hr	50
BP104T	Human Anatomy, Physiology and Pathophysiology I (Theory)	4	20	20	1 Hr	40	60	3 Hr	100
BP105T	Introduction to Pharmacognosy (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP106T	Pharmaceutical Inorganic and Analytical Chemistry (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP107P	General Pharmacy (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

BP108P	Healthcare Psychology and Communication Skills (Practical)	1	10	10	3 Hr	20	30	3Hr	50
BP109P	Human Anatomy, Physiology and Pathophysiology I (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP110P	Introduction to Pharmacognosy (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP111P	Pharmaceutical Inorganic and Analytical Chemistry (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

Table-Xb: Semester II

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP202T	Biochemistry (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP203T	Human Anatomy, Physiology and Pathophysiology II (Theory)	4	20	20	1 Hr	40	60	3 Hr	100
BP204T	Pharmaceutical Organic Chemistry (Theory)	4	20	20	1 Hr	40	60	3 Hr	100
BP205T	Pharmacognosy and Phytochemistry (Theory)	4	20	20	1 Hr	40	60	3 Hr	100
BP206T	Physical Pharmaceutics (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP207P	Biochemistry (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP208P	Human Anatomy, Physiology and Pathophysiology II (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP209P	Pharmaceutical Organic Chemistry (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

BP210P	Pharmacognosy and Phytochemistry (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP211P	Physical Pharmaceutics (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP212P	SEC – Elective 1 (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

Table-Xc: Semester III

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP301T	Introduction to Machine Learning in Pharmaceutical Sciences (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP302T	Environmental Science (Theory)	1	10	10	1 Hr	20	30	1.5 Hr	50
BP303T	Ethics and Universal Human Values (Theory)	1	10	10	1 Hr	20	30	1.5 Hr	50
BP304T	General Pharmacology (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP305T	Heterocyclic Compounds and Stereochemistry (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP306T	Pharmaceutical Dosage Forms I (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP307T	Pharmaceutical Engineering (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP308T	Pharmaceutical Microbiology (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP309P	General Pharmacology (Practical)	2	10	10	4 Hr	20	30	4 Hr	50

BP310P	Heterocyclic Compounds and Stereochemistry (Practical)	2	10	10	4 Hr	20	30	4 Hr	50
BP311P	Pharmaceutical Dosage Forms I (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP312P	AEC – Elective 2 (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

Table-Xd: Semester IV

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP401T	Herbal Drug Technology (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP402T	Medicinal Chemistry (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP403T	Pharmaceutical Biotechnology (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP404T	Social Pharmacy and Public Health (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP405T	Systemic Pharmacology I (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP406P	Herbal Drug Technology (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP407P	Medicinal Chemistry (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP408P	Pharmaceutical Biotechnology (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

BP409P	Social Pharmacy and Public Health (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP410P	Systemic Pharmacology I (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP411I	Internship (Mandatory)	4	Refer Section 22	–	–	–	100	4 Hr	100

Table-Xe: Semester V

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP501T	Biomedicinal Chemistry (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP502T	Industrial Pharmacognosy (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP503T	Innovation and Startup Ecosystem (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP504T	Pharmaceutical Dosage Forms II (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP505T	Pharmaceutical Quality Assurance (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP506T	Systemic Pharmacology II (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP507P	Biomedicinal Chemistry (Practical)	2	10	10	4 Hr	20	30	4 Hr	50
BP508P	Industrial Pharmacognosy (Practical)	1	10	10	3 Hr	20	30	3 Hr	50

BP509P	Pharmaceutical Dosage Forms II (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP510P	Systemic Pharmacology II (Practical)	2	10	10	4 Hr	20	30	4 Hr	50

Table-Xf: Semester VI

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP601T	Advanced Pharmacognosy (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP602T	Biopharmaceutics and Pharmacokinetics (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP603T	Intellectual Property Rights (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP604T	AI Applications in Pharmaceutical Sciences (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP605T	Pharmaceutical Analysis (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP606T	Pharmaceutical Jurisprudence (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP607T	AEC – Elective 3 (Theory)	1	10	10	1 Hr	20	30	1.5 Hr	50
BP608P	Biopharmaceutics and Pharmacokinetics (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP609P	Pharmaceutical Analysis (Practical)	2	10	10	4 Hr	20	30	4 Hr	50

BP610P	SEC – Elective 4 (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP611P	VAC – Elective 5 (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP612I	Internship (Mandatory)	4	Refer Section 22	–	–	–	100	4 Hr	100

Table-Xg: Semester VII

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP701T	Biostatistics and Research Methodology (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP702T	Cosmetics and Cosmeceuticals (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP703T	AI in Clinical Applications (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP704T	Modern Analytical Techniques (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP705T	Pharmacovigilance (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP706T	Pharmacy Practice (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP707T	Regulatory Affairs (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP708T	AEC – Elective 6 (Theory)	1	10	10	1 Hr	20	30	1.5 Hr	50
BP709P	Modern Analytical Techniques (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP710RP	Research Project	6	Refer Section 21	–	–	–	150	4 Hr	150

Table-Xh: Semester VIII

Course Code	Name of the Course	Credit	Continuous Mode (Marks)	Sessional Exam (Marks)	Sessional Duration	Internal Total	End Semester Marks	Exam Duration	Total Marks
BP801T	Ethical Considerations and Translational Applications of AI in Pharmacy (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP802T	Clinical Pharmacotherapeutics (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP803T	Industrial Pharmacy and Facility Design (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP804T	Pharmaceutical Management (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP805T	Sterile Dosage Forms and Novel Drug Delivery System (Theory)	3	15	15	1 Hr	30	45	2 Hr	75
BP806T	AEC – Elective 7 (Theory)	2	10	10	1 Hr	20	30	1.5 Hr	50
BP807P	Pharmaceutical Marketing Skills (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP808P	Sterile Dosage Forms and Novel Drug Delivery System (Practical)	2	10	10	4 Hr	20	30	4 Hr	50
BP809P	VAC – Elective 8 (Practical)	1	10	10	3 Hr	20	30	3 Hr	50
BP810RP	Research Project	6	Refer Section 21	–	–	–	150	4 Hr	150

11.2. Internal assessment: Continuous internal assessment and sessional examination

The marks allocated for Continuous mode of Internal assessment and Sessional examination shall be awarded as per the scheme given below.

Table–XI: Scheme for awarding internal assessment: Continuous mode and Sessional

a. Theory

Theory– Internal assessment pattern of marks distribution

Theory		Internal assessment pattern of marks distribution			
Credit Type	**Max. Marks**	**Total**	**Attendance** (Refer Table– XII) and Student– Teacher Interaction	**Academic Activities** (Average of any three: quiz, assignment, open book test, field work, group discussion, seminar, etc.)	**Sessional** (Average of two tests) Duration 1 Hour
4	100	40	10	10	20
3	75	30	7.5	7.5	15
2 or 1	50	20	05	05	10

b. Practical

Practical – Internal assessment pattern of marks distribution

Theory		Internal assessment pattern of marks distribution			
Credit Type	**Max. Marks**	**Total**	**Attendance** (Refer Table– XII) and Student– Teacher Interaction	**Based on Practical Records, Regular viva voce, etc.**	**Sessional** (Average of two tests) Duration – As per allotted hours#)
2 or 1	50	20	05	05	10

For practical courses (core as well as elective), those having four hours per week shall have a four-hour duration for the sessional and end-semester examinations. Practical courses with less than four hours per week shall have a three-hour duration for the sessional and end-semester examinations.

Table–XII: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory			Practical
	4 Credit	3 Credit	2 or 1 Credit	
90 – 100	4	3.5	2	2
85 – 89	3	2.5	1.5	1.5
75 – 84	2	1.5	1	1
Less than 75	0	0	0	0

11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s)/University. The scheme of question paper for theory and practical Sessional examinations is given in Table XIII– XIV below.

Table–XIII: Internal Assessment Question Paper Pattern (Theory)

Type of questions	4 Credit Course	3 Credit Course	2 or 1 Credit Course
I. Multiple Choice Questions (MCQs) Or Objective Type Questions	4×1 Mark each or 2×2 Marks each (Compulsory)	2×1 Mark each (Compulsory)	2×1 Mark each (Compulsory)
II. Short Answers	2×3 Marks each (2 out of 3)	2×3 Marks each (2 out of 3)	1×3 Marks each (1 out of 2)
III. Long Answers	1×10 Marks each (1 out of 2)	1×7 Marks each (1 out of 2)	1×5 Marks each (1out of 2)
Max. Marks	20	15	10
Duration	1 Hour	1 Hour	1 Hour

Table–XIV: Internal Assessment Question Paper Pattern (Practical)

Type of questions	2 or 1 Credit Course
Synopsis	2
Major Experiment	4
Minor Experiment	2
Viva voce	2
Max. Marks	10
Duration	As per the allotted hours in scheme

The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in Table – XI.

11.3. End semester Examination

The End semester Theory and practical examination shall be conducted as per the scheme given in Table XV– XVI as per the credits allotted.

Table–XV: End Semester Question Paper Pattern (Theory)

Type of questions	4 Credit Course	3 Credit Course	2 or 1 Credit Course
I. Multiple Choice Questions (MCQs) Or Objective Type Questions	20×1 Mark each or 10×2 Marks each (Compulsory)	10×1 Mark each (Compulsory)	10×1 Mark each (Compulsory)
II. Short Answers	5×4 Marks each (5 out of 7)	5×4 Marks each (5 out of 7)	5×2 Marks each (5 out of 7)

III. Long Answers	2×10 Marks each (2 out of 3)	2×7.5 Marks each (2 out of 3)	2×5 Marks each (2 out of 3)
Max. Marks	60	45	30
Duration	3 Hours	2 Hours	1.5 Hours

Table–XVI: End Semester Question Paper Pattern (Practical)

Type of questions	2 or 1 Credit Course
Synopsis	7.5
Major Experiment	10
Minor Experiment	5
Viva voce	7.5
Max. Marks	30
Duration	As per the allotted hours in scheme #

For practical courses (core as well as elective), those having four hours per week shall have a four-hour duration for the sessional and end-semester examinations. Practical courses with less than four hours per week shall have a three-hour duration for the sessional and end-semester examinations.

12. Promotion and award of grades

12.1. Promotion: A student shall be declared PASS and eligible to receive a grade in a course of the B.Pharm. programme if he/she secures at least 50% marks in that particular course, including internal assessment. For example, to be declared PASS and to receive a grade, the student must secure a minimum of 50 marks out of a total of 100, inclusive of internal assessment marks (continuous internal assessment and sessional examination marks) and the end-semester theory examination marks as applicable

12.2. Grace Marks and Moderation: Grace marks shall be awarded to the students as per the norms of the University, with due emphasis on promoting learner progression.

13. Carry forward of internal assessment marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However, his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed within that particular semester only. The re-conduct of sessional examinations for failed candidates shall be conducted only once for the purpose of improving their sessional marks, without changing their continuous internal assessment.

15. End semester supplementary examinations

Supplementary examination should be completed within 2 months of publishing results of regular end semester examination. The proposed end semester examinations to be conducted as per the schedule below

Table–XVI: Tentative schedule of end semester examinations

Semester	For Regular Examiantion
I, III, V and VII	November / December
II, IV, VI and VIII	May / June

16. Academic progression

Students are permitted to progress to the next semester even if they fail a course. However, to appear for the Semester VIII end semester examination, a student must have successfully completed all courses up to Semester VII. The final CGPA shall be awarded only after successful completion of all courses from Semester I to Semester VIII within the maximum duration prescribed by PCI. Lateral entry students shall successfully complete all courses from Semester III to Semester VII before appearing for the Semester VIII end semester examination

17. Grading of performance

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XVII.

Table–XVII: Letter grades and grade points equivalent to percentage of marks and performance

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A student who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

18. The Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade

Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester.

$$SGPA = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester.

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses.

$$SGPA = \frac{C1S1 + C2S2 + C3S3 + C4S4 + C5S5 + C6S6 + C7S7 + C8S8}{C1 + C2 + C3 + C4 + C5 + C6 + C7 + c8}$$

CGPA To Percentage Conversion

It is mandatory for Examining Authority to mention both, marks and SGPA and/or CGPA scores, in the marksheets. The conversion factor for calculation of CGPA into percentage should be 10.0 uniformly.

Credit Record and Transfer Mechanism

The Examining Authority shall be responsible for creation and verification of Academic Bank of Credits ID, uploading and maintenance of semester wise credits/grades and award in the ABC and National Academic Depository (NAD) to facilitate the credit transfer and redemption as per guidelines of statutory bodies.

20. Declaration of class

The classification of the degree shall be determined based on the Cumulative Grade Point Average (CGPA) obtained by the candidate, as indicated below:

- First Class with Distinction: **CGPA of 7.50 and above**
- First Class: **CGPA of 6.00 to 7.49**
- Second Class: **CGPA of 5.00 to 5.99**

21. Project work

All students shall undertake a project under the supervision of a teacher and submit a report, preferably with the involvement of an external mentor from Industry, Hospital, NABL or CDSCO-approved labs, or an Allied/Interdisciplinary field. The project shall be carried out in groups not exceeding three members. The project report must be submitted in triplicate as a typed and bound copy of no less than 25 pages. Internal and external examiners appointed by the University shall evaluate the project during the practical examinations of the respective semester(s), and students shall be evaluated in groups. Additionally, students are permitted the option to pursue a continuous research theme initiated in the seventh semester and extending through the eighth semester. Under this provision, the specific project milestones achieved by the conclusion of the seventh semester shall undergo formal evaluation by the appointed examiners during that semester's final examination.

The projects shall be evaluated as per the criteria given in **Table XVIII** and **Table XIX** below.

Table - XVIII: Evaluation of Dissertation Book

Sl. No.	Evaluation Criteria	Maximum Marks
1	Objectives of the work undertaken	10
2	Methodology adopted	20
3	Results and discussion	20
4	Conclusion and outcome	10
	Total	**60**

Table XIX. Evaluation of Dissertation Presentation

Sl. No.	Evaluation Criteria	Maximum Marks
1	Presentation of work	40
2	Communication skills	20
3	Question and answer skills	30
	Total	**90**

Explanation: The 60 marks assigned to the dissertation book shall be same for all the students in a group. However, the 90 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

22. Internship

Every candidate shall be required to complete a minimum of 240 hours of practical training, spread over a period of two semesters, in a Pharmaceutical/ Cosmetics/ Medical Devices/ Food Industry, or in a Hospital/Community Pharmacy, or any other relevant field as per the prescribed course content. He/she has to submit two internship reports which will be evaluated separately.

Certificate and Report submission: *75 Marks*
Presentation and Discussion: *25 Marks*
Total: *100 Marks*

23. Industry/Field Visits and other Co-curricular Activities.

It shall be compulsory for pharmacy Institutions to organize industrial/field visit and other co-curricular activities to promote holistic learning through participative, problem-based, experiential and innovative pedagogical methods. Students shall submit individual reports, which shall be assessed in continuous evaluation mode as part of any core course each year, as decided by the Programme Committee.

