AMRITA VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY
School of Pharmacy

B. Pharm Regulations -2026
in compliance with
Choice Based Credit System (CBCS)
as per National Education Policy 2020, prescribed by the Pharmacy Council of India, New Delhi

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):

K1. Apply fundamental knowledge of pharmaceutical sciences and biomedical sciences to understand drug discovery, development, formulation, quality assurance, and rational use of medicines.

K2. Explain the scientific principles underlying the synthesis, isolation, characterization, manufacturing, quality control, regulatory requirements, and evaluation of pharmaceutical products, including synthetic, natural, and biotechnological medicines.

K3. Integrate knowledge of pharmacy practice, pharmacotherapeutics, public health, and national and international healthcare policies to support safe, effective, and patient-centered pharmaceutical care.

S1. Perform pharmaceutical synthesis, formulation, manufacturing, analytical testing, quality control, and biological evaluation using appropriate laboratory techniques, instruments, and standard operating procedures.

S2. Apply pharmaceutical calculations, scientific reasoning, and evidence-based approaches to solve problems related to drug development, dosage form design, pharmacokinetics, medication safety, and patient care.

S3. Evaluate drug substances, pharmaceutical formulations, and clinical information by interpreting experimental data, physiological parameters, scientific literature, and regulatory requirements to support informed decision-making.

S4. Demonstrate competency in pharmacy practice by accurately interpreting prescriptions, dispensing medicines, providing patient counseling, promoting medication safety, and collaborating effectively within interdisciplinary healthcare teams.

S5. Design, conduct, and communicate pharmaceutical research by identifying research problems, formulating hypotheses, collecting and analyzing data, and presenting scientific findings using appropriate digital and professional communication skills.

S6: Utilize modern pharmaceutical software, digital technologies, artificial intelligence, machine learning, and computational tools for data analysis, decision-making, and problem-solving in pharmaceutical sciences.

A1. Demonstrate ethical, professional, and patient-centered values by adhering to regulatory standards, ensuring patient safety, maintaining confidentiality, and fulfilling social and professional responsibilities.

A2. Exhibit lifelong learning, critical thinking, innovation, adaptability, and commitment to continuous professional development in response to emerging advances in pharmaceutical sciences and healthcare.

A3: Promote environmentally responsible practices, green pharmacy principles, and sustainable healthcare by addressing the environmental impact of pharmaceutical manufacturing, use, and disposal, in alignment with the United Nations Sustainable Development Goals (SDGs).

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.

PHARMACIST'S OATH

I swear by the code of ethics of Pharmacy Council of India, in relation to the community and shall act as an integral part of health care team.

I shall uphold the laws and standards governing my profession.

I shall strive to perfect and enlarge my knowledge to contribute to the advancement of pharmacy and public health.

I shall follow the system which I consider best for pharmaceutical care and counselling of patients.

I shall endeavour to discover and manufacture drugs of quality to alleviate sufferings of humanity.

I shall hold in confidence the knowledge gained about the patients in connection with my professional practice and never divulge unless compelled to do so by the law.

I shall associate with organizations having their objectives for betterment of the profession of Pharmacy and make contribution to carry out the work of those organizations.

While I continue to keep this oath unviolated, may it be granted to me to enjoy life and the practice of pharmacy respected by all, at all times !

Should I trespass and violate this oath, may the reverse be my lot !

GLOSSARY

KEYWORD	DEFINITION
Ability Enhancement Courses	Courses of varying durations which are optional, and offered in the curriculum that improves the understanding of the subject and enhance ability of the students.
Academic Calendar	The schedule of the institution for the academic year, giving details of all academic and administrative events.
Assessment	Performance evaluation based on certain established criteria
Attainment of Course Outcomes (COs)	COs are to be attained by all students at the end of a formal course. While the method of computation of attainment of COs is not unique, each institution has to follow a well-defined direct method of computing CO attainment based on the student performance in all assessment instruments, and indirect method of computing COs through course exit survey of students
Bloom's Taxonomy	A hierarchical framework used to classify educational learning objectives into levels of complexity and specificity, utilized here to design question papers and assessment tools.
Choice Based Credit System (CBCS)	A mode of learning in higher education which facilitates a student to have some freedom in selecting his/her own choices, across various disciplines for completing a UG / PG program. All UG and PG programs, as per UGC, have to implement CBCS
Co-Curricular Activities	Activities, which support the curriculum such as field trips, hospital visits, community medicine shops, display of academic achievements, quiz, debate, discussion, seminars, role-play, etc
Collaboration	Formal agreement/ understanding between any two or more institutions for training, research, student/ faculty exchange or extension support.
Continuous Assessment	A component of internal assessment that evaluates regular engagement, including attendance and student-teacher interaction.
Counseling	Assisting and mentoring students individually or collectively for academic, career, personal and financial decision-making.