23.1Industry/Field Visits

It shall be compulsory for students to undertake at least one industrial/field visit during each year to facilities involved in the manufacturing of active pharmaceutical ingredients, excipients, pharmaceutical formulations, medical devices, food, cosmetics, government/ NABL approved drug and medical device testing laboratories or NABH accredited hospital. It shall be assured by the institutions that the facilities chosen for a particular year shall not be repeated

23.2 Memorandum of Understanding (MoU)

A formal and legally valid Memorandum of Understanding (MoU) must be executed (minimum 10) between the pharmacy Institution and pharmaceutical Industry/ government/NABL approved drug and medical device testing laboratories/ NABH accredited hospital. Out of those MoUs, 5 must be with the pharmaceutical industries.

23.3 Co-curricular Activities

It shall be compulsory for the pharmacy institution to adopt a village or a ward in the panchayath/municipal corporation and engage in community service activities. The community services shall include (but not limited to) prescription survey, awareness of rational drug use, patient counselling services or activities as per the prescribed course content.

24. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B. Pharm Programme shall not be eligible for award of ranks. Moreover, the candidates should have completed the B. Pharm Programme in minimum prescribed number of years (i.e. four years) for the award of Ranks.

25. Award of Degree

Candidates who fulfil the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

26. Duration for Completion of the Programme

The maximum period permitted for completion of the Programme shall be twice the prescribed duration of the Programme. Any student who fails to complete the Programme within this stipulated period shall be required to discontinue the course.

27. Re-admission after Break of Study

A candidate seeking re-admission to the programme after a break in studies must obtain approval from the university by paying the prescribed condonation fee. Condonation will not be granted if the break in study exceeds two years or if the student fails to complete the programme within the maximum permitted duration (N×2).

CURRICULAR STRUCTURE

T: Theory **P**: Practical **AEC**: Ability Enhancement Course **SEC**: Skill Enhancement Course **VAC**: Value Addition Course

The numeral against the T / P cell indicates the credit assigned for the course. | **T** | **3** | indicates Theory course with 3

Note:-Refer the detailed syllabus for exact course codes

Course Type	Semester I		Semester II		Semester III		Semester IV		Semester V		Semester VI		Semester VII		Semester VIII	
Core-1	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**
	General Pharmacy		Biochemistry		General Pharmacology		Herbal Drug Technology		Biomedicinal Chemistry		Biopharmaceutics and Pharmacokinetics		Modern Analytical Techniques		Sterile Dosage Form and Novel Drug Delivery Systems	
Core-2	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**2**
	General Pharmacy		Biochemistry		General Pharmacology		Herbal Drug Technology		Biomedicinal Chemistry		Biopharmaceutics and Pharmacokinetics		Modern Analytical Techniques		Sterile Dosage Form and Novel Drug Delivery Systems	
Course Type	I		II		III		IV		V		VI		VII		VIII	

Core-3	**T**	**1**	**T**	**4**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**	**T**	**3**
	Healthcare Psychology and Communication Skills		Human Anatomy, Physiology and Pathophysiology II		Heterocyclic Compounds and Stereochemistry		Medicinal Chemistry		Industrial Pharmacognosy		Pharmaceutical Analysis		Biostatistics Research methodology		Industrial Pharmacy and Facility Design	
Core-4	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**2**	**T**	**3**	**T**	**2**
	Healthcare Psychology and Communication Skills		Human Anatomy, Physiology and Pathophysiology II		Heterocyclic Compounds and Stereochemistry		Medicinal Chemistry		Industrial Pharmacognosy		Pharmaceutical Analysis		Pharmacovigilance		Clinical Pharmaco-therapeutics	
Core-5	**T**	**4**	**T**	**4**	**T**	**3**	**T**	**3**	**T**	**2**	**T**	**3**	**T**	**3**	**T**	**2**
	Human Anatomy, Physiology and Pathophysiology I		Pharmaceutical Organic Chemistry		Pharmaceutical Dosage Forms I		Pharmaceutical Biotechnology		Pharmaceutical Dosage Forms II		Advanced Pharmacognosy		Pharmacy Practice		Pharmaceutical Management	
Core-6	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**P**	**1**	**T**	**3**	**T**	**2**	**T**	**2**
	Human Anatomy, Physiology and Pathophysiology I		Pharmaceutical Organic Chemistry		Pharmaceutical Dosage Forms I		Pharmaceutical Biotechnology		Pharmaceutical Dosage Forms II		Pharmaceutical Jurisprudence		Cosmetics and Cosmeceuticals		Ethical Considerations and Translational Applications of AI in Pharmacy	
Core-7	**T**	**3**	**T**	**4**	**T**	**3**	**T**	**2**	**T**	**3**	**T**	**2**	**T**	**2**	**P**	**1**
	Introduction To Pharmacognosy		Pharmacognosy and Phytochemistry		Pharmaceutical Engineering		Social Pharmacy and Public Health		Systemic Pharmacology and Chemotherapy		Intellectual Property Rights		AI in Clinical applications		Pharmaceutical Marketing Skills	
Course Type	**I**		**II**		**III**		**IV**		**V**		**VI**		**VII**		**VIII**	

Core-8	**P**	**1**	Introduction To Pharmacognosy		**P**	**1**	Pharmacognosy and Phytochemistry		**T**	**3**	Pharmaceutical Microbiology		**P**	**1**	Social Pharmacy and Public Health		**P**	**1**	Systemic Pharmacology and Chemotherapy		**P**	**2**	AI applications in Pharmaceutical Sciences		**T**	**2**	Regulatory Affairs	—
Core-9	**T**	**3**	Pharmaceutical Inorganic and Analytical Chemistry		**T**	**3**	Physical Pharmaceutics		**T**	**2**	Introduction to Machine Learning in Pharmaceutical Sciences		**T**	**2**	Systemic Pharmacology I		**T**	**3**	Pharmaceutical Quality Assurance		—		—		—		—
Core-10	**P**	**1**	Pharmaceutical Inorganic and Analytical Chemistry		**P**	**1**	Physical Pharmaceutics		**T**	**1**	Environmental Science		**P**	**1**	Systemic Pharmacology I		**T**	**2**	Innovation and Startup Ecosystem		—		—		—	
Core-11	**T**	**2**	Basics of Python Programming for Pharmaceutical Sciences (Theory)		**T**	**3**	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences		**T**	**1**	Ethics and Universal Human Values		—				—				—		—		—		—
Internship	—		—		—		—		—		—		—	4	Internship (Mandatory)		—		—		—	4	Internship (Mandatory)		—		—	
Research	—		—		—		—		—		—		—		—		—		—		—		—		—	6	—	6
	—		—		—		—		—		—		—		—		—		—		—		—		Research Project		Research Project	
Course Type	**I**		**II**						**III**				**IV**				**V**				**VI**				**VII**		**VIII**	

AEC	—	—	P	1	—	—	**T**	**1**	T	1	T	2
	—	—	Elective 2		—	—	Elective 3		Elective 6		Elective 7	
SEC	—	P	1	—	—	—	**P**	**1**	—		—	
	—	Elective 1		—	—	—	Elective 4		—		—	
VAC	—	—		—	—	—	**P**	**1**	—		P	1
		—		—	—	—	Elective 5		—		Elective 8	
Credits per semester	**21**	**23**		**23**	**25**	**25**	**26**		**26**		**24**	
Total Credits	**193**											

Semester I

Course Code	Name of the course	No. of hours per week (L/P)	Credit points
BP101T	Basics of Python Programming for Pharmaceutical Sciences (Theory)	2	2
BP102T	General Pharmacy (Theory)	3	3
BP103T	Healthcare Psychology and Communication Skills (Theory)	1	1
BP104T	Human Anatomy, Physiology and Pathophysiology I (Theory)	4	4
BP105T	Introduction to Pharmacognosy (Theory)	3	3
BP106T	Pharmaceutical Inorganic and Analytical Chemistry (Theory)	3	3
BP107P	General Pharmacy (Practical)	3	1
BP108P	Healthcare Psychology and Communication Skills (Practical)	2	1
BP109P	Human Anatomy, Physiology and Pathophysiology I (Practical)	3	1
BP110P	Introduction to Pharmacognosy (Practical)	3	1
BP111P	Pharmaceutical Inorganic and Analytical Chemistry (Practical)	3	1
Total		**30**	**21**

Course Code	Course Title			Course Type
BP101T	**Basics of Python Programming for Pharmaceutical Sciences (Theory)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
2	2	--	--	30
Maximum Marks	SE			ESE
50	20			30

Course Objectives:

The objectives of this course are to:

1. Introduce the fundamentals of Python programming for pharmaceutical sciences.
2. Develop basic programming skills using control structures, functions, and data structures.
3. Provide knowledge of data handling techniques for structured dataset management.
4. Familiarize students with data analysis tools such as NumPy and Pandas for healthcare datasets.
5. Enable students to visualize and interpret pharmaceutical data.

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Explain the fundamentals of Python programming, including variables, data types, operators, and libraries.
2	Analyze program logic using control structures and functions.
3	Organize, manipulate, and retrieve data using data structures and file handling techniques.
4	Analyze pharmaceutical datasets using Python libraries.
5	Visualize and interpret pharmaceutical data using graphical tools.

Course content:

Unit No.	Topics	No. of Lectures
I	**Introduction to Python programming** • Installing Python and an Integrated Development Environment (IDE) [Jupyter Notebook, PyCharm, VS Code etc.], Advantages of IDEs over text editors. • Python variables and data types (integers, floats, strings, booleans), Type casting and basic operators (arithmetic, comparison, logical), Input and output operations.	6 Hours

Unit No.	Topics	No. of Lectures
	• Basic string operations and manipulation techniques. Introduction to standard libraries and third-party libraries, installing and uninstalling libraries.	
II	**Control Structures & Functions** • Conditional statements (if, if-else, if-elif-else), nested conditions • Loops (for loop, while loop). • Break and continue statements. • Defining and calling functions, passing arguments and returning values. • Writing modular programs for simple pharmaceutical applications- dosage calculation and BMI calculation.	6 hours
III	**Data Structures & File Handling** • Lists, tuples, and dictionaries. • Indexing and slicing lists, basic operations on lists and dictionaries, string manipulation techniques. • Introduction to NumPy arrays, basic operations using NumPy (array creation, arithmetic operations). • Reading and writing CSV files. • Understanding structured healthcare datasets. • Importing small pharmaceutical datasets and performing basic data access and manipulation tasks.	6 hours
IV	**Data Handling with Pandas** • Introduction to Pandas library. • Pandas Series and DataFrame structures. • Reading CSV and Excel files-PK study datasets and ADR reports • Inspecting datasets using functions such as head(), tail(), info(), and describe(). • Data cleaning techniques and handling missing values. • Filtering and selecting data based on conditions. • Grouping data and performing aggregation functions.	6 Hours

Unit No.	Topics	No. of Lectures
V	**Data Visualization with Matplotlib** • Introduction to Matplotlib. • Creating line plots, histograms, scatter plots, and box plots. • Labeling axes, titles, and legends. • Create plots and visualize pharmaceutical datasets - concentration-time curves for oral and IV administration, ADR reporting rates across drugs, dissolution profiles. • Scientific interpretation of plots.	6 Hours

Recommended References *(Preferably Latest Editions)*:

1. Weiss, C.J., 2017. *Scientific Computing for Chemists with Python*. Available at: https://weisscharlesj.github.io/SciCompforChemists/notebooks/introduction/intro.html
2. Perkovic, L., 2015. *Introduction to Computing Using Python: An Application Development Focus*. 2nd ed. Hoboken: Wiley.
3. Sweigart, A., 2025. *Automate the Boring Stuff with Python*. 3rd ed. Available at: https://automatetheboringstuff.com/
4. W3Schools, n.d. *Python Tutorial*. Available at: https://www.w3schools.com/python/
5. Datasets for Education and Research:
   Mentors and students can access healthcare datasets from sources such as Kaggle (healthcare records), government agencies (healthdata.gov, WHO, https://www.data.gov.in/), and clinical trial registries (https://ctri.nic.in/, https://clinicaltrials.gov/). *Always use data responsibly*.

Course Code	Course Title			Course Type
BP102T	**General Pharmacy (Theory)**			**Core**
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	--	--	45
Maximum Marks	SE			ESE
75	30			45

COURSE OBJECTIVES:

The objectives of this course are to:

1. Provide knowledge about evolution and development of Pharmacy profession in India and the growth of the Pharmaceutical Industries over the years.
2. Provide understanding of different types of pharmacopoeias and other official books in maintaining the standards of medicines.
3. Provide knowledge about the basic pharmaceutical calculations used in dispensing and compounding.
4. Understand the role of active pharmaceutical ingredients and pharmaceutical excipients in drug formulations
5. Impart basic knowledge about formulation and preparation of various solid, liquid and semisolid dosage forms

CO No.	Upon successful completion of this course, the students will be able to:
1	Describe the history and evolution of the pharmacy profession, including pharmacopeial practices and prescription handling.
2	Perform accurate pharmaceutical calculations required in the formulation and preparation of various types of dosage forms.
3	Explain the properties and functions of active pharmaceutical ingredients (APIs) and excipients and demonstrate the methods of preparation of solid dosage forms.
4	Illustrate the formulation principles of liquid dosage forms by analyzing the role of APIs and excipients involved.
5	Compare and evaluate the formulation of semisolid dosage forms based on the characteristics of APIs, excipients, and preparation methods.

Course Content:

Unit No.	Topics	No. of Lectures
UNIT-I	**Introduction to the Profession of Pharmacy** • History of the Profession of Pharmacy in India: In relation to pharmacy education, pharmaceutical industries and organizations-evolution, development and milestones. • Scope of the Pharmacy Profession: Role and responsibilities of pharmacists in retail/community pharmacy, hospital and clinical pharmacy, and industrial pharmacy including research and development. • Pharmacopoeias: Introduction to IP, BP, USP, BPC, International Pharmacopoeia, other pharmacopoeias and the National Formulary of India; structure and content of the Indian Pharmacopoeia; study of one model IP monograph. • Introduction to Prescription: Structure and format/parts of prescription, handling of prescriptions, Latin terminology related to prescriptions, Errors in Prescription.	**9 Hours**
UNIT-II	**Introduction to Pharmaceutical Calculations and Dosage Forms** • Metric system of weights and measures; calculations based on alligation, proof spirit, isotonic solutions, dilute solutions (percentage and ratio) and geometric dilution; scientific notation of units and measures. • Posology: Definition and dose calculation based on age, body weight and body surface area. Factors affecting posology • Introduction to Dosage Forms: Routes of administration and classification of dosage forms. • Introduction to Active Pharmaceutical Ingredients and Excipients: Definition, ideal characteristics and importance.	**10 Hours**
UNIT-III	**Solid Dosage Forms** • Powders: Classification, advantages and disadvantages; dusting powders, effervescent powders, efflorescent powders, hygroscopic powders and eutectic mixtures; introduction to excipients and methods of preparation. Evaluation of powder formulation • Tablets: Definition, types of tablets including moulded tablets and pills with examples; advantages and disadvantages; introduction to excipients and methods of preparation. • Capsules: Definition, types of capsules, advantages and disadvantages, capsule sizes; introduction to excipients and methods of preparation.	**10 Hours**
UNIT-IV	**Monophasic and Biphasic Liquids** • For internal use- aromatic waters, syrups, elixirs and linctus (Definition and uses or application). • For external use and body cavities- liniments, lotions, enemas, eye drops, ear drops, nasal drops and tinctures with examples.	**7 Hours**

Unit No.	Topics	No. of Lectures
	• Suspensions- Definition and types (flocculated and deflocculated), advantages and disadvantages, formulation excipients and general methods of preparation. • Emulsions- Definition and types, emulsifying agents, tests for identification of types of emulsions, formulation excipients and general methods of preparation.	
UNIT-V	**Semisolid Dosage Forms** • Definitions, classification, advantages and disadvantages, ointment bases and other excipients used in semisolid dosage forms; general methods of preparation of ointments, pastes, creams and gels. • Suppositories / Pessaries: Definition, types of suppositories, advantages and disadvantages, formulation excipients used in suppositories, properties of ideal suppository bases, types of suppository bases, displacement value and general method of preparation.	**9 Hours**

Recommended References (Preferably latest editions):

1. Ansel, H.C., Allen, L.V. and Popovich, N.G., Pharmaceutical Dosage Forms and Drug Delivery Systems. Lippincott Williams & Wilkins, New Delhi.
2. Carter, S.J., Cooper and Gunn's Dispensing for Pharmaceutical Students. CBS Publishers, New Delhi.
3. Indian Pharmacopoeia Commission, Indian Pharmacopoeia. Ghaziabad.
4. Indian Pharmacopoeia Commission, National Formulary of India. Ghaziabad, India.
5. British Pharmacopoeia Commission, British Pharmacopoeia. London.
6. United States Pharmacopeial Convention, United States Pharmacopeia (USP–NF). Rockville, Maryland, USA.
7. Lachman, L., Lieberman, H.A. and Kanig, J.L., The Theory and Practice of Industrial Pharmacy. Lea & Febiger, University of Michigan.
8. Gennaro, A.R., Remington: The Science and Practice of Pharmacy. Lippincott Williams & Wilkins, New Delhi.
9. Rawlins, E.A., Bentley's Textbook of Pharmaceutics. Elsevier Health Sciences, USA.
10. Nieloud, F. and Marti-Mestres, G., Pharmaceutical Emulsions and Suspensions. Marcel Dekker Inc., New York.

Course Code	Course Title			Course Type
BP103T	**Healthcare Psychology and Communication Skills (Theory)**			**Core**
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	1	--	--	15
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Introduce the fundamental concepts and branches of psychology relevant to healthcare.
2. Help students understand human behavior, development, and psychological responses to illness.
3. Develop awareness of common psychological disorders and coping mechanisms in healthcare contexts.
4. Equip students with effective health communication skills for clinical and community settings.
5. Promote professional interaction with patients, caregivers, and healthcare teams through ethical and empathetic communication.

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Explain the fundamental concepts of psychology and their relevance in healthcare settings.
2	Describe the stages of human development, personality traits, and behavioral responses associated with illness and recovery.
3	Apply effective communication models and techniques in clinical and interdisciplinary healthcare scenarios.
4	Demonstrate professional communication skills including active listening, empathetic interaction, and accurate clinical documentation.
5	Analyze psychological and behavioral interventions that promote mental health, treatment adherence, and stigma reduction.

Course Content:

Unit No.	Topics	No. of Lectures
I	**Introduction to Psychology in Healthcare** Definition, scope, and relevance of psychology in health sciences. Branches of psychology with healthcare relevance: clinical, health, behavioural, and developmental psychology. Sensation, perception, and attention in clinical assessment. Learning and memory: reinforcement in health behaviour change. Emotion and motivation: theories and implications in health contexts.	3 hours
II	**Developmental and Behavioural Psychology** Human developmental stages and healthcare needs. Personality theories and patient interaction styles. Psychological factors affecting illness perception and recovery. Common psychological disorders in healthcare: anxiety, depression, and somatization. Coping strategies, resilience, and stress management techniques.	3 hours
III	**Foundations of Health Communication** Elements and models of communication in healthcare. Types of communication: interpersonal, group, mass, and telehealth communication. Barriers to effective communication in clinical settings. Active listening, questioning techniques, and empathy. Culturally appropriate and inclusive communication.	3 hours
IV	**Professional Communication in Healthcare Settings** Communication with patients, caregivers, and interdisciplinary teams. Delivering difficult news and handling emotionally charged situations. Legal and ethical issues in health communication (confidentiality, consent). Writing patient records, reports, and discharge summaries. Use of technology and digital communication tools in healthcare services.	3 hours
V	**Health Psychology and Behavioural Interventions** Health belief models and illness behaviour. Psychosomatic illnesses and the mind–body connection. Behaviour change theories (e.g., CBT, TTM) in treatment adherence. Psychological first aid and crisis communication. Mental health promotion and stigma reduction through communication.	3 hours

Recommended References *(Preferably Latest Editions)*:

1. Feldman, R.S., Understanding Psychology. McGraw-Hill Education, New York.
2. Taylor, S.E., Health Psychology. McGraw-Hill Education, New York.
3. Hargie, O., The Handbook of Communication Skills. Routledge, London.

4. Nevid, J.S., Rathus, S.A. and Greene, B., Psychology and the Challenges of Life: Adjustment and Growth. Wiley, New York.
5. Atkinson, R.L., Atkinson, R.C., Smith, E.E., Bem, D.J. and Nolen-Hoeksema, S., Introduction to Psychology. Wadsworth Publishing, Belmont.
6. Kumar, A., Communication Skills for Health Professionals. Jaypee Brothers Medical Publishers, New Delhi.
7. Park, K., Park's Textbook of Preventive and Social Medicine. Banarsidas Bhanot Publishers, Jabalpur.

Course Code	Course Title			Course Type
BP104T	**Human Anatomy, Physiology and Pathophysiology I (Theory)**			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
4	4	--	--	60
Maximum Marks	**SE**			**ESE**
100	40			60

COURSE OBJECTIVES:

The objectives of this course are to:

1. Understand the structural organization of the human body from cells to systems.
2. Comprehend physiological functions of various body systems and the principles of homeostasis.
3. Learn the cellular basis of disease including injury, adaptation, and inflammation.
4. Recognize common pathological conditions related to skin, bones, joints, blood, cardiovascular system, and special senses.
5. Establish the groundwork for clinical interpretation of symptoms and disease mechanisms relevant to pharmacy and therapeutics.

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Explain the fundamental concepts of Human Anatomy, Physiology and Pathophysiology.
2	Explain the gross morphology, structure and functions of various organs of the human body.
3	Understand the etiology and pathogenesis of diseases/disorders associated with integumentary system, peripheral nervous system and cardiovascular system
4	Understand the basic mechanism behind inflammation
5	Identify and differentiate the various tissues and organs of different systems of human body.

Course Content:

Unit No.	Topics	No. of Lectures
I	**Introduction to human body** **a)** Definition and scope of anatomy, physiology and pathophysiology. Levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminologies. **b) Cellular and tissue level of organization** Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, forms of intracellular signalling: (i) contact-dependent, (ii) paracrine, (iii) synaptic, (iv) endocrine. Classification of tissues, structure, location and functions of epithelial, connective tissues, muscular and nervous tissues. **c) Basic principles of cell injury and adaptation** Definitions of commonly used relevant medical terminologies. Introduction and definition of cell injury, causes of cellular injury, pathogenesis (cell membrane damage, mitochondrial damage, ribosome damage and nuclear damage), morphology of cell injury – adaptive changes (atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia), cell swelling, intracellular accumulation and cell death. Etiology and pathogenesis of cancer.	12 hours
II	**Integumentary system and skeletal system** **a) Structure and functions of skin.** **b) Skin disorders** Psoriasis and dermatitis and pathophysiology of leprosy. Basic principles of wound healing. **c) Skeletal system and joints** Divisions of skeletal system, types of bones, salient features and functions of bones of axial and appendicular skeletal system. Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction. Structural and functional classification of joints. **d) Diseases of bones and joints** Pathophysiology of rheumatoid arthritis, osteoporosis and gout.	12 hours

Unit No.	Topics	No. of Lectures
III	**Body fluids, blood and lymphatic system** **a)** Body fluids, composition and functions of blood, hemopoiesis, formation of haemoglobin, mechanisms of coagulation, blood grouping, Rh factors and transfusion. **b)** Lymphatic organs and tissues, lymphatic vessels, lymph formation, circulation and functions of lymphatic system. **c) Basic mechanism of inflammation and repair** Introduction, classification and pathophysiology of inflammation, clinical signs of inflammation, mediators of inflammation. **d) Haematological diseases** Pathophysiology of iron deficiency, megaloblastic anaemia (Vit B12 and folic acid), sickle cell anaemia, thalassemia, hereditary acquired anaemia and haemophilia.	12 hours
IV	**Cardiovascular system** **a)** Anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram. **b)** Pathophysiology of hypertension, cardiac arrhythmias, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and coronary artery disease).	12 hours
V	**Peripheral nervous system and special sense** **a) Classification of peripheral nervous system**: structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves. **b) Special senses:** Structure and functions of eye, ear, nose and tongue. **c) Pathophysiology of special sense disorders:** glaucoma, cataract, myopia, otitis externa, otitis media, vertigo and anosmia.	12 hours

Recommended References *(Preferably Latest Editions)*:

1. Sembulingam, K. and Sembulingam, P., *Essentials of Medical Physiology*. Jaypee Brothers Medical Publishers, New Delhi.
2. Guyton, A.C. and Hall, J.E., *Textbook of Medical Physiology*. Elsevier Saunders, Philadelphia, USA.
3. Tortora, G.J. and Grabowski, S.R., *Principles of Anatomy and Physiology*. Wiley, Palmetto, GA, USA.
4. Kumar, V., Cotran, R.S. and Robbins, S.L., *Basic Pathology*. W.B. Saunders Company, Philadelphia.

Course Code	Course Title			Course Type
BP105T	Introduction to Pharmacognosy (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	--	--	45
Maximum Marks	SE			ESE
75	30			45

COURSE OBJECTIVES

The objectives of this course are to:

1. Explain the origin, history, and classification of natural drugs.
2. Understand cultivation and conservation methods for medicinal plants.
3. Study quality control and evaluation of crude drugs.
4. Study primary and secondary metabolites with their therapeutic relevance
5. Introduce traditional systems of medicine and phyto-therapeutic agents.

COURSE OUTCOMES (CO)

CO No.	Upon successful completion of this course, the students will be able to:
1	Describe the historical development, classification, and scope of Pharmacognosy.
2	Explain cultivation, processing, and conservation techniques for medicinal plants.
3	Apply quality evaluation methods to crude drugs using organoleptic, microscopic, and chemical parameters.
4	Identify primary and secondary metabolites with their therapeutic relevance.
5	Recognize traditional systems of medicine and commonly used phyto-therapeutic agents.

Course Content:

Unit	Topic	No of Lectures
I	**Fundamentals of Pharmacognosy** (a) Definition, history, present status, scope and development of pharmacognosy. (b) Sources of drugs: Plants, animals, microbial, marine, mineral and plant tissueculture. **Plants:** Licorice and Clove **Animals:** Shellac and Cod liver oil **Microbial:** *Saccharomyces boulardii* and *Lactobacillus casei* **Marine:** laminarin and Cytarabin	**(10 Hrs)**

Unit	Topic	No of Lectures
	Mineral: Talc and Shilajit **Plant tissue culture:** Digoxin and Atropine (c) Historical milestones in drug discovery: Morphine, Quinine, Penicillin, Taxol and Artemisinin, Caffeine, Reserpine. (d) Introduction to different herbal / traditional pharmacopoeias: Indian Pharmacopoeia, British Herbal Pharmacopoeia, United States Pharmacopeia – Herbal Medicines and Dietary Supplements, Ayurvedic Pharmacopoeia of India, Unani Pharmacopoeia of India and American Herbal Pharmacopoeia (e) Official and non-official; codified and non-codified drugs. Classification of crude drugs: alphabetical, morphological, taxonomical, chemical, pharmacological and chemotaxonomic classification along with their merits and limitations.	
II	**Cultivation, Collection, Processing and Storage of Drugs of Natural Origin** Methods of plant cultivation and Good Agricultural and Collection Practices (WHO /GAP / GCP guidelines) for medicinal plants. Factors influencing cultivation, collection and storage of medicinal plants. Plant hormones and their applications in cultivation of medicinal plants. Application of polyploidy, mutation and hybridization concepts with reference to secondary metabolites. Ex-situ and in-situ conservation and strategies for value addition of medicinal plants. Role of eco-pharmacognosy in sustainable conservation of endangered medicinal plants such as kutki and chirata.	**(8 hrs)**
III	**Quality Control of Drugs of Natural Origin (WHO Guidelines)** Detection of adulteration of drugs of natural origin. Evaluation of drugs using organoleptic, microscopic (qualitative and quantitative), physical, chemical and biological methods. Physicochemical parameters: extractive values, Loss on Drying, foreign organic matter, ash values, bitterness value, foaming index, haemolytic potential, swelling index, viscosity, optical rotation, refractive index, acid value and saponification value. DNA barcoding.	**(10 hrs)**
IV	**Introduction to Metabolites of Plant Origin** Definition and general properties of plant metabolites. Primary and secondary metabolites such as carbohydrates, proteins, lipids, alkaloids, glycosides, flavonoids, tannins, terpenoids, volatile oils and resins. Traditional Systems of Medicine Basic principles of treatment of diseases in different systems of medicine including AYUSH and TCM. Role of pharmacognosy in allopathy and traditional systems of medicine such as AYUSH**,** Sowa Rigpa and TCM. Types of dosage forms in AYUSH medicines.	**(10 hrs)**

Unit	Topic	No of Lectures
	Ayurved: Taila, avaleha Unani: Jawarish, Sharbat Siddha: Menapagu, Kudineer Homeopathy: Tinctures, Sugar pellets Sowa Rigpa: Pills (Rilvo/rilbu), Chema TCM: Jiu, Tang	
V	**Phyto-therapeutic Agents** Biological source, major constituents and uses of the following classes of drugs: • Adaptogens and Immunomodulators: Ashwagandha, Tulsi, Giloy • Hepatoprotectives: Milk thistle, Kutki • Cardiovascular drugs: Garlic, Arjuna • Antidiabetics: Gymnema, Fenugreek • Anti-inflammatory and analgesics: Turmeric, Boswellia • CNS drugs: Brahmi • Antimicrobial and antivirals: Neem, Andrographis • Gastrointestinal drugs: Psyllium • Dermatological agents: Aloe • Drugs used in women's health: Chasteberry, Shatavari • Respiratory drugs: Vasaka	**(7 hrs)**

Recommended References *(Preferably Latest Editions)*:

1. Evans, W.C., *Trease and Evans Pharmacognosy*. 16th ed. London: W.B. Saunders & Co., 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., *Pharmacognosy*. 9th ed. Philadelphia: Lea & Febiger, 1988.
3. Wallis, T.E., *Textbook of Pharmacognosy*. London: J. & A. Churchill Ltd.
4. World Health Organization (2002) *WHO traditional medicine strategy 2002–2005*. Geneva: World Health Organization.
5. World Health Organization (1998) *Quality control methods for medicinal plant materials*. Geneva: World Health Organization.
6. World Health Organization (2003) *WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants*. Geneva: World Health Organization.
7. Biren Shah, Avinash Seth, Textbook of Pharmacognosy and Phytochemistry, Elsevier Health Sciences, 14 May 2012 - Medical - 620 pages.