Course	A course is a unit of 1 to 6 credits in a formal program. A 3-credit course will have three classroom sessions of one-hour duration during each week for the entire semester.
Course Outcomes (COs)	COs are statements that describe what students should be able to do at the end of a course.
Credit	A credit system is a systematic way of describing an educational programme by attaching credits to its components as a unit of measure for academic work. One (1) credit is assigned for every one hour of lecture per week or every two hours of practical (laboratory) work per week. For internship / Practice School and projects, 4 hours equals 1 credit.
Cumulative Grade Point Average (CGPA)	A calculation based on the SGPA of all eight semesters, used to determine the final class and rank.
E-learning Resources	Learning resources available on Internet
Elective Courses	A choice available to students to select from among a large number of Courses
Enrichment Courses	Enrichment courses are credit-bearing courses designed to complement the core curriculum by enhancing students' knowledge, skill, professional competence and overall personality development beyond the regular curriculum.
Evaluation Process	Assessment of teaching, learning and evaluation process and reforms to increase the efficiency and effectiveness of the system.
Experiential Learning	Is a process of learning through experience and is more specifically defined as "learning through reflection on doing".
Field Project	Formal projects students need to undertake that involve conducting surveys outside the college/university premises and collection of data from designated communities or natural places
Graduate Attributes	The disciplinary expertise or technical knowledge that has traditionally formed the core of most university courses. They are qualities that also prepare graduates as agents for social good in an unknown future.
Grievance Redressal	Mechanisms for receiving, processing and addressing dissatisfaction expressed, complaints and other formal requests

	made by learners, staff and other stakeholders on the institutional provisions promised and perceived.
ICT	Information and Communication Technology Consists of the hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, images) as well as related services.
Internal Examination Committee	A body chaired by the Principal that plans the internal assessment calendar, approves question paper patterns, and addresses student grievances regarding internal marks.
Internship /Practice School	A mandatory period of work in a pharmaceutical industry, hospital, or clinical research organization, typically completed in Semester VII and VIII under an identified mentor.
Learning Outcomes	Specific intentions of a Programme or module, written in clear terms. They describe what a student should know, understand, or be able to do at the end of that Programme or module
Levels of Outcomes	**Programme Educational Objectives (PEOs):** PEOs are broad statements that describe the professional achievements and career accomplishments that graduates are expected to attain a few years after completing the programme. **Programme Outcomes (POs):** POs are statements that describe the knowledge, skills, and competencies that students should acquire by the time they graduate from the programme. **Course Outcomes (COs):** COs are statements that describe what students should be able to know, understand, and perform at the end of a specific course.
Miller's Pyramid	A framework for assessing clinical competence, used to monitor the progress and attainment of pharmacy students.
Multi-disciplinary Courses	Courses of varying durations which are optional, and offered outside the curriculum in the multidisciplinary areas that

	encourage understanding of recent trends in allied areas and helping the students in getting placed.
OBE: Outcome Based Education	OBE is an educational theory that bases each part of an educational system around goals (outcomes). Each student should have achieved the goal by the end of the educational experience
Outcome	An outcome of an educational Programme is what the student should be able to do at the end of a Programme/ course/ instructional unit.
Participative Learning	Participatory Learning and Action is a family of approaches, methods, attitudes, behaviours and relationships, which enable and empower people to share, analyze and enhance their knowledge of their life and conditions, and to plan, act, monitor, evaluate and reflect.
Problem Based Learning (PBL)	Is a student-centred pedagogy in which students learn about a subject through the experience of solving an open-ended problem found in trigger material. The PBL process does not focus on problem solving with a defined solution, but it allows for the development of other desirable skills and attributes. This includes knowledge acquisition, enhanced group collaboration and communication.
Programme	A structured set of courses and learning experiences offered over a specified period, leading to the award of a certificate, diploma, or degree recognized by the appropriate regulatory authority (e.g., UGC/PCI).
Program Committee	A committee led by a senior teacher that reviews class progress, discusses curriculum issues, and monitors the attainment of program outcomes.
Remedial Courses	Courses offered to academically disadvantaged students in order to help them cope with academic requirements.
Research Project	A supervised project carried out in groups of no more than three students during the final year, relating to an elective subject.

Semester	A period of study consisting of not less than 100 working days. Odd semesters run from June/July to November/December, and even semesters run from December/January to May/June
Semester Grade Point Average (SGPA)	A number representing the weighted average of the grade points obtained in all courses during a single semester.
Sessional	Tests conducted for each course during the semester, the average of which contributes to the internal assessment marks.
Skill Enhancement Courses	Courses of varying durations which are optional, and offered in the curriculum that develop the required skills and helping the students in getting placed.
Progression	Vertical movement of students from one level of education to the next higher level successfully or towards gainful employment.
Value Added Courses	Courses of varying durations which are optional, and offered outside the curriculum that add value and helping the students in getting placed.

REGULATION

1. Short title and commencement

This regulation shall be called as "The Regulation for the B. Pharm. Degree Programme of Amrita in compliance with Choice Based Credit System (CBCS) as per National Education Policy 2020 prescribed by the Pharmacy Council of India, New Delhi". It shall come into effect from Academic Year 2026-27 onwards.

2. Minimum qualification for admission

2.1 B. Pharm (Regualr)

i. A candidate shall have passed the 10+2 examination with minimum 50% marks, conducted by the respective State or Central Government authorities, recognized as equivalent to 10+2 examination 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 (Directly to third semester):

Candidate shall have passed 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.