Course Code	Course Title			Course Type
BP106T	**Pharmaceutical Inorganic and Analytical Chemistry (Theory)**			**Core**
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	--	--	45
Maximum Marks	SE			ESE
75	30			45

COURSE OBJECTIVES:

The objectives of this course are to:

1. Understand the importance of errors, impurities in pharmaceuticals.
2. Comprehend the principles of buffer systems.
3. Develop skills in performing and interpreting limit tests and titrimetric analysis.
4. Emphasize the importance of inorganic compounds and radiopharmaceuticals in Pharmacy
5. Explain synthesis and analysis of inorganic compounds/products of pharmaceutical importance

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Identify sources and types of errors in pharmaceutical analysis, and impurities products
2	Apply concepts of acid-base chemistry, buffer systems with importance of electrolytes
3	Describe and differentiate various analytical techniques used in pharmaceutical analysis, including titrimetric methods, and their specific applications in quality assessment.
4	Analyze the properties, mechanisms, and therapeutic uses of gastrointestinal agents, radiopharmaceuticals, expectorants, antidotes, and other pharmaceutical compounds, illustrating their roles in therapy and safety considerations.
5	Describe the drugs used in expectorants, emetics, haemintics, poison and antidote and astringents.

Course Content:

Unit No.	Topic	No. of Lectures
1	**Introduction to pharmaceutical analysis** Different techniques of analysis, Methods of expressing strength of solutions, Primary and secondary standards with examples. **Errors** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures. **Impurities** Definition, types, contents and regulatory importance. Sources and types of impurities in Pharmaceuticals, limit tests for chloride, sulphate, iron, arsenic, lead, heavy metals, and modified limit test for chloride and sulphate	**7 hours**
2	**Acid-Base Chemistry and Buffer Systems in Pharmacy** Definition of acids, bases, buffers, pH Scale and its significance, Buffer equation, calculation of pH for Buffer solution. Isotonicity and its application in IV Fluids and Ophthalmic Solutions. **Major extra and intracellular electrolytes** Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium chloride and Oral Rehydration Salt (ORS), Physiological acid base balance.	**8 hours**
3	**Acid base titrations** Theories of acid base indicators, classification of acid base titrations. Preparation and standardization of titrants viz. hydrochloric acid and sodium hydroxide. Theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves. Assay of Ammonium hydroxide. **Non-aqueous titrations** Types of solvents used, acidimetric and alkalimetric titration using non-aqueous solvents. Preparation and standardization of acidic and basic titrants. Estimation of weakly acidic and basic substances using nonaqueous titrants, estimation of Sodium benzoate. **Precipitation titrations and gravimetry** Principle and steps involved in gravimetric analysis, Mohr9s method, Volhard's, Modified Volhard's, Fajans method. Estimation of barium sulphate by gravimetry. **Complexometric titrations** Classification, metal ion indicators, masking and demasking reagents, preparation and standardization of disodium EDTA. Estimation of Magnesium sulphate and Calcium gluconate*. **Redox titrations** Concepts of oxidation and reduction, Types of redox titrations viz. Permanganometry, Cerimetry, Iodimetry, Iodometry and titrations with potassium iodate.	**14 hours**

4	**Gastrointestinal agents** **Acidifiers:** Sodium acid phosphate and Dilute Hydrochloric acid. **Antacids:** Ideal properties of antacids, combinations of antacids, Sodium bicarbonate*, Aluminium hydroxide gel*. **Agents promote bowel movements:** Magnesium hydroxide, Sodium orthophosphate, Sodium Potassium tartrate and magnesium trisilicate. **Antimicrobials**: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and itspreparations. **Radiopharmaceuticals** Basics of radioactivity, applications of radioisotopes of Sodium Iodide I-131, Technetium-99m, Cobalt-60, Phosphorus-32 including safe handling, storage, and disposal of radiopharmaceuticals, adhering to regulatory guidelines for safety.	**10 hours**
5	**Miscellaneous Compounds** **Expectorants:** Potassium iodide, Ammonium chloride*. **Emetics:** Copper sulphate*, Sodium potassium tartrate. **Haematinics:** Ferrous sulphate*, Ferrous gluconate. **Poison and Antidote:** Definition, classification of antidotes, Sodium thiosulphate	**6 hours**

Recommended References (*Preferably latest editions*):

1. Bentley, R. and Driver, J., *Bentley and Driver's Textbook of Pharmaceutical Chemistry*. Oxford: Oxford University Press.

2. Vogel, A.I., *Vogel's Textbook of Quantitative Chemical Analysis*. Essex: Pearson Education Limited.

3. Beckett, A.H. and Stenlake, J.B., *Practical Pharmaceutical Chemistry*. Part I & II. London: The Athlone Press, University of London.

4. Schroff, M.L., *Inorganic Pharmaceutical Chemistry*. New Delhi: Oxford Book Company.

5. Indian Pharmacopoeia Commission, *Indian Pharmacopoeia*. Ghaziabad, India.

Course Code	Course Title			Course Type
BP107P	General Pharmacy (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Familiarize students with essential pharmaceutical calculations including dilution, concentration, and allegation methods required for accurate formulation of dosage forms.
2. Impart practical skills in the preparation of official and non-official dosage forms such as solutions, syrups, powders, granules, suppositories, semisolids, gargles, and mouthwashes in accordance with pharmacopeial standards.
3. Develop understanding of formulation principles related to selection of ingredients, dosage form design, stability, and patient acceptability.
4. Train students in the application of pharmacopoeial specifications (IP, BPC, WHO) during compounding, labeling, and evaluation of pharmaceutical preparations.
5. Enhance hands-on competency and professional confidence required for dispensing practice and pharmaceutical compounding in hospital and community pharmacy settings.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Perform accurate pharmaceutical calculations using dilution and allegation principles for the preparation of various dosage forms.
2	Prepare and dispense liquid dosage forms such as solutions, syrups, gargles, and mouthwashes following official pharmacopeial procedures.
3	Formulate solid dosage forms including powders, divided powders, dusting powders, and effervescent granules as per standard guidelines.
4	Prepare semisolid and specialized dosage forms such as ointments, liniments, and suppositories using appropriate bases and techniques.
5	Compile and evaluate a compendium of marketed dosage forms, demonstrating compliance with pharmacopeial standards, labeling requirements, and patient-centric considerations

Course Content:

List of practical
1. Pharmaceutical Calculations
Solutions based on allegation and dilution methods
2. Solutions (any one)
a) Strong solution of ammonium acetate - IP
b) Cresol with soap solution - IP
c) Lugol's solution -BPC
3. Syrups (any one)
a) Simple Syrup- IP
b) Medicated syrup-IP
4. Aromatic waters (any one)
a) Dill water -BPC
b) chloroform water- IP
4. Elixir
Paracetamol paediatric elixir- IP
5. linctus
Iodine Throat Paint (Mandle's Paint) - BPC
4. Powders & Granules (any two)
a) ORS powder - WHO
b) Effervescent granules - IP
c) Dusting powder - IP
d) Divided powders - IP
5. Suppositories (any two)
a) Glycerogelatin suppository - BPC
b) Cocoa butter suppository - IP
c) Zinc Oxide suppository - IP
6. Semisolids (any one)
a) Sulphur ointment - IP
b) Non-staining iodine ointment with methyl salicylate - BPC
7. Gargles & Mouthwashes
a) Iodine gargle - BPC
b) Chlorhexidine mouthwash - IP
8. Biphasic liquid dosage form (any two)
a) Liquid paraffin emulsion (comparison study with marketed formulation)
b) Turpentine Liniment (comparison study with marketed formulation)
c) Calamine lotion (comparison study with marketed formulation)
d) Aluminium Hydroxide gel (comparison study with marketed formulation)
Note:
a) Preparation of compendia of dosage forms (marketed products), is recommended.
b) Any other practical relevant to the syllabus can be introduced.
c) Minimum 12 experiments must be performed covering all dosage forms.

Recommended References (Preferably latest editions):

1. Carter, S.J., Cooper and Gunn's Dispensing for Pharmaceutical Students. 12th ed. New Delhi: CBS Publishers.
2. Indian Pharmacopoeia Commission, Indian Pharmacopoeia, Vol. I. Ghaziabad: IPC.
3. United States Pharmacopeial Convention, United States Pharmacopeia–National Formulary (USP–NF). Rockville, MD, USA.
4. British Pharmacopoeia Commission, British Pharmacopoeia Codex. London: The Stationery Office.
5. World Health Organization, Oral Rehydration Salts (ORS) Formulation Guidelines. Geneva: WHO.

Course Code	Course Title			Course Type
BP108P	**Healthcare Psychology and Communication Skills (Practical)**			**Core**
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	2	30
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are:

1. To develop effective communication skills essential for diverse clinical and community health scenarios.
2. To enhance empathetic interaction through role plays, simulations, and reflective practices.
3. To promote collaborative learning and peer feedback in communication-based tasks.
4. To encourage application of psychological principles in real-life healthcare contexts.
5. To build confidence in delivering health education and awareness activities in community settings.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Demonstrate patient-centered communication through role plays and clinical simulations.
2	Analyze healthcare communication challenges using case study discussions.
3	Practice reflective listening, paraphrasing, and team-based communication strategies.
4	Design and deliver effective health education messages for the community.
5	Reflect on personal emotional growth and improvement in communication competencies.

Course content:

List of practical
1. **Role Plays and Simulations** Counselling a patient with chronic illness Breaking bad news in a clinical setting Empathetic listening in crisis response 2. **Case Study Discussions** Mental health cases in primary care Impact of miscommunication in healthcare errors 3. **Peer-to-Peer Practice Sessions** Reflective listening and paraphrasing Effective team communication and decision-making 4. **Community Engagement Tasks** Designing IEC materials for public health awareness Conducting mock health education sessions 5. **Journaling & Self-Reflection Logs** Weekly reflection on emotional responses during care simulations Growth in communication skill development over the semester
Recommended References (*Preferably latest editions*): 1. Morgan, C.T. and King, R.A., *Introduction to Psychology*. New York: McGraw-Hill. 2. Taylor, S.E., *Health Psychology*. New York: McGraw-Hill Education. 3. Hargie, O., *Skilled Interpersonal Communication: Research, Theory and Practice*. London: Routledge. 4. Balzer-Riley, J., *Communication in Nursing and Healthcare*. Boston: Pearson. 5. Weinman, J., Petrie, K.J. and Moss-Morris, R., *The Psychology of Health and Illness*. London: Routledge.

Course Code	Course Title			Course Type
BP109P	**Human Anatomy, Physiology and Pathophysiology I (Practical)**			Core
Credit	**Hours Per Week(L-T-P)**			**Max. Hours**
	L	T	P	
1	--	--	3	45
Maximum Marks	**SE**			**ESE**
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Provide fundamental knowledge of the structure and functions of various organ systems of the human body.
2. Understand the mechanisms of homeostasis and their role in maintaining normal physiological functions.
3. Introduce the basic concepts of pathophysiology and the causes of diseases affecting different organ systems.
4. Explain the body's physiological responses to disease-producing agents.
5. Lay the foundation for understanding clinical conditions through the study of functional alterations in organs and systems.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Explain the principles, applications, and experimental use of microscopy techniques, and perform basic laboratory experiments related to the nervous system and special senses.
2	Describe the gross morphology, microscopic structure, and coordinated functioning of major human organs and organ systems, emphasizing their roles in maintaining normal physiology.
3	Estimate and interpret key hematological parameters, and explain the mechanisms of homeostasis along with related physiological and pathological disorders.
4	Discuss the etiology and pathogenesis of selected disease states, linking structural and functional changes to clinical manifestations
5	Identify and explain common diseases with respect to their signs and symptoms, risk factors, diagnostic methods, preventive measures, treatment strategies, and possible complications.

Course Content:

List of Practicals
(Minimum12 experiments must be performed-First 12 experiments are mandatory) Practical HAPP allows the verification of physiological processes discussed in theory classes through experiments on living tissues, simulated videos, models and charts.

Experiment Number	Title of the Experiment
1.	Study of compound microscope.
2.	Microscopic study of epithelial and connective tissue.
3.	Microscopic study of muscular and nervous tissue.
4.	Identification of axial bones and appendicular bones.
5.	Introduction to hemocytometry.
6.	Enumeration and interpretation of white blood cell (WBC) count.
7.	Enumeration and interpretation of total red blood corpuscles (RBC) count.
8.	Estimation and interpretation of hemoglobin content.
9.	Determination of blood group.
10.	Determination of pulse rate, heart rate and blood pressure.
11.	Recording and interpretation of ECG.
12.	Demonstration of function of olfactory nerve.
13.	Examination of different types of taste.
14.	Demonstration of visual acuity.
15.	To study the cardiovascular system and integumentary system.
16.	Case studies/files of patients with anaemia, thalassemia, haemophilia, leprosy, gout, hypertension and ischemic heart disease.

Recommended References *(Preferably latest editions)*:

1. Wilson, K.J.W., Anatomy and Physiology in Health and Illness. New York: Churchill Livingstone.
2. Guyton, A.C. and Hall, J.E., Textbook of Medical Physiology. Philadelphia: Elsevier.
3. Tortora, G.J. and Grabowski, S.R., Principles of Anatomy and Physiology. New York:Wiley.

Course Code	Course Title			Course Type
BP110P	**Introduction to Pharmacognosy (Practical)**			**Core**
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	T	P	
1	--	--	3	45
Maximum Marks	**SE**			**ESE**
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Identify medicinal plants and crude drugs using morphological and microscopical characters.
2. Analyze powdered drugs and perform quantitative microscopy.
3. Evaluate crude drugs using physicochemical parameters.
4. Introduce standardization and quality control of herbal materials.
5. Collect medicinal plants and prepare voucher specimens.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Identify medicinal plants and crude drugs using morphological and microscopical characters.
2	Analyze powdered drugs microscopically to identify diagnostic cell contents.
3	Perform quantitative microscopy for stomatal and vein parameters.
4	Evaluate quality and purity of crude drugs using physicochemical parameters.
5	Collect medicinal plants and prepare voucher specimens during field visits.