4. Medium of instruction and examinations

Medium of instruction and examination shall be English.

5. Working days in each semester

Each semester shall consist of not less than 100 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

100% attendance is necessary for the students, however, 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 examination/s.

7. Programme/Course credit structure

As per the Choice Based Credit System (CBCS) prescribed by PCI, 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 on 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, Research Project and Internship/ Practice School. Theory (T) courses consist of lecture (L) and tutorial (T) hours while Practical (P) courses consist of hours spent in the laboratory. The Credits(C) assigned to a course is 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 3 credits. Similarly, a practical course with two laboratory hours per week throughout semester carries 1 credit.

7.1.2. Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 180. These credits are distributed across Theory courses, Practical courses, Internship/Practice School and Research 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 within Semester IV of the programme. namely

- Basics of Python programming for Pharmaceutical sciences (T) – From First Sem /- 2 Credits
- Applied Biostatistics and Data Analysis for Pharmaceutical Sciences (T) - From Second Sem /- 2 Credits

The lateral entry student shall be awarded 44 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 45 credits, 41 credits shall be accounted for the Diploma programme, and the remaining 4 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/Practice School 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.

Category:

PHAR-Pharmacy Courses
AEC: Ability Enhancement Courses
SEC : Skill Enhancement Courses
VAC: Value added Courses
ERC : Enrichment Courses

Table-I: Course of Study for Semester I

Category	Course code	Name of the course	No. of hours	Tutorial	Credit points
ERC	BP.101T	Basics of Python Programming for Pharmaceutical Sciences- Theory	2	-	2
PHAR	BP.102T	General Pharmacy-Theory	3	-	3
PHAR	BP.103T	Human Anatomy, Physiology & Pathophysiology I–Theory	4	-	4
PHAR	BP.104T	Introduction to Pharmacognosy -Theory	2	0.5	2.5
PHAR	BP.105T	Pharmaceutical Inorganic and Analytical Chemistry–Theory	3	0.5	3.5
ERC	BP.106RBT BP.106RMT	1. Remedial Biology#* 2. Remedial Mathematics–Theory#*	2	-	2
ERC	BP.107T (22AVP103)	Mastery Over Mind–Theory*	1	-	1
PHAR	BP.108P	General Pharmacy-Practical	3	-	1.5
PHAR	BP.109P	Introduction to Pharmacognosy- Practical	3	-	1.5
PHAR	BP.110P	Pharmaceutical Inorganic and Analytical Chemistry-Practical	2	-	1
ERC	BP.111P	Mastery Over Mind–Practice*	1	-	-
	Total		**24/26#***	**1**	**20/22#***

#Applicable only for the students appearing for Remedial Biology (RB)/Remedial Mathematics (RM)course.
*School level exam (Audit Courses)

Table II: Course of Study for Semester II

Category	Course Code	Name of the course	No. of hours	Tutorial	Credit points
ERC	BP.201T	Applied Biostatistics & Data Analytics for Pharmaceutical Science–Theory#	2	-	2
PHAR	BP.202T	Biochemistry–Theory	2	0.5	2.5
PHAR	BP.203T	Human Anatomy, Physiology & Pathophysiology II–Theory	4	-	4
PHAR	BP.204T	Pharmaceutical Organic Chemistry I–Theory	3	0.5	3.5
PHAR	BP.205T	Pharmacognosy and Phytochemistry -Theory	3	-	3
PHAR	BP.206T	Physical Pharmaceutics -Theory	3	-	3
PHAR	BP.207P	Biochemistry–Practical	2	-	1
PHAR	BP.208P	Human Anatomy, Physiology & Pathophysiology II - Practical	2	-	1
PHAR	BP.209P	Pharmaceutical Organic Chemistry I– Practical	3	-	1.5
PHAR	BP.210P	Pharmacognosy and Phytochemistry - Practical	3	-	1.5
PHAR	BP.211P	Physical Pharmaceutics- Practical	2	-	1
SEC	BP.212P SEC1/2/3	1. Communication skill/ 2. Mental wellbeing, stress and conflict management/ 3. Fundamentals of computer operations	2	-	1
	Total		**31**	**1**	**25**

Table III: Course of Study for Semester III

Category	Course code	Name of the course	No. of hours	Tutorial	Credit points
ERC	BP.301T	Machine Learning and AI in Drug Development & Manufacturing - Theory	2	-	2
ERC	BP.302T	Environmental Science -Theory	1	-	1
ERC	BP.303T	Ethics and Universal Human Values -Theory	1	-	1
PHAR	BP.304T	General Pharmacology -Theory	2	-	2
PHAR	BP.305T	Pharmaceutical Organic Chemistry II -Theory	2	0.5	2.5
PHAR	BP.306T	Pharmaceutical Dosage Forms I -Theory	2	-	2
PHAR	BP.307T	Pharmaceutical Engineering -Theory	2	0.5	2.5
PHAR	BP.308T	Social Pharmacy & Public Health- Theory	2	-	2
ERC	BP.309T	Healthcare Psychology & Communication Skills-Theory	1	-	1
PHAR	BP.310P	General Pharmacology-Practical	2	-	1
PHAR	BP.311P	Pharmaceutical Organic Chemistry II- Practical	2	-	1
PHAR	BP.312P	Pharmaceutical Dosage Forms I- Practical	2	-	1
PHAR	BP.313P	Pharmaceutical Engineering- Practical	2	-	1
PHAR	BP.314P	Social Pharmacy & Public Health - Practical	2	-	1
ERC	BP.315P	Healthcare Psychology & Communication Skills - Practical	2	-	1
AEC	BP.316 AEC1/2/3	Nutraceutical and Functional Foods Food Analysis Yoga & Life Sciences	2	-	1
	Total		**29**	**1**	**23**

Table IV: Course of Study for Semester IV

Category	Course code	Name of the course	No.of hours	Tutorial	Credit points
ERC	BP.401T	AI Application in Pharmaceutical Sciences- Theory	2	-	2
PHAR	BP.402T	Herbal Drug Technology -Theory	2	0.5	2.5
PHAR	BP.403T	Heterocyclic Compounds & Stereochemistry- Theory	2	0.5	2.5
PHAR	BP.404T	Medicinal Chemistry –Theory	3	0.5	3.5
PHAR	BP.405T	Pharmaceutical Microbiology- Theory	3	-	3
PHAR	BP.406T	Pharmaceutical Biotechnology- Theory	2	0.5	2.5
PHAR	BP.407T	Systemic Pharmacology I–Theory	2	-	2
PHAR	BP.408P	Herbal Drug Technology-Practical	3	-	1.5
PHAR	BP.409P	Medicinal Chemistry - Practical	2	-	1
PHAR	BP.410P	Pharmaceutical Microbiology & Biotechnology-Practical	2	-	1
PHAR	BP.411P	Systemic Pharmacology I - Practical	2	-	1
ERC	26CUL200	Integrated Amrita Meditation Techniques- Practical*	1	-	1
	Total		**26**	**2**	**23.5**

*School-level exam (Audit Courses)

Table V: Course of Study for Semester V

Category	Course code	Name of the course	No. of hours	Tutorial	Credit points
PHAR	BP.501T	Biomedicinal Chemistry - Theory	3	0.5	3.5
ERC	BP.502T	Innovation and Startup Ecosystem - Theory	2	-	2
PHAR	BP.503T	Pharmaceutical Dosage Forms II -Theory	2	-	2
PHAR	BP.504T	Pharmaceutical Quality Assurance - Theory	2	0.5	2.5
PHAR	BP.505T	Systemic Pharmacology II–Theory	3	-	3
PHAR	BP.506T	Pharmaceutical Jurisprudence - Theory	2	0.5	2.5
PHAR	BP.507T	Pharmacy Practice –Theory	2	0.5	2.5
ERC	BP.508T	Life Skill I– Theory	2	-	2
PHAR	BP.509P	Biomedicinal Chemistry - Practical	2	-	1
PHAR	BP.510P	Pharmaceutical Dosage Forms II - Practical	2	-	1
PHAR	BP.511P	Systemic Pharmacology II–Practical	2	-	1
		Total	**24**	**2**	**23**

Table VI: Course of Study for Semester VI

Category	Course code	Name of the course	No. of hours	Tutorial	Credit points
PHAR	BP.601T	Advanced Pharmacognosy- Theory	2	-	2
PHAR	BP.602T	Biopharmaceutics and Pharmacokinetics- Theory	2	0.5	2.5
PHAR	BP.603T	Intellectual Property Rights - Theory	2	-	2
ERC	BP.604T	AI in Clinical, Ethics, and Translational Pharmacy- Theory	2	-	2
PHAR	BP.605T	P. Analysis-Theory	3	0.5	3.5
PHAR	BP.606T	Novel Drug Delivery Systems -Theory	2	0.5	2.5
ERC	BP.607T	Life Skill II–Theory	2	0.5	2.5
AEC	BP.608 T AEC1//2/3/4/5	Green Chemistry	1	-	1
		Scientific Writing			
		Drug store & Business Management			
		Career Building in Cultivation of Medicinal Plants			
		Active Pharmaceutical Ingredients and Excipient Sciences			
		Industrial Pharmacognosy			
SEC	BP.609P 1/2/3	Computer Aided Drug Design	2	-	1
		Analytical Method Development and Validation			
		Principles of Preclinical Studies			
		Pharmaceutical Marketing Skills			
VAC	BP.610P1/2	Professional Skills	2	-	1
		Process Analytical Technology and QbD in Formulation Science			
PHAR	BP.611P	Pharmaceutical Analysis - Practical	3	-	1.5
PHAR	BP.612P	Novel Drug Delivery Systems - Practical	3	-	1.5
	Total		**26**	**2**	**23**