Course Content:

List of Practical (minimum 12 experiments must be performed)
1. Morphological study of medicinal plants (as mentioned in Unit V Theory). 2. Organoleptic evaluation and powder microscopical characters of the following drugs: Tulsi and Ashwagandha. 3. Organoleptic evaluation and powder microscopical characters of the following drugs: Amla and Arjuna. 4. Organoleptic evaluation and powder microscopical characters of the following drugs: Turmeric and Psyllium husk. 5. Organoleptic evaluation and powder microscopical characters of the following drugs: Brahmi and Fenugreek. 6. Determination of Loss on Drying of crude drugs. 7. Determination of swelling index and foaming index of crude drugs. 8. Determination of stomatal number and stomatal index of leaf. 9. Determination of vein islet and vein termination number of leaf. 10. Determination of ash value and extractive values of crude drugs. 11. Determination of foreign organic matter of crude drugs. 12. Determination of dimensions of calcium oxalate crystals and phloem fibers by eyepiece micrometry. 13. Additional point: Two chemical tests each for Primary (Carbohydrate and protein) and Secondary metabolites (Tannin, Alkaloid) 14. Experiential learning-based experiments involving collection, identification of medicinal plant material, preparation of voucher specimens and excursion visits to medicinal plant garden. Morphological study of medicinal plants and Herbarium preparation
Recommended References *(Preferably Latest Editions)*: 1. Evans, W.C., 2009. *Trease and Evans Pharmacognosy*. 16th ed. London: W.B. Saunders & Co. 2. Tyler, V.E., Brady, L.R. and Robbers, J.E., 1988. *Pharmacognosy*. 9th ed. Philadelphia: Lea & Febiger. 3. Wallis, T.E., *Textbook of Pharmacognosy*. London: J. & A. Churchill Ltd. 4. World Health Organization (2003) *WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants*. Geneva: World Health Organization

Course Code	Course Title			Course Type
BP111P	**Pharmaceutical Inorganic and Analytical Chemistry (Practical)**			**Core**
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Gain practical knowledge on various volumetric titration techniques.
2. Learn the principles of volumetric analysis.
3. Study the preparation and assessment of inorganic compounds.
4. Determine the assay of various inorganic compounds in pharmaceutical use.
5. Develop analytical skill for the qualitative and quantitative analysis of various inorganic compounds.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Perform limit tests to detect and identify impurities in pharmaceutical substances.
2	Prepare various pharmaceutical inorganic compounds following standard procedures.
3	Analyze the significance of quality control in pharmaceutical products and raw materials.
4	Demonstrate proficiency in titrimetric analysis using different volumetric techniques.
5	Competence in applying analytical skills to qualitative and quantitative data.

Course Content

List of practical
1. **Limit tests (Any 4 Experiments)** a. Limit test and modified limit test for Chloride as per Indian Pharmacopoeia b. Limit test and modified limit test for sulphate as per Indian Pharmacopoeia c. Limit test for Iron d. Limit test for Lead e. Limit test for arsenic. 2. **Preparation of inorganic pharmaceuticals (Any 3 Experiments)** a. Preparation of Aluminium hydroxide b. Preparation of potash alum c. Preparation of ferrous sulphate d. Preparation of Magnesium sulphate from magnesium hydroxide or magnesium carbonate. 3. **Test for Purity (Any 2 Experiments)** a. Assessment of swelling power of bentonite as per Indian Pharmacopoeia b. Evaluation of acid neutralizing capacity of aluminium hydroxide gel c. Determination of potassium iodate and iodine in potassium Iodide 4. **Assay of the following inorganic compounds including standardization of titrant (Any 5 Experiments)** a. Assay of ammonium chloride by acid base titration, b. Assay of Ferrous sulphate by Cerimetry, c. Assay of Copper sulphate by Iodometry, d. Assay of Calcium gluconate by Complexometry, e. Assay of Hydrogen peroxide by Permanganometry, f. Assay of Sodium benzoate by non-aqueous titration, g. Assay of Sodium Chloride by precipitation titration (Modified Volhard's method)

Recommended References *(Preferably Latest Editions)*:

1. Bentley, R. and Driver, J., *Bentley and Driver's Textbook of Pharmaceutical Chemistry*. Oxford: Oxford University Press.
2. Vogel, A.I., *Vogel's Textbook of Quantitative Chemical Analysis*. Essex: Pearson Education Limited.
3. Beckett, A.H. and Stenlake, J.B., *Practical Pharmaceutical Chemistry*. Part I & II. London: The Athlone Press, University of London.
4. Kennedy, J.H., *Analytical Chemistry: Principles*. New York: Saunders College Publishing.
5. Schroff, M.L., *Inorganic Pharmaceutical Chemistry*. New Delhi: Oxford Book Company.
6. Indian Pharmacopoeia Commission, *Indian Pharmacopoeia*. Ghaziabad, India.

Semester II

Course Code	Name of the course		No. of hours per week (L/P)	Credit points
BP201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)		2	2
BP202T	Biochemistry (Theory)		3	3
BP203T	Human Anatomy, Physiology and Pathophysiology II (Theory)		4	4
BP204T	Pharmaceutical Organic Chemistry (Theory)		4	4
BP205T	Pharmacognosy and Phytochemistry (Theory)		4	4
BP206T	Physical Pharmaceutics (Theory)		3	3
BP207P	Biochemistry (Practical)		3	1
BP208P	Human Anatomy, Physiology and Pathophysiology II (Practical)		3	1
BP209P	Pharmaceutical Organic Chemistry (Practical)		3	1
BP210P	Pharmacognosy and Phytochemistry (Practical)		3	1
BP211P	Physical Pharmaceutics (Practical)		3	1
BP212P SEC*	BP212P SEC1	Communication Skills	2	1
	BP212P SEC2	Mental Well-Being, Stress & Conflict Management		
	BP212P SEC3	Fundamentals of Computer Operations		
Total			**37**	**26**

* Only one elective course shall be selected
The syllabi for elective subjects are given in the *appendix*

Course Code	Course Title			Course Type
BP201T	**Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)**			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
2	2	--	--	30
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Explain fundamental statistical concepts relevant to pharmaceutical sciences.
2. Develop the ability to interpret clinical and experimental data scientifically.
3. Apply statistical methods for analysing pharmaceutical and biomedical data.
4. Demonstrate the use of Python-based tools for statistical analysis and data handling.
5. Recognize the role of statistical analysis in evidence-based decision making and machine learning applications in healthcare.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Classify pharmaceutical data using appropriate descriptive statistics.
2	Apply probability concepts and statistical distributions in clinical and pharmaceutical contexts.
3	Perform sampling and hypothesis testing for decision-making in research.
4	Analyze correlation and regression relationships in pharmaceutical datasets.
5	Demonstrate statistical analysis using Python and interpret outputs appropriately.

Course Content:

Unit No.	Topics	No. of Lectures
I	**Descriptive Statistics** • Types of data in pharmaceutical sciences (nominal, ordinal, interval, ratio) • Sources of data in pharmacy: clinical trials, pharmacovigilance, quality control, PK studies • Measures of central tendency: mean, median, mode, their calculation and interpretation • Measures of dispersion (range, variance, standard deviation) and their interpretation using pharmaceutical data • Skewness and understanding distribution shape in biological measurements • Perform descriptive statistical analysis using Python libraries such as NumPy and Pandas, with focus on Interpretation of results	6 hours
II	**Probability & Statistical Distributions in Healthcare** • Basic probability concepts and laws (addition and multiplication rules), conditional probability and its interpretation • Bayes' theorem and its application in clinical decision-making • Concept of random variables (discrete and continuous) • Normal distribution and its importance in biological and pharmaceutical measurements, • Binomial distribution demonstrating applications in clinical trial outcomes • Poisson distribution for modeling rare events such as adverse drug reactions • Graphical visualization of these probability distributions using Python	6 hours
III	**Sampling & Statistical Inference** • Population versus sample, sampling techniques used in clinical research, Sampling error and bias • Conceptual understanding of the Central Limit Theorem • Confidence intervals and their interpretation • Hypothesis testing framework (null and alternative hypotheses) • Type I and Type II errors, p-value and statistical significance • Demonstration, calculation and interpretation of these parameters using python with pharmaceutical data	6 hours
IV	**Basics of Correlation & Regression** Conceptual understanding of the following concepts with emphasis on their interpretation- • correlation and Pearson correlation coefficients • Interpretation of positive and negative correlations • Scatter plots and trend visualization using pharmaceutical data such as dose-response relationships	6 hours

Unit No.	Topics	No. of Lectures
	• Simple linear regression concept, interpretation of regression coefficients • Introduction to odds ratio and its application in clinical risk analysis	
V	**Statistical Analysis Using Python – Case based learning** • Demonstration of descriptive statistics, correlation analysis and linear regression using Python libraries- SciPy / Statsmodels / Scikit-learn on pharmaceutical datasets • Interpretation of the output summaries and p-values • Preparation of statistical reports	6 hours

Recommended References *(Preferably Latest Editions)*:

1. Lane, D.M., Introduction to Statistics. Houston: Rice University. Available at: https://onlinestatbook.com/2/index.html
2. Walters, S.J., Campbell, M.J. and Machin, D., Medical Statistics: A Textbook for the Health Sciences. Hoboken, NJ: Wiley-Blackwell.
3. Rowe, P., Essential Statistics for the Pharmaceutical Sciences. London: Pharmaceutical Press.
4. Bolton, S. and Bon, C., Pharmaceutical Statistics: Practical and Clinical Applications. New York: Informa Healthcare.
5. De Muth, J.E., Basic Statistics and Pharmaceutical Statistical Applications. Boca Raton, FL: CRC Press.

Course Code	Course Title			Course Type
BP202T	**Biochemistry (Theory)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	--	--	45
Maximum Marks	SE			ESE
75	30			45

COURSE OBJECTIVES

The objectives of this course are to:

1. Know about enzymology and various tests in clinical chemistry
2. Understand the biochemical pathways and clinical relevance of carbohydrate, lipid and protein metabolism.
3. Describe energetics and biological oxidation.
4. Explain aminoacid and protein metabolism
5. Understand Nucleic acid metabolism and genetic information.

COURSE OUTCOMES (CO):

CO No.	**Upon successful completion of this course, the students will be able to:**
CO1	Explain the principles of enzymology and various tests in clinical chemistry
CO2	Describe the classification, the classification, structure, and functions of major biomolecules such as carbohydrates, lipids, proteins, nucleic acids, enzymes, and vitamins.
CO3	Explain the principles of bioenergetics, biological oxidation, and the overview of metabolic pathways of biomolecules, along with their clinical significance.
CO4	Understand metabolism of lipid and its significance.
CO5	Understand metabolism of proteins & its significance and monitoring of metabolic and organ-specific disorders.

Course Content:

Unit No.	Topics	No. of Lectures
I	**Enzymology** a. Introduction, properties, nomenclature, and IUB classification of enzymes and coenzymes. Enzyme kinetics (Michaelis plot, Lineweaver‑Burk plot). Enzyme inhibitors with examples. Regulation of enzymes: enzyme induction and repression, allosteric enzyme regulation. Therapeutic and diagnostic application of enzymes and isoenzymes. Factors affecting enzyme activity. Digestion, absorption function of dietary Macro and Micronutrients, including Vitamins and Minerals, Biochemical functions of vitamins and associated diseases. b. Clinical Chemistry: Liver function tests (routinely performed tests based on liver function). Renal function tests (routinely performed tests based on kidney function, ELISA test)	10 hours
II	a. Introduction about biomolecules ‑ Introduction of carbohydrate, lipids, nucleic acids, amino acids and proteins. b. Bioenergetics: Concept of free energy; relationship between free energy, enthalpy, and entropy; redox potential; energy-rich compounds (ATP, GTP, etc.) and their biological significance. c. Carbohydrate Metabolism and their role in diabetis mellitus: Overview and significance of major pathways: Glycolysis, Citric Acid Cycle (TCA), Gluconeogenesis, Hexose Monophosphate (HMP) shunt, and Glycogen metabolism; regulation of blood glucose levels; metabolic adaptations during fed state, fasting, and prolonged starvation; metabolic derangements in diabetes mellitus and related disorders. d. Biological Oxidation: Electron Transport Chain (ETC), oxidative phosphorylation, and mechanisms of ATP synthesis; regulation and clinical implications of mitochondrial dysfunction and oxidative stress.	10 hours
III	**Lipid metabolism** a. Classification, functions, and properties of lipids and lipoproteins (HDL, LDL, VLDL, chylomicrons) b. β-oxidation and de-novo synthesis of fatty acids: Ketone bodies:synthesis, utilization, and clinical significance c. Biological significance of cholesterol, lipid profile, and its clinical significance d. Disorders associated with lipid metabolism: Hyperlipidaemias and hypercholesterolemia, lipid storage diseases, atherosclerosis, fatty liver disease, and obesity	7 hours
IV	**Amino acids and protein metabolism** a. Classification and Biological Functions: Classification and physiological roles of amino acids. Structure and functions of proteins and plasma proteins b. General Metabolism of Amino Acids: Transamination, oxidative and non-oxidative deamination, decarboxylation. Urea cycle ‑ nitrogen disposal and detoxification. Fate of carbon skeletons of amino acids (glucogenic vs ketogenic).	10 hours

Unit No.	Topics	No. of Lectures
	c. Catabolism of Specific Amino Acids and Related Disorders: Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, Alkaptonuria, Tyrosinemia) and Inborn errors of branched chain and aromatic amino acids d. Biochemical significance of neurotransmitters and hormones derived from amino acids: 5-HT (serotonin), melatonin, dopamine, noradrenaline, adrenaline e. Catabolism of heme and related disorders (jaundice).	
V	**Nucleic acid metabolism and genetic information transfer** a. Nucleotide Metabolism and their related disorders: Biosynthesis of purine and pyrimidine nucleotides. Catabolism of purine nucleotides (uric acid formation). Clinical significance of Hyperuricemia and Gout. b. Genome Structure and Central Dogma: Organization of the mammalian genome. Introduction to DNA replication, Transcription, and Translation. c. Genetic Code and Regulation of Protein Synthesis: Properties of the genetic code: Inhibitors of transcription and translation (antibiotics, toxins) d.DNA Repair and Related Disorders: DNA damage types, Repair mechanisms. Overview of clinical disorders associated with faulty DNA repair with case studies.	8 hours

Recommended References *(Preferably latest editions)*:

1. Nelson, D.L., Cox, M.M. and Hoskins, A., *Lehninger Principles of Biochemistry*. New York: W.H. Freeman.
2. Kennelly, P.J., Rodwell, V.W., Bender, D.A., Botham, K.M. and Weil, P.A., *Harper's Illustrated Biochemistry*. New York: McGraw-Hill Education.
3. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Weil, P.A., *Harper's Biochemistry*. New York: McGraw-Hill.
4. Voet, D. and Voet, J.G., *Biochemistry*. New York: John Wiley & Sons.
5. Devlin, T.M., *Textbook of Biochemistry with Clinical Correlations*. New York: Wiley-Liss.
6. Satyanarayana, U. and Chakrapani, U., *Biochemistry*. Kolkata: Books and Allied (P) Ltd.
7. Stryer, L., *Biochemistry*. New York: W.H. Freeman.