Table VII: Course of Study for Semester VII

Category	Course code	Name of the course	No. of hours	Tutorial	Credit points
PHAR	BP.701T	Biostatistics and Research Methodology- Theory	3	-	3
PHAR	BP.702T	Cosmetics and Cosmeceuticals - Theory	2	-	2
PHAR	BP.703T	Modern Analytical Techniques–Theory	3	-	3
PHAR	BP.704T	Pharmacovigilance -Theory	3	-	3
PHAR	BP.705T	Regulatory Affairs -Theory	2	-	2
PHAR	BP.706T	Clinical Pharmacotherapy- Theory	2	-	2
PHAR	BP.707T	Industrial Pharmacy & Facility Design- Theory	2	0.5	2.5
AEC	BP.708T1/2/3/4/5/6/7	Current Good Manufacturing Practices (cGMP)	1	-	1
		Pharmaceutical Automation			
		Modern Techniques in Cellular Biology			
		Medical Devices			
		Transformation of Food Waste into Medicinal Products			
		Biosimilars, Vaccines & Macromolecules			
		Pharmaceutical Management			
ERC	BP.709T	Life Skill III–Theory	2	0.5	2.5
PHAR	BP.710P	Modern Analytical Techniques -Practical	3	-	1.5
PHAR	BP.711PS	Practice School 1	8	-	2
ERC	BP.712PW	Live in Labs [$]	-	-	3
	Total		**31**	**1**	**24.5/27.5**

*School level exams (Audit Courses)

[$]Live in Labs is an optional experiential learning initiative. Those who complete it successfully shall get a separate grade sheet/certificate.

Table VIII: Course of Study for Semester VIII

Category	Course code	Name of the course	No. of hours	Tutorial	Credit points
PHAR	BP.801PR	Practice School II & Research Project	40	-	20
	Total		**40**		**20**

Table-IX: Total Credits per Semester

	Credit Points		
Semester	**University**	**School level**	**Total**
I	**19**	**1/3**	**20/22**
II	**25**	**0**	**25**
III	**23**	**0**	**23**
IV	**22.5**	**1**	**23.5**
V	**23**	**0**	**23**
VI	**23**	**0**	**23**
VII	**24.5**	**0/3**	**24.5/27.5**
VIII	**20**	**0**	**20**
Total credit points for the program	**180**	**2/4[#]/5[$]/7[#$]**	**180/ 182[#]/185[$]/187[#$]**

[#]*Applicable only for the students appearing for Remedial Biology (RB)/Remedial Mathematics (RM)course (Audit Courses) and $ applicable only for the students opting Live in Labs (Optional).

Note: Earning total credits [180] as mentioned above is mandatory for award of the degree. However, student has the liberty to earn additional credits through various MOOCs / Swayam NPTEL.

10. Remedial Mathematics/Biology

There are two Remedial courses: Remedial Mathematics & Biology. Those who have not studied biology in plus two shall study Remedial biology and those who have not studied Mathematics in plus two shall study Remedial Mathematics in the first semester and those who have studied both Mathematics& Biology in Plus Two need not study any of these Remedial Courses.

11. Self-Directed Learning (SDL)

Self-directed learning is a process in which an individual takes initiative and responsibility for their own learning, actively engages in setting goals, acquiring knowledge, and evaluating the progress. It involves activities such as diagnosing learning needs, formulating learning goals, identifying resources, choosing and implementing learning strategies, and evaluating learning outcomes. Self-directed learning aims to empower learners to become independent and critical thinkers. Incorporating self-directed learning into daily classes or timetables can greatly enhance students' learning experiences and foster their autonomy.

Scope of SDL includes:

- SDL enables individuals to develop essential life skills, such as critical thinking, problem-solving, communication, and self-reflection.
- It empowers students to explore topics beyond the curriculum and pursue knowledge according to their own interests and pace thus becoming responsible learners.
- It allows for continuous professional growth, adapting to changing job requirements and exploring new career paths.
- It helps develop an entrepreneurial mindset, fosters creativity and innovation, and equips individuals with the necessary skills to start and manage their own ventures.
- Individuals can engage in self-directed learning to acquire new skills, deepen their knowledge in areas of personal interest, and even pursue hobbies that bring them joy and fulfillment.
- It encourages individuals to continue learning throughout their lives, embracing new challenges, and adapting to an ever-changing world.

Self-directed learning (SDL) is incorporated into the semester timetable as it is beneficial for students, promotes autonomy, motivation, and a deeper engagement with the learning process. Ensuring effective implementation of participative, problem-based, experiential learning, and innovative pedagogical approaches for effective outcomes

12. Programme Committee

a. 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.

b. 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.

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

d. 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

13. Internal Examination Committee

a. 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.

b. 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

c. The Committee shall meets periodically, before each Sessional Examination (Internal Assessment) and before the end-semester examination.

d. 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.

14. Practice School

Practice school is an essential component of pharmacy education that offers students an opportunity to acquire practical skills in various settings such as hospitals, pharmacies, industries and research labs. The objective of practice school is to bridge the gap between theoretical knowledge and practical application in the real world. A comprehensive understanding of the definition, scope, and objectives of Practice School is given below.

Scope of Practice School:

The scope of Practice School is to provide students with a comprehensive learning experience that goes beyond classroom lectures. Students are exposed to real-world scenarios that challenge their problem-solving skills and enhance their ability to make decisions. The program provides students with an opportunity to interact with patients, healthcare professionals, and researchers, which helps them to develop their communication skills.

Practice School is an essential component of pharmacy education that provide students with a comprehensive learning experience that goes beyond classroom lectures. The program is designed to help students acquire practical skills, bridge the gap between theory and practice, expose them to real-world scenarios, enhance their communication skills, and evaluate their performance.