Course Code	Course Title			Course Type
BP203T	**Human Anatomy, Physiology and Pathophysiology II (Theory)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
4	4	--	--	60
Maximum Marks	SE			ESE
100	40			60

COURSE OBJECTIVES

The objectives of this course are to:

1. Understand the anatomy and physiology of major body systems.
2. Learn mechanisms of neurological, gastrointestinal, respiratory, renal, endocrine, and reproductive functions.
3. Identify common pathophysiological conditions affecting each organ system.
4. Correlate structural and functional abnormalities with disease symptoms.
5. Equip students with foundational knowledge for interpreting disease processes and planning rational pharmacotherapy.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Describe the structural organization of the nervous, gastrointestinal, respiratory, urinary, endocrine and reproductive systems.
2	Explain the physiological mechanisms that regulate the functions of nervous, endocrine and reproductive systems.
3	Illustrate the etiology and development of common diseases affecting different organ systems including cancer.
4	Analyze the pathophysiological alterations associated with disorders of the nervous, gastrointestinal, respiratory, renal and endocrine systems.
5	Interpret clinical manifestations and case findings related to organ system dysfunctions.

Course Content:

Unit No.	Topics	No. of Lectures
I	**Nervous System** **a)** Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse and neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (Cerebrum, Brain stem and Cerebellum), Spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity). **b)** Pathophysiology of epilepsy, Parkinson's disease, Stroke, Migraine, Depression, Schizophrenia, Alzheimer's disease and Meningitis.	14 hours
II	**Gastrointestinal System** **a)** Anatomy of GI tract with special reference to anatomy and functions of stomach (acid production in the stomach and its regulation through parasympathetic nervous system; role of pepsin in protein digestion). Anatomy and functions of small intestine and large intestine. Anatomy and functions of salivary glands, pancreas and liver. Movements of GIT, digestion and absorption of nutrients. **b)** Pathophysiology of Inflammatory Bowel Diseases, Peptic ulcer, Jaundice, Hepatitis, Typhoid and Alcoholic and Non-alcoholic fatty liver disease.	12 hours
III	**a) Respiratory System** Anatomy of respiratory system with special reference to anatomy of lungs. Mechanism of respiration and regulation of respiration. Lung volumes and capacities, transport of respiratory gases, artificial respiration and resuscitation methods. **b)** Pathophysiology of Asthma, Chronic Obstructive Pulmonary Diseases (Emphysema and Chronic bronchitis) and Tuberculosis. **c) Urinary System** Anatomy of urinary tract with special reference to anatomy of kidney and nephrons. Functions of kidney and urinary tract. Physiology of urine formation, micturition reflex and role of kidneys in acid–base balance. Role of Renin Angiotensin Aldosterone System in kidney. **d)** Pathophysiology of Acute and Chronic Renal Failure and Urinary Tract Infections.	12 hours

Unit No.	Topics	No. of Lectures
IV	**Endocrine System** **a)** Classification of hormones and mechanism of hormone action. Structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland and thymus. **b)** Pathophysiology of Acromegaly, Dwarfism, Hypothyroidism, Hyperthyroidism, Goiter and Diabetes	10 hours
V	**Reproductive System** **a)** Anatomy of male and female reproductive system. Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition. **b)** Pathophysiology of sexually transmitted diseases: AIDS, Syphilis and Gonorrhoea and Polycystic Ovary Syndrome.	12 hours

Recommended References *(Preferably latest editions):*

1. Wilson, K.J.W., Ross and Wilson Anatomy and Physiology in Health and Illness. Churchill Livingstone, New York.
2. Tortora, G.J. and Grabowski, S.R., Principles of Anatomy and Physiology. Palmetto, GA, U.S.A.
3. Guyton, A.C. and Hall, J.E., Textbook of Medical Physiology. Elsevier.
4. Chatterjee, C.C., Human Physiology (Vol. I & II). Academic Publishers, Kolkata.
5. Mohan, H., Textbook of Pathology. Jaypee Publishers.
6. Porth, C.M., Pathophysiology: Concepts of Altered Health States. Lippincott Williams & Wilkins.
7. Kumar, V., Abbas, A.K., Aster, J.C. and Deyrup, A.T., Robbins and Kumar Basic Pathology. Elsevier.

Course Code	Course Title			Course Type
BP204T	**Pharmaceutical Organic Chemistry (Theory)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
4	4	--	--	60
Maximum Marks	SE			ESE
100	40			60

COURSE OBJECTIVES

The objectives of this course are to:

1. Develop a clear understanding of the chemistry of saturated hydrocarbons.
2. Study the chemistry and reactions of unsaturated hydrocarbons.
3. Understand the chemistry and reaction mechanisms of alkyl halides.
4. Explain the chemistry of aromatic hydrocarbons and their derivatives.
5. Provide an understanding of carbonyl compounds and fundamental organic reaction mechanisms relevant to pharmaceuticals.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Describe the chemical reactions and mechanisms of aliphatic saturated hydrocarbons.
2	Explain the reactions and mechanisms of aliphatic unsaturated hydrocarbons.
3	Understand nucleophilic substitution and elimination reactions of alkyl halides.
4	Explain electrophilic aromatic substitution reactions and the effect of substituents.
5	Apply knowledge of carbonyl compounds and reaction mechanisms in pharmaceutical chemistry.

Course Content:

Unit No.	Topics	No. of Lectures
I	**Basic Principles of Organic Chemistry and Classification, nomenclature:** Classification of Organic Compounds. Common and IUPAC systems of nomenclature of organic compounds **Aliphatic Saturated Hydrocarbons –** **Alkanes** • Methods of preparation: Wurtz reaction, Kolbe's reaction, Clemmensen reduction, Wolff–Kishner reduction • Chemical reactions of alkanes • Mechanism of free radical substitution (halogenation) • Pharmaceutical applications of alkanes: Liquid paraffin, soft paraffin, hard paraffin **Cycloalkanes** • Baeyer's strain theory and its limitations • Coulson–Moffitt modification • Sachse–Mohr theory	12 hours
II	**Aliphatic Unsaturated Hydrocarbons – -** **Alkenes** • Methods of preparation: o Dehydration of alcohols o Dehydrohalogenation of alkyl halides o Dehalogenation of vicinal dihalides o Wittig reaction • Chemical reactions of alkenes • Mechanism of electrophilic addition reactions • Markovnikov's and anti-Markovnikov's rule • Ozonolysis **Conjugated Dienes** • Stability of conjugated dienes • Mechanism of Diels–Alder reaction Electrophilic and free radical addition reactions • 1,2- and 1,4-addition reactions	12 hours

Unit No.	Topics	No. of Lectures

III	**Alkyl Halides**
	• Nucleophilic substitution reactions: **SN1 and SN2**
	  ○ Mechanism, kinetics, substrate structure, solvent effect, stereochemistry
	• Elimination reactions: **E1 and E2**
	  ○ Mechanism, kinetics, substrate structure, solvent effect, stereochemistry
	• Zaitsev's (Saytzeff's) rule with examples
	• Comparison of substitution vs elimination reactions
		12 hours

IV	**: Benzene and Its Derivatives – -**
	• IUPAC nomenclature of mono- and di-substituted benzene derivatives
	• Structure of benzene
	• Molecular orbital picture and resonance
	• Aromaticity and Hückel's rule
	• Electrophilic aromatic substitution reactions:
	  ○ Nitration
	  ○ Halogenation
	  ○ Friedel–Crafts alkylation and its limitations
	  ○ Friedel–Crafts acylation
	  ○ Sulphonation and desulphonation
	• Effect of substituents on reactivity and orientation	

V	**Carbonyl Compounds -** **Aldehydes and Ketones** • Preparation and properties of carbonyl compounds • Nucleophilic addition reactions • Aldol condensation and crossed aldol condensation • Cannizzaro and crossed Cannizzaro reactions • Benzoin and Perkin condensation • Oxidation and reduction reactions • Pharmaceutical applications of carbonyl compounds: Chloral, Paraldehyde, Ketoprofen	

Recommended References *(Preferably latest editions)*:

1. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., *Organic Chemistry*. Pearson Education India.
2. Finar, I.L., *Organic Chemistry, Vol. I*. Pearson Books.
3. Bahl, B.S. and Bahl, A., *Textbook of Organic Chemistry*. S. Chand & Company.
4. Furniss, B.S., *Vogel's Textbook of Practical Organic Chemistry*.

Course Code	Course Title			Course Type
BP205T	**Pharmacognosy and Phytochemistry (Theory)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
4	4	--	--	60
Maximum Marks	SE			ESE
100	40			60

COURSE OBJECTIVES

The objectives of this course are to:

1. Understand major metabolic pathways and the biogenetic origin of primary and secondary phytoconstituents, including the use of modern tools for pathway studies.
2. Study and interpret the pharmacognostic features of crude drugs containing primary metabolites such as carbohydrates, proteins/enzymes, and lipids.
3. Study and interpret the pharmacognostic features of crude drugs containing secondary metabolites such as alkaloids, glycosides, tannins, resins, volatile oils, flavonoids, phenolics, and terpenoids.
4. Impart knowledge of conventional and modern extraction techniques and enable selection of appropriate extraction methods.
5. Develop competency in isolation, identification, characterization, and quality evaluation of medicinal plants and botanicals.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Describe biosynthetic pathways and genetic tools involved in phytoconstituent production.
2	Classify and explain drugs containing primary and secondary metabolites.
3	Apply traditional and modern extraction and isolation methods.
4	Explain qualitative and quantitative analysis of plant metabolites.
5	Evaluate identity, purity, and quality of herbal raw materials.

Course Contents:

Unit	Topic	No of Lectures
I	**Metabolic Pathways and Biogenetic Studies –** Brief study of basic metabolic pathways and biosynthesis of secondary metabolites including: • Shikimic acid pathway • Acetate pathway • Amino acid pathways • Utilization of radioactive isotopes in biogenetic studies.	**6 hours**
II	**Primary Metabolites** **General classification and identification tests, Pharmacognostic study** (biological source, distribution, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: **Carbohydrates:** • Acacia • Agar • Tragacanth • Honey **Proteins and Enzymes:** • Gelatin • Casein • Soy proteins, Whey protein, Spirulina, Albumin • Proteolytic enzymes: Papain, Bromelain **Lipids (Waxes, Fats, Fixed Oils):** • Castor oil • Olive oil • Cocoa butter • Wool fat • Beeswax	**12 hours**
III	**Secondary Metabolites –** **General classification and identification tests, Pharmacognostic study** (biological source, distribution, general cultivation, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: **Alkaloids:** • Vinca • Rauwolfia • Opium **Volatile Oils:** • Eucalyptus • Clove • Cinnamon • Fennel **Tannins:** • Myrobalans • Catechu	**14 hours**

Unit	Topic	No of Lectures
	• Pterocarpus **Resins:** • Guggul • Asafoetida **Glycosides:** • Senna • Liquorice • Digitalis **Phenylpropanoids, Flavonoids and Lignans:** • Green Tea • Ruta • Flax seed **Iridoids, Other Terpenoids and Naphthoquinones:** • Gentian • Artemisia • Henna	
IV	**Extraction Methods for Medicinal Plants** **Conventional Methods of Extraction:** Extraction, factors affecting extraction yield and quality (Type of solvent, Drug: solvent ratio, time, stirring rate, temperature and particle size) • Infusion • Decoction • Digestion • Maceration • Percolation • Reflux • Distillation (Hydro, hydro-steam, steam, direct distillation) • Soxhlet extraction • Successive solvent extraction **Modern Methods of Extraction (Principle and Applications):** • Supercritical fluid extraction • Microwave-assisted extraction • Ultrasonic-assisted extraction • Enzyme-assisted extraction • Pressurized liquid extraction	**12 hours**
V	**Overview of Isolation, Identification and Characterization Techniques-** **Separation and Isolation Techniques:** • Planar chromatography • Column chromatography • Preparative TLC • Flash chromatography **Identification Techniques:** • Phytochemical tests • Chromatographic techniques • Spectroscopic techniques (UV characterization) • Fingerprinting of medicinal plants using TLC/HPTLC.	**16 hours**

Unit	Topic	No of Lectures
	Types and significance of markers (phytochemical reference standards). **Screening and analysis of major metabolites** • Alkaloids: Caffeine • Glycosides: Sennoside • Saponins: Glycyrrhizin • Tannins: Catechin • Resins: Coniferyl benzoate • Flavonoids: Hesperidin • Phenolics: Gallic acid • Steroids: Diosgenin	

Recommended References *(Preferably latest editions)*:

1. Dewick, P.M., *Medicinal Natural Products: A Biosynthetic Approach*. John Wiley & Sons.
2. Evans, W.C., *Trease and Evans' Pharmacognosy*. W.B. Saunders & Co., London.
3. Wagner, H., and Bladt, S., Plant Drug Analysis: A Thin Layer Chromatography Atlas.Springer-Verlag.
4. Harborne, J.B., Phytochemical Methods: A Guide to Modern Techniques of PlantAnalysis. Chapman & Hall.
5. Quality Standards of Indian Medicinal Plants series published by the Indian Council of Medical Research (ICMR).
6. Biren Shah, Avinash Seth, Textbook of Pharmacognosy and Phytochemistry, Elsevier Health Sciences, 14 May 2012 - Medical - 620 pages

Course Code	Course Title			Course Type
BP206T	**Physical Pharmaceutics (Theory)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	--	--	45
Maximum Marks	SE			ESE
75	30			45

COURSE OBJECTIVES

The objectives of this course are to:

1. Provide a comprehensive understanding of the theory and principles of pharmaceutical processes and unit operations involved in drug manufacturing.
2. Impart knowledge of physicochemical phenomena such as solubility, dissolution, interfacial phenomena, rheology, and micromeritics relevant to dosage form design.
3. Develop understanding of colloidal and coarse dispersions, including suspensions and emulsions, and their pharmaceutical applications.
4. Familiarize students with rheological and micromeritic properties of powders and dispersions and their role in formulation development and evaluation.
5. Build a strong foundation for formulation development, process optimization, and quality control of pharmaceutical dosage forms.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Explain and interpret the fundamental principles governing pharmaceutical manufacturing processes and unit operations.
2	Analyze physicochemical properties of drugs and excipients and correlate them with formulation stability, quality, and performance.
3	Apply concepts of interfacial phenomena, colloids, and dispersions in the design and evaluation of pharmaceutical dosage forms.
4	Evaluate and optimize pharmaceutical processes by controlling variables related to rheology, micromeritics, and dispersion systems.
5	Demonstrate foundational competency required for advanced studies in formulation development, industrial pharmacy, and pharmaceutical research.