The objectives of Practice School are to:

- Develop practical skills: The program is designed to help students acquire practical skills that are essential in their chosen field of specialization.
- Bridging the gap between theory and practice: The program provides students with an opportunity to apply their theoretical knowledge in a practical setting.
- Exposure to real-world scenarios: The program exposes students to real-world scenarios that challenge their problem-solving skills and decision-making ability.
- Enhance communication skills: The program provides students with an opportunity to interact with patients, healthcare professionals, and researchers, which helps them to develop their communication skills.
- Working independently and as a team: Students get a feel of a real-life work environment and develop the ability to work independently and as a team.
- Identifying strengths and weaknesses: It also creates awareness among students about their strengths and weaknesses.

15. Practice School I in the seventh semester

Practice School I is a one-month program during the VII Semester in a hospital/community pharmacy to provide students with hands-on experience in pharmacy services. The program is designed to help students understand the daily operations of the pharmacy and develop skills in dispensing medication, counseling patients, and managing drug inventory.

16. Practice School II and Research Project in the eighth semester

Practice School II and Research Project is a four-month program conducted during semester VIII of study that allows students to have 3 rotations in industry, hospital/ community pharmacy, or research department. The program is designed to give students an opportunity to apply their theoretical knowledge in a practical setting and gain hands-on experience in their chosen field of specialization.

During the Practice School II and Research Project, students are required to identify a real-life problem in their field of specialization and conduct a research project in any of the selected two options to find a solution to the problem. The research project is a mandatory component of the program, and students are expected to submit a report on their findings. The research project component of Practice School II is designed to help students develop research skills, critical thinking, and problem-solving skills. It also helps students to apply the knowledge gained during the program to real-life situations and find practical solutions to problems in their field of specialization.

The Scope of the Research project:

The scope of a research project involves investigating a specific area of pharmacy, such as drug design and development, clinical pharmacy, pharmacology, pharmaceutical technology, sales and marketing. The goal of the research project is to advance knowledge in the field, address a specific research question or hypothesis, and contribute to the improvement of patient care. It is important for the research project to be feasible, ethical, and relevant to the current issues and challenges in pharmacy.

The objectives of the Research project are to:

Acquire research skills: Conducting a research project requires a range of research skills, such as literature review, data collection, data analysis, and interpretation of results. These skills are transferable and can be applied in various fields beyond pharmacy.

Develop scientific writing skills: The research project provides an opportunity to develop scientific writing skills, including how to write an introduction, methods, results and discussion sections of a research paper, as well as how to prepare a bibliography

Enable critical thinking ability: Research projects in pharmacy require critical thinking and analysis, which involve evaluating and interpreting data, drawing conclusions, and making evidence-based recommendations.

Adopt application-oriented learning: The research project provides an opportunity to apply the knowledge and skills learned in coursework to real-world scenarios. Students can investigate a current issue or challenge in pharmacy and propose practical solutions.

Appreciate time management and organizational skills: Conducting a research project requires planning, time management, and organization skills. Students learn how to prioritize tasks, set realistic goals, and manage their time effectively.

Enhance communication skills: Students can develop their communication skills by presenting their research findings to peers and faculty members, writing a research paper, and preparing a poster/ oral presentation.

Follow ethical considerations: Research projects in pharmacy require students to consider ethical issues, such as confidentiality, informed consent, and the protection of human subjects. Students can learn about ethical guidelines and best practices in conducting research.
Overall, a research project in pharmacy provides an excellent opportunity for students to acquire a wide range of skills and competencies that are valuable for their future careers, whether in pharmacy services, academia, or research.

Evaluation and Grading:

The evaluation shall comprise formative assessment by both the site preceptor and the faculty mentor, and summative assessment by the school-level evaluation committee. The formative assessment shall be based on the student's regularity, professional conduct, skills acquired during the practice school, ability to learn and apply new concepts, problem-solving ability, and overall progress as observed throughout the training period.

For Practice School I (7th Semester), students shall submit a Practice School report documenting the activities carried out during the training, including prescription reading and handling, patient counselling, dispensing activities, and other relevant professional responsibilities. The summative assessment shall be conducted through report evaluation and/or presentation/viva by the committee.

For Practice School II (8th Semester), students shall submit a comprehensive report/thesis based on the activities undertaken during the practice school or research project. The School-level Evaluation Committee shall assess the report and conduct a presentation/viva based on the objectives, methodology, outcomes, and overall quality of the work.

The assessment shall be distributed as follows:

Course	**Formative Assessment**		**Summative Assessment**	**Total**
	Preceptor	**Mentor**		
Practice School I (PS1)	20	10	20	50
Practice School II (PS2)	40	20	40	100

The detailed criteria for formative and summative assessment are given below:

Course	**Formative Assessment**	**Criteria**	**Marks**
Practice School I (PS1)	Preceptor	Regularity & enthusiasm, skills acquired, learning & application, problem-solving	20
	Mentor	Progress review, documentation, professionalism	10
	Summative Assessment	Objectives & methodology, outcomes, presentation & viva	20
Total			**50**

Course	**Formative Assessment**	**Criteria**	**Marks**
Practice School II (PS2)	Preceptor	Regularity & enthusiasm, skills acquired, learning & application, problem-solving	40
	Mentor	Progress review, documentation, professionalism	20
	Summative Assessment	Objectives & methodology, outcomes, presentation & viva	40
Total			**100**

17.Condonation under exceptional cases:

If the attendance of a student falls short of 75% in any course, due to continuous absence caused by accident, prolonged illness, or unforeseen circumstances, such case may be considered by the Principal for condonation of absence based on the request of the student supported by the recommendation of the respective faculty advisor. However, in such cases, the student must have duly applied for leave in time. The overall attendance of a student in such a case shall not fall below 65%. Condonation will be considered only in the case of those students who have

proved themselves to be otherwise regular, by attending at least 75% of the classes during the semester, excluding the period of long leave.
At least 65% physical presence is mandatory in every course even in such exceptional cases and this provision can be exercised by a student, only once in the program. However, the student may apply for a second condonation in the 7^{th} semester provided he or she does not have any arrears.
Condonation cannot be claimed as a matter of right. It shall be granted at the discretion of the authorities, based on the genuineness and validity of the reasons cited for the absence. A student is not eligible for condonation if he had any unauthorized absence during the semester

18. Examinations/Assessments
The scheme for formative assessment and summative assessment is given in Table–X

18.1. Formative assessment

The formative assessment includes sessional exams, cycle tests, assignments, and problem-based learning (PBL). There shall be two formative assessments (FA1 & FA2) and the marks of the cycle tests of FA1 and FA2 shall be submitted 10 days before the first and second sessional examinations respectively. There shall be a minimum of two cycle tests per FA. The cycle test shall include questions of any type like that of the end-semester examination pattern. Students can be divided into groups of 5 or 6 students each and they shall submit an assignment on a specific topic which can be decided by the subject in charge at the beginning of the semester. The assignment topic shall be different for different groups. The average of FA1 and FA2 is to be considered as the formative assessment. In the case of practical courses included in CGPA calculation, 10 marks can be allotted to day-to-day assessment. For elective (theory) and life skill Courses, formative assessment includes two sessional examinations. The aggregate marks obtained in the two sessional examinations shall be considered as the Formative Assessment score. For elective practical courses, formative assessment includes one sessional examination.

18.1.1. Sessional Exams

Two Sessional exams shall be conducted for theory and one sessional exam for practical courses as per the schedule fixed by the school. In case a student misses one sessional examination due to any medical emergency, he/she can attend a re-sessional examination covering the entire syllabus of the subject conducted before the summative assessments. The scheme of question papers for theory and practical Sessional examinations is given below. The average marks of two formative assessments shall be computed for internal assessment as per the requirements given in Table -X.
For courses included in CGPA calculations, the sessional exam shall be conducted for 30 marks for theory and converted to 15 marks for calculation of FA marks and the sessional exam for practical is conducted for 35 marks. One sessional exam shall be conducted for 20 marks for theory in case of courses having school-level exams. For ERC and elective courses, the sessional exam conducted for 30 marks will be converted to 25 marks.

Question Paper pattern

Question paper pattern for theory Sessional examinations (as per blooms taxonomy)

For courses included in CGPA calculations:

I.	Multiple Choice Questions(MCQs) (Answer all the questions)	=	10x1=10marks
II.	Long Answers (Answer any one from 2)	=	1x10=10marks
III.	Short Answers (Answer any 4 from 5)	=	2x5 = 10marks

	Total	=	30marks

For courses having school level exams (Audit courses):

I.	Long Answers (Answer any one from 2)	=	1x10=10marks
II.	Short Answers (Answer any 2 from 3)	=	2x 5 = 10marks

	Total	=	20 marks

Question paper pattern for Practical Sessional examinations

For courses included in CGPA calculations:

I.	Synopsis	=	5marks
II.	Experiments	=	20 marks
III.	Viva voce	=	10marks

	Total	=	35 marks

18.1.2. Problem Based Learning

PBL is a teaching method where students learn by solving open-ended problems in small groups. It focuses on developing critical thinking, problem-solving, and teamwork skills.

Benefits of PBL

- Student-centered learning
- Lifelong learning skills
- Improved comprehension and self-learning
- Teamwork and communication skills
- Development of a self-motivated attitude

PBL Process for B.Pharm Program

- Groups of 6-7 students formed by the class coordinator, considering diversity in academic performance, gender, and communication skills.
- Two-hour PBL sessions twice a week for two consecutive weeks (total of 4 hours per course).
- Faculty member creates a scenario or problem for each session.
- Students analyze the scenario, identify key issues, and define learning objectives in the first session.
- Students independently research the problem using library resources and prepare a write-up.
- In the second session, students discuss their findings and address the learning objectives.
- Faculty facilitator assesses student performance based on engagement and quality of work.

Guidelines

- College PBL committee oversees planning, meetings, and documentation.
- Each course has one PBL session per semester, scheduled by the class coordinator.
- Scenarios are created by faculty, approved by the department and college PBL committee, and shared with students one week before the session. Scenarios are changed annually.
- Facilitators can be faculty members or Ph.D. teaching assistants. They guide discussions but do not teach.
- Each group selects a leader and scribe/secretary for managing discussions, documentation, and presentations. These roles can rotate among group members for different courses.