Course Content:

UNIT	TOPIC	No. of Lectures
UNIT -I	**Solubility, Distribution Phenomenon and Buffers** **Solubility:** Solubility expressions, solute–solvent interactions, Solubility of liquids in liquids, Solubility of solids in liquids, Solubility of gases in liquids, determination of saturation solubility, effect of pH on solubility, factors affecting solubility, Raoult's law, partition coefficient—measurement and pharmaceutical significance, critical solution temperature (CST) and pharmaceutical applications. **Buffers:** Introduction to buffers, buffers in pharmaceutical and biological systems, general procedure for preparation of buffers and indicators, buffer equation, factors influencing the pH of buffer solutions, factors influencing buffer capacity, pH determination methods (electrometry and colorimetry).	**09 Hours**
UNIT -II	**Interfacial Phenomena** **Liquid interface:** Surface and interfacial tension, surface free energy, measurement of surface and interfacial tension, spreading coefficient, surface-active agents, wetting and contact angle, pharmaceutical applications of wetting agents, Hydrophilic–Lipophilic Balance (HLB), required HLB, detergency, micelles and Critical Micelle Concentration (CMC), types of monolayers at liquid surfaces. **Solid interface:** Adsorption at solid interfaces, activated charcoal as an adsorbent, adsorption isotherms (Langmuir and Freundlich—basic concepts), and pharmaceutical applications of adsorption. **Electrical properties of interfaces:** Electrical double layer, Nernst potential, zeta potential and its pharmaceutical significance, effect of electrolytes on zeta potential.	**08 Hours**
UNIT -III	**Colloidal and Coarse Dispersions** **Coarse dispersions:** Suspensions—Stokes' law, sedimentation of flocculated and deflocculated suspensions, Brownian movement, sedimentation parameters, flocculation and controlled flocculation. **Emulsions:** Theories of emulsification and stabilization (DLVO theory, monomolecular adsorption, multimolecular adsorption, solid particle adsorption and interfacial film theory), physical instabilities of emulsions (creaming, cracking/coalescence and phase inversion). **Colloidal dispersions:** Types of colloidal dispersions (lyophobic, lyophilic and association colloids), optical, kinetic and electrical properties of colloids, size and shape of colloidal systems, stability of colloidal systems (protective action and peptization), applications of colloidal systems, pharmaceutical examples of colloidal systems.	**12 Hours**
UNIT -IV	**Rheological studies** Newtonian and non-Newtonian systems. Types of non-Newtonian flow (plastic, pseudoplastic and dilatant systems). Thixotropy—measurement, hysteresis loop, bulges and spurs. Rheopexy (negative	**8Hours**

	thixotropy). Determination of rheological properties using capillary, rotational, single-point and multipoint viscometers. Viscoelasticity, psycho-rheology. Applications of rheology in pharmaceutical formulations.	
UNIT –V	**Micromeritics** Particle size and size distribution, Particle Shape and Surface area: Methods for determination and significance. Flow properties of powders: methods of determination, pharmaceutical significance, and methods of flow enhancement. Advanced characterization of powder flow using powder flow testers.	**08 Hours**

Recommended References *(Preferably latest editions)*:

1. Sinko, P.J. *Martin's Physical Pharmacy and Pharmaceutical Sciences*. Latest Edition. Wolters Kluwer.
2. Allen, L.V. Jr., Ansel, H.C. and McPherson, T.B. *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. Latest Edition. Wolters Kluwer.
3. Adejare, A. (Ed.) *Remington: The Science and Practice of Pharmacy*. Latest Edition. Pharmaceutical Press.
4. Aulton, M.E. and Taylor, K.M.G. *Aulton's Pharmaceutics: The Design and Manufacture of Medicines*. Latest Edition. Elsevier.
5. Lachman, L., Lieberman, H.A. and Kanig, J.L. *The Theory and Practice of Industrial Pharmacy*. CBS Publishers & Distributors (Indian Reprint) / CBS Publishers.
6. Myers, D. *Surfaces, Interfaces, and Colloids: Principles and Applications*. Latest Edition. Wiley.
7. Mendham, J., Denney, R.C., Barnes, J.D. and Thomas, M.J.K. *Vogel's Textbook of Quantitative Chemical Analysis*. Latest Edition. Pearson.

Course Code	Course Title			Course Type
BP207P	**Biochemistry (Practical)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES

The objectives of this course are:

1. To develop skills to identify and differentiate carbohydrates and proteins through classical qualitative biochemical tests.
2. To apply biochemical techniques for analysis of pathological conditions using urine and blood samples.
3. To perform estimations of clinically important biomolecules such as glucose, cholesterol, urea, creatinine, uric acid, and proteins in biological fluids.
4. To demonstrate enzymatic activity and study factors affecting enzyme function, including substrate concentration and temperature.
5. To interpret biochemical results and correlate them with clinical conditions such as diabetes, renal dysfunction, and lipid disorders.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Identify proteins and carbohydrates using qualitative biochemical tests and explain their physiological relevance.
2	Detect normal and abnormal constituents in urine and interpret their diagnostic significance.
3	Estimate and interpret levels of glucose, cholesterol, urea, creatinine, uric acid, and serum proteins, and correlate results with clinical conditions.
4	Demonstrate enzyme–substrate reactions and evaluate the effect of temperature and substrate concentration on enzymatic activity.
5	Analyze, record, and report biochemical results accurately and relate practical findings to theoretical knowledge and clinical application.

Course Content

List of practical
(Minimum 12experiments must be performed)
1. Identification tests for proteins (Albumin and Casein). 2. Qualitative analysis of carbohydrates* (Glucose, Fructose, Lactose, Sucrose, and Starch). 3. Qualitative analysis of urine for normal and abnormal constituents. 4. Introduction to sample collection and blood sample withdrawal (Video Demonstration) 5. Estimation of blood glucose. 6. Estimation of total cholesterol and HDL cholesterol. 7. Estimation of urea, creatinine, and uric acid in serum. 8. Estimation of serum total protein and albumin. 9. Study of enzymatic hydrolysis of starch. 10. Study of the effect of temperature on salivary amylase activity. 11. Study of the effect of substrate concentration on salivary amylase activity. 12. Estimation of hemoglobin in blood by Sahli's method / Cyanmethemoglobin method. 13. Estimation of serum bilirubin (total and direct bilirubin). 14. Estimation of glycogen content 15. Estimation of SGOT and SGPT **(Note-Reference value should be considered from the leaflet provided in the kit)**
Recommended References *(Preferably latest editions)*: 1. Plummer, D. T. *An Introduction to Practical Biochemistry.* McGraw-Hill, New York. 2. Wilson, K., and Walker, J. *Principles and Techniques of Biochemistry and Molecular Biology.* Cambridge University Press. 3. Varley, H., Gowenlock, A. H., Bell, M., and Bell, J. L. *Varley's Practical Clinical Biochemistry.* Heinemann Medical Books. 4. Burtis, C. A., Ashwood, E. R., and Bruns, D. E. *Tietz Textbook of Clinical Chemistry and Molecular Diagnostics.* Elsevier. 5. Rodwell, V. W., Bender, D. A., Botham, K. M., Kennelly, P. J., and Weil, P. A. *Harper's Illustrated Biochemistry.* McGraw-Hill. 6. Freifelder, D. *Essential Molecular Biology: A Practical Approach.* Oxford University Press.

Course Code	Course Title			Course Type
BP208P	**Human Anatomy, Physiology and Pathophysiology II (Practical)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES

The objectives of this course are to:

1. Provide foundational knowledge of the structure and functions of major organ systems of the human body.
2. Develop understanding of physiological mechanisms responsible for maintenance of homeostasis.
3. Explain the pathophysiology of diseases affecting different organ systems.
4. Explore causes of diseases and the body's responses to pathological conditions.
5. Build a strong base for clinical learning through the study of functional and structural changes in disease states.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Explain the gross morphology, structures, and functions of various organs and organ systems of the human body.
2	Demonstrate basic emergency response procedures such as cardiopulmonary resuscitation (CPR).
3	Describe the etiology and pathogenesis of selected disease states.
4	Identify signs and symptoms, risk factors, diagnostic methods, prevention, treatment strategies, and complications of diseases.
5	Understand coordinated working patterns of different organs of each system and perform experiments related to special senses and nervous system.

Course Content:

List of Practicals
(Minimum12 experiments must be performed-First 12 experiments are mandatory) Practical HAPP allows the verification of physiological processes discussed in theory classes through experiments on living tissues, simulated videos, models, and charts.

Experiment Number	Title of the Experiment
1.	Demonstration of total blood count by cell analyser.
2.	Enumeration and interpretation of differential count.
3.	Determination of bleeding time and clotting time.
4.	Determination and interpretation of erythrocyte sedimentation rate (ESR).
5.	Study of nervous system using specimens and models.
6.	Study of respiratory system using models.
7.	Study of gastrointestinal system using models.
8.	Study of reproductive system using models.
9.	Recording of body mass index (BMI).
10.	Study of family planning devices and pregnancy diagnosis tests
11.	Recording of body temperature.
12.	Determination of tidal volume and vital capacity.
13.	Demonstration of general neurological examination.
14.	Demonstration of reflex activity.
15.	Understanding pathophysiology of IBD, peptic ulcer, jaundice, hepatitis, typhoid, asthma, tuberculosis, diabetes, and thyroid disorders through case files / case reports.
16.	Hands-on training in cardiopulmonary resuscitation (CPR).

Recommended References *(Preferably latest editions)*:

1. Wilson, K. J. W., and Waugh, A. Anatomy and Physiology in Health and Illness Churchill Livingstone, New York.
2. Best, C. H., and Taylor, N. B. The Physiological Basis of Medical Practice. Williams & Wilkins, Baltimore.
3. Guyton, A. C., and Hall, J. E. Textbook of Medical Physiology. Elsevier / W.B. Saunders, Philadelphia.
4. Tortora, G. J., and Grabowski, S. R. Principles of Anatomy and Physiology. John Wiley & Sons.
5. Brunton, L., Chabner, B., and Knollmann, B. Goodman & Gilman's The Pharmacological Basis of Therapeutics. McGraw-Hill, New York.
6. Colledge, N. R., Walker, B. R., and Ralston, S. H. Davidson's Principles and

Practice of Medicine. Churchill Livingstone, London.				
Course Code	Course Title			Course Type
BP209P	**Pharmaceutical Organic Chemistry (Practical)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES

The objectives of this course are to:

1. Understand and follow essential laboratory safety protocols for handling chemicals, glassware, and equipment.
2. Identify and analyze organic compounds through their physical properties and functional group reactivity.
3. Apply ball-and-stick molecular models to visualize and interpret the structure of organic compounds.
4. Perform purification techniques such as crystallization to isolate and refine organic substances.
5. Synthesize simple organic compounds and their derivatives using standard laboratory methods.

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Recall and outline the preliminary qualitative tests used for identifying water-insoluble and immiscible organic compounds.
2	Understand the synthesis methods for preparing simple organic compounds and their derivatives.
3	Apply crystallization techniques to purify organic compounds effectively.
4	Analyze experimentally to detect elements and functional groups to identify unknown organic compounds.
5	Interpret and analyze organic compounds through systematic qualitative analysis to confirm their chemical nature.
6	Determine the melting and boiling points of organic compounds using a calibrated thermometer, perform simple distillation, and use molecular drawing software to represent organic structures.

Course Contents:

Sr. No.	Practical *(Minimum 12 experiments to be performed — Total 15 Turns)*	No. of Turns
1	**Qualitative analysis of unknown organic compounds** Systematic qualitative analysis of a minimum of five water-insoluble or water-immiscible unknown organic compounds from different chemical classes: **a. Preliminary tests:** Color, odour, Solubility tests, test for aromaticity, test for saturation/unsaturation etc. **b. Detection of elements** such as nitrogen, sulphur and halogens by Lassaigne's test. **c. Determination of Functional group** tests such as phenols, amides, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons and nitro compounds. **d. Preparation of the derivatives** and confirmation of the unknown organic compound by melting point / boiling point of the crude product (before recrystallization); recrystallization of the derivative/product using a suitable solvent to obtain a pure sample; and re-determination of the melting point / boiling point after recrystallization, comparing it with the value obtained before crystallization to confirm the purity and identity of the compound.	**5/6**
2	**Building Molecular Models** Students will use ball-and-stick models to create structures of molecules and understand their shapes and bonding.	**1**
3	**Crystallization (minimum three compounds)** Students will learn how to purify a minimum of three organic compounds using the crystallization technique.	**1/2/3**
4	**Simple Distillation** Students will learn the technique of simple distillation to separate and purify liquids based on differences in their boiling points	**1**
5	**Melting Point Determination (incl. thermometer calibration)** Study of the construction and working of a laboratory thermometer, and its calibration against standard fixed points / known reference substances. Using the calibrated thermometer, students will determine the melting point of a given solid organic compound by the capillary tube method / melting point apparatus, and use it to check the purity and identity of the compound.	**1/2**
6	**Boiling Point Determination** Using the calibrated thermometer, students will determine the boiling point of a given liquid organic compound by a suitable method, and use it to check the purity and identity of the compound.	**1/2**
7	**Drawing Structures Using Software** Students will use molecular drawing software (e.g. ChemDraw, ChemSketch, or similar) to draw 2D/3D structures of organic compounds and visualize their conformations.	**1**

Recommended References ***(Preferably latest editions):***

1. Furniss, B. S., Hannaford, A. J., Smith, P. W. G. and Tatchell, A. R. **Vogel's Textbook of Practical Organic Chemistry.** Longman Scientific & Technical, London.
2. Mann, F. G. and Saunders, B. C. **Practical Organic Chemistry.** Pearson Education.
3. Shriner, R. L., Hermann, C. K. F., Morrill, T. C., Curtin, D. Y. and Fuson, R. C. **The Systematic Identification of Organic Compounds.** John Wiley & Sons.
4. Vogel, A. I. **Elementary Practical Organic Chemistry.** Longman Group Ltd.
5. Pavia, D. L., Lampman, G. M., Kriz, G. S. and Engel, R. **Introduction to Organic Laboratory Techniques.** Cengage Learning.

Course Code	Course Title			Course Type
BP210P	**Pharmacognosy and Phytochemistry (Practical)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES

The objectives of this course are to:

1. Perform chemical tests for the identification of gums, resins, oils, fats, waxes, and unorganized drugs.
2. Examine crude drugs using transverse section and powder microscopy for correct identification.
3. Apply suitable extraction techniques and study their effect on yield of crude extracts.
4. Isolate and identify important phytoconstituents and volatile oils using standard procedures.
5. Evaluate herbal raw materials collected from field/market sources as per Pharmacopoeial standards.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Identify unorganized crude drugs using specific chemical tests.
2	Analyze organized crude drugs through microscopy and powder analysis.
3	Select and perform appropriate extraction methods for herbal drugs.
4	Isolate and characterize phytoconstituents using laboratory techniques and TLC.
5	Assess and compare the quality and purity of herbal raw materials with official standards.

Course Content:

List of Practicals (minimum 12 experiments must be performed)
1. Chemical tests for identification of Agar, Acacia, Tragacanth, Honey. 2. Chemical tests for identification of Castor oil, Sesame oil, Wool fat, Beeswax. 3. Chemical tests for identification of Asafoetida, Catechu, Aloe. 4. Transverse section and powder microscopy of vinca leaf. 5. Transverse section and powder microscopy of cinnamon bark. 6. Transverse section and powder microscopy of fennel fruit. 7. Transverse section and powder microscopy of clove flower bud. 8. Transverse section and powder microscopy of Ephedra stem 9. Transverse section and powder microscopy of Liquorice roots. 10. Study of effect on different extraction techniques on yield of crude extract (Maceration, Decoction, Soxhlation, Ultrasound, Microwave). 11. Isolation of volatile oil by hydro-distillation and it's TLC. 12. Isolation of caffeine from tea. 13. Isolation of Hesperidin from orange peel. 14. Isolation of Curcumin from Turmeric and TLC characterization 15. Isolation of Pectin from orange peel. 16. Experiential learning-based experiment involving evaluation and comparison offield/market collected herbal raw materials with Pharmacopoeial standards. 17. Evaluation of a marketed herbal sample & preparation of a mini-Certificate of Analysis (COA)
Recommended References *(Preferably latest editions)*: 1. Trease, G. E. and Evans, W. C. Pharmacognosy. Elsevier. 2. Harborne, J. B. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Springer. 3. Wallis, T. E. Textbook of Pharmacognosy. CBS Publishers & Distributors, New Delhi. 4. Tyler, V. E., Brady, L. R. and Robbers, J. E. Pharmacognosy. Lea & Febiger. 5. Anatomy of Crude Drugs (IE) Book by M A Iyengar and S C K Nayak BSP Books 6. Quality Standards of Indian Medicinal Plants series published by the Indian Council of Medical Research (ICMR).

Course Code	Course Title			Course Type
BP211P	**Physical Pharmaceutics (Practical)**			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	3	45
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES

The objectives of this course are to:

1. Introduce basic laboratory techniques for determining physicochemical properties such as surface tension, viscosity, and density in pharmaceutical systems.
2. Develop understanding of interfacial phenomena and surfactant behavior, including micelles, critical micellar concentration (CMC), and HLB in formulation design.
3. Train students in evaluating disperse systems through sedimentation studies and the effect of suspending agents.
4. Provide practical experience in powder characterization, including particle size distribution, density, flow properties, porosity, and the role of glidants.
5. Develop skills in determining solubility, partition coefficient, buffer capacity, and related equilibria relevant to drug formulation.

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Demonstrate practical knowledge of principles and procedures involved in measuring surface tension, viscosity, density, and related physical properties using standard laboratory apparatus.
2	Determine and interpret surfactant-related parameters such as CMC and required HLB and explain their significance in formulation stability and performance.
3	Conduct experiments and analyze results related to sedimentation volume and evaluate the influence of type and concentration of suspending agents on dispersion stability.
4	Evaluate micromeritic and flow properties of powders by determining particle size distribution, bulk density, tapped density, Hausner ratio, Carr's index, angle of repose, true density, and porosity, and interpret the effect of glidants
5	Perform and assess experiments on solubility, partition coefficient, critical solution temperature, adsorption studies, and buffer capacity, and apply findings to formulation decisions.

Course Content:

List of practical

(Minimum 12 experiments must be performed)

1. Determination of surface tension of given liquids by drop count method and drop weight method.
2. Determination of critical micellar concentration (CMC) of surfactants.
3. Determination of viscosity of liquids using Ostwald's viscometer and Brookfield viscometer.
4. Preparation of pharmaceutical emulsion using surfactant blends based on required HLB
5. Calculation of isotonicity by different methods (Sodium Chloride Equivalent Method).
6. Determination of particle size and particle size distribution using sieving method.
7. Determination of particle size and particle size distribution using microscopic method.
8. Determination of densities and derived properties of powders (bulk density, tapped density, Hausner ratio, Carr's compressibility index), true density, and porosity.
9. Determination of angle of repose and influence of glidants on angle of repose.
10. Determination of solubility of a drug at different pH/buffer systems at room temperature.
11. Determination of partition coefficient of a drug in n-octanol and water system.
12. Determination of partition coefficient of a drug in benzene and water system.
13. Determination of critical solution temperature and composition of phenol–water system.
14. Determination of specific surface area of charcoal by adsorption of acetic acid on activated charcoal.
15. Determination of buffer capacity at various stages of titration of a weak acid against a strong base and determination of pKa.

Recommended References *(Preferably latest editions)*:

1. Sinko, P. J. Martin's Physical Pharmacy and Pharmaceutical Sciences. Wolters Kluwer.
2. Aulton, M. E., & Taylor, K. M. G. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. Elsevier.
3. Allen, L. V., Popovich, N. G., & Ansel, H. C. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Wolters Kluwer.
4. Lachman, L., Lieberman, H. A., & Kanig, J. L. The Theory and Practice of Industrial Pharmacy. CBS Publishers & Distributors.
5. Adejare, A. (Ed.). Remington: The Science and Practice of Pharmacy. Pharmaceutical Press.

6. Cooper, S. J., & Gunn, C. Cooper and Gunn's Tutorial Pharmacy. CBS Publishers & Distributors.
7. Myers, D. Surfaces, Interfaces, and Colloids: Principles and Applications. John Wiley & Sons.
8. Gaud, R. S., & Gupta, G. D. Laboratory Manual of Physical Pharmaceutics. Vallabh Prakashan.
9. Jain, N. K. Textbook of Physical Pharmacy. CBS Publishers & Distributors.
10. C.V.S. Subrahmanyam. Physical Pharmaceutics. PharmaMed Press.

Course Code	Course Title			Course Type
BP212P SEC1	**Communication Skills (Practical)**			Elective
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	2	30
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Enhance verbal and non-verbal communication skills in academic, clinical, and professional pharmacy settings.
2. Develop competence in patient counselling, prescription communication, and inter professional dialogue.
3. Promote empathetic and ethical communication in diverse cultural and patient contexts.
4. Use digital tools and professional formats (e.g., email, reports, posters) for effective communication.
5. Foster confidence, active listening, and clarity in pharmacy-related presentations and conversations.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to
1	Demonstrate effective verbal and non-verbal communication in clinical, retail, and academic pharmacy contexts.
2	Perform patient counselling and handle real-world pharmacy interactions using role play and case scenarios.
3	Draft professional emails, prepare patient information leaflets, and create drug labels with clarity and accuracy.
4	Deliver confident oral presentations and communicate complex medical information in a simplified, patient-friendly manner.
5	Apply principles of ethical and culturally sensitive communication in handling patients and professional peers.

Course Contents:

List of practical

(Perform any 12 Experiments)

1. Introduction to Communication in Pharmacy
    - Types of communication: verbal, non-verbal, written
    - Importance in clinical, academic, and retail pharmacy
2. Listening and Observation Skills Workshop
    - Active listening techniques, barriers to listening
    - Observation of cues: patient posture, tone, compliance
3. Role-play: Communicating with a Patient for Dispensing a Prescription
    - Explanation of dosage, frequency, side effects, and precautions
4. Role-play: Handling Difficult Conversations (e.g., Angry Patient or Confused Elderly)
    - Empathy, patience, tone modulation, de-escalation techniques
5. Written Communication I: Professional Email Writing & Documentation
    - Writing emails to doctors, suppliers, institutions
    - Structure, etiquette, and clarity in pharmacy communications
6. Written Communication II: Preparing Patient Information Leaflets and Drug Labels
    - Use of simple language, drug facts, precautions, icons
    - Creating flyers for common conditions (e.g., diabetes, asthma)
7. Non-verbal Communication Skills
    - Body language, eye contact, gestures, tone of voice
    - Cross-cultural sensitivity in pharmacy communication
8. Presentation Skills I – Basic Techniques
    - Voice projection, clarity, use of visuals
    - Individual practice with simple pharmacy topics
9. Presentation Skills II – Group Presentations
    - Topics: health awareness campaigns, drug education, OTC safety
    - Peer and faculty feedback
10. Patient Counseling Practice (Case-Based)
    - Counseling for chronic illness (e.g., hypertension, diabetes)
    - Role-playing real-life counseling situations
11. Communicating with Healthcare Professionals
    - Case handoff, drug information request, referral writing
    - Using SBAR (Situation, Background, Assessment, Recommendation) format
12. Mock Interview / Group Discussion Practice
    - Industry/clinical job interview scenarios
    - GD on topics like "Generic vs Branded Medicines"
13. Digital Communication Skills for Pharmacists
    - Creating a simple health blog, social media awareness post
    - Basics of teleconsultation and ePharmacy chat support
14. Ethics and Professionalism in Communication
    - Confidentiality, patient rights, informed consent
    - Role-play ethical dilemmas in pharmacy
15. Assessment & Reflection
    - Final presentation or counseling demo
    - Feedback, self-evaluation, and faculty observation

Recommended References *(Preferably latest edition)*:

1. Communication Skills in Pharmacy Practice – E. M. Kelly & S. L. Svarstad,

   Lippincott Williams & Wilkins

2. Developing Communication Skills for Pharmacy – Catherine Langford, Pharmaceutical
   Press

3. Patient Counselling Guidelines for Pharmacists – WHO India, World Health

   Organization

Course Code	Course Title			Course Type
BP212P SEC2	**Mental Well-Being, Stress and Conflict Management (Practical)**			Elective
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	2	30
Maximum Marks	SE			ESE
50	20			30

COURSE OBJECTIVES:

The objectives of this course are to:

1. Introduce students to the concepts of mental well-being and stress.
2. Equip students with techniques to manage stress, anxiety, and emotional well-being.
3. Develop conflict resolution skills for personal and professional life.
4. Encourage emotional intelligence and interpersonal communication.
5. Promote resilience and positive mindset development.

COURSE OUTCOMES (CO):

CO No.	Upon successful completion of this course, the students will be able to
1	Identify sources and effects of stress in personal and professional life.
2	Apply stress management techniques such as mindfulness, journaling, and relaxation exercises.
3	Utilize conflict management strategies to resolve interpersonal and workplace conflicts.
4	Demonstrate improved emotional intelligence and resilience.
5	Develop effective communication skills for personal and professional growth.

Course Content:

List of practical
(Perform any 12 Experiments) 1. Self-assessment of stress levels using Perceived Stress Scale (PSS) 2. Journaling activity: Maintain a 7-day emotional diary 3. Mindfulness breathing exercise and reflection 4. Guided meditation session and feedback form 5. Time management activity using Eisenhower Matrix 6. Role-play exercise on workplace conflict resolution 7. SWOT analysis of personal behavior and coping mechanisms 8. Cognitive restructuring worksheet for negative thoughts 9. Group discussion: "How do you respond to stress?" 10. Conflict styles self-test (Thomas-Kilmann Conflict Mode Instrument) 11. Visualization technique to reduce anxiety 12. Progressive muscle relaxation practice 13. Team activity: Building trust through icebreakers and communication 14. Reflection report after practicing gratitude for 5 days 15. Case study analysis: Conflict scenario in a healthcare/pharma setup
Recommended References *(Preferably latest edition)*: 1. The Relaxation and Stress Reduction Workbook – Martha Davis, Elizabeth Robbins Eshelman & Matthew McKay, New Harbinger Publications 2. Managing Stress: Principles and Strategies for Health and Well-Being – Brian Luke Seaward, Jones & Bartlett Learning 3. Emotional Intelligence – Daniel Goleman, Bantam Books 4. The 7 Habits of Highly Effective People – Stephen R. Covey, Simon & Schuster 5. Conflict Management: A Practical Guide to Developing Negotiation Strategies – Barbara A. Budjac Corvette, Pearson Education 6. Mindfulness: An Eight-Week Plan for Finding Peace in a Frantic World – Mark Williams & Danny Penman, Rodale Books 7. Stress Management for Life: A Research-Based Experiential Approach – Michael Olpin & Margie Hesson, Cengage Learning 8. Crucial Conversations: Tools for Talking When Stakes Are High – Kerry Patterson, Joseph Grenny, Ron McMillan & Al Switzler, McGraw-Hill Education

Course Code	Course Title			Course Type
BP212P SEC3	**Fundamentals of Computer Operations (Practical)**			Elective
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	2	30
Maximum Marks	SE		ESE	
50	20		30	

COURSE OBJECTIVES:

The objectives of this course are to:

1. Provide foundational knowledge of computer systems, operating environments, and digital tools used in academic and professional settings.
2. Develop practical skills in digital documentation, data handling, and presentation using commonly available office productivity tools.
3. Familiarize students with file management practices and digital communication methods used in professional environments.
4. Enhance the ability to access, search, and retrieve scientific and academic information from online resources.
5. Prepare students to utilize computer-based tools for managing pharmaceutical data, documentation, and basic professional tasks.

COURSE OUTCOMES (CO):

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

CO No.	Upon successful completion of this course, the students will be able to
1	Demonstrate the ability to operate computer systems and perform basic system and file management functions.
2	Prepare and format digital documents and spreadsheets for academic and pharmaceutical applications.
3	Develop presentations and use digital communication tools for effective professional communication.
4	Access and retrieve scientific information using online databases and academic search platforms.
5	Apply basic computer skills for organizing, analyzing, and managing pharmaceutical data and documentation.

Course Content:

List of practical

(Perform any 12 Experiments)

General Instruction on Digital Tools

*Open-source digital tools are **preferred for teaching and learning purposes**. However, institutions may **choose appropriate software platforms, applications, or online services depending on availability, institutional policy, and infrastructure**. The selected tools should enable students to perform the required digital and documentation tasks effectively. The **specific software may vary**, but the **skills and competencies listed below must be achieved using suitable tools.***

Practical Components

1. Basic operation and navigation of a computer operating system, including system settings and file explorer functions.
2. Creating, renaming, organizing, moving, and deleting files and folders within a computer system.
3. Preparing a structured academic or pharmacy-related report using a word-processing application with appropriate formatting, tables, headers, and page layout.
4. Inserting equations, images, and formatted elements while preparing documents such as reports, notices, or certificates using document editing tools.
5. Creating spreadsheets for pharmacy-related calculations such as dose calculations, inventory records, or sales data using spreadsheet applications.
6. Applying basic spreadsheet formulas and functions such as summation, averaging, conditional calculations, and counting operations.
7. Generating graphs, charts, and data visualizations from experimental or pharmaceutical data using spreadsheet tools.
8. Preparing a short academic presentation (approximately five slides) using presentation software with text, images, and basic design elements.
9. Performing effective internet browsing and academic search techniques using online scientific literature databases and search platforms.
10. Writing and sending professional emails including file attachments, proper subject lines, and appropriate use of CC and BCC with correct communication etiquette.
11. Introduction to digital systems used in pharmacy practice such as billing, inventory management, or prescription management through demonstration or simulation.
12. Using cloud-based storage platforms for saving, organizing, and sharing academic or pharmacy-related files and data.
13. Exploring digital health technologies such as pharmacy-related mobile applications or electronic health tools used in healthcare practice.
14. Accessing and utilizing online learning platforms for professional education and course materials.
15. Preparing and submitting digital assignments using word-processing, spreadsheet, or presentation tools.

Recommended References *(Preferably latest edition)*:

1. Introduction to Computers – Peter Norton, McGraw-Hill Education
2. Computer Basics: Absolute Beginner's Guide – Michael Miller, Que Publishing