18.2. Summative assessment

The summative assessment for each theory and practical course through semesters I to VII shall be conducted by the university except for the courses with the asterisk symbol (*) in table I -IX for which examinations shall be conducted by the subject experts at school level. The grades from audit courses are not included in CGPA calculation but the same shall be included in the grade sheets of the respective semesters.

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

Tables-X: Schemes for Formative assessment and Summative assessment semester wise

Semester I

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2									
			Sessional		Cycle Test	Sessional		Cycle Test					Marks	Duration	
			Marks	Duration		Marks	Duration								
ERC	BP.101T	Basics of Python Programming for Pharmaceutical Sciences - Theory	25	1.5 hrs	-	25	1.5hrs	-	-	-	-	25	25	1.5 hrs	50
PHAR	BP.102T	General Pharmacy-Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.103T	Human Anatomy, Physiology & Pathophysiology I–Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.104T	Introduction to Pharmacognosy -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.105T	Pharmaceutical Inorganic and Analytical Chemistry–Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
ERC	BP.106RBT BP.106RMT	Remedial Biology/ Remedial Mathematics –Theory*#	25	1hr	-	25	1hr	-	-	-		25	25	1 hr	50
ERC	BP.107T (22AVP103)	Mastery Over Mind–Theory*	20	1hr	-	-	-	-	-	-	5	25	25	1 hr	50
	Total														**550**

*Audit courses (School level Exam Only)

#Applicable only for the students appearing for Remedial Biology/ Remedial Mathematics

Category	Course code	Name of the course	Formative assessment		Attendance	Total Marks	Summative assessment		Total Marks
			Sessional	Day to Day assessment			Marks	Duration	
PHAR	BP.108P	General Pharmacy-Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.109P	Introduction to Pharmacognosy- Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.110P	Pharmaceutical Inorganic and Analytical Chemistry-Practical	35	10	5	50	50	4 hrs	100
Total									**300**

Semester II

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2									
			Sessional		Cycle Test	Sessional		Cycle Test					Marks	Duration	
			Marks	Duration		Marks	Duration								
ERC	BP.201T	Applied Biostatistics & Data Analytics for Pharmaceutical Science–Theory	25	1.5 hrs	-	25	1.5 hrs	-	-	-	-	25	25	1.5 hrs	50
PHAR	BP.202T	Biochemistry–Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.203T	Human Anatomy, Physiology & Pathophysiology II –Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.204T	Pharmaceutical Organic Chemistry I–Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.205T	Pharmacognosy and Phytochemistry -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.206T	Physical Pharmaceutics -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
Total															**550**

Category	Course code	Name of the course	Formative assessment		Attendance	Total Marks	Summative assessment		Total Marks
			Sessional	Day to Day assessment			Marks	Duration	
PHAR	BP.207P	Biochemistry–Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.208P	Human Anatomy, Physiology & Pathophysiology II - Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.209P	Pharmaceutical Organic Chemistry I– Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.210P	Pharmacognosy and Phytochemistry - Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.211P	Physical Pharmaceutics- Practical	35	10	5	50	50	4hrs	100
SEC	BP.212P SEC1/2/3	Communication skill Mental wellbeing, stress and conflict management Fundamentals of computer operations	25	-	-	-	25	3hrs	50
Total									**550**

Semester III

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2									
			Sessional		Cycle Test	Sessional		Cycle Test					Marks	Duration	
			Marks	Duration		Marks	Duration								
ERC	BP.301T	Machine Learning and AI in Drug Development & Manufacturing – Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
ERC	BP.302T	Environmental Science -Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
ERC	BP.303T	Ethics and Universal Human Values - Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
PHAR	BP.304T	General Pharmacology -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.305T	Pharmaceutical Organic Chemistry II - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.306T	Pharmaceutical Dosage Forms I -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.307T	Pharmaceutical Engineering -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.308T	Social Pharmacy & Public Health- Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
ERC	BP.309T	Healthcare Psychology & Communication Skills-Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
Total															**700**

Category	Course code	Name of the course	Formative assessment				Summative assessment		Total Marks
			Sessional	Day to Day assessment	Attendance	Total Marks	Marks	Duration	
PHAR	BP.310P	General Pharmacology-Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.311P	Pharmaceutical Organic Chemistry II- Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.312P	Pharmaceutical Dosage Forms I- Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.313P	Pharmaceutical Engineering- Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.314P	Social Pharmacy & Public Health - Practical	35	10	5	50	50	4 hrs	100
ERC	BP.315P	Healthcare Psychology & Communication Skills - Practical	25	-	-	25	25	2 hrs	50
AEC	BP. 316P AEC1/2/3	Nutraceuticals and Functional Foods Food Analysis Yoga & Life Sciences	25	-	-	25	25	2hrs	50
Total									**600**

Semester IV

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2									
			Sessional		Cycle Test	Sessional		Cycle Test					Marks	Duration	
			Marks	Duration		Marks	Duration								
ERC	BP.401T	AI Application in Pharmaceutical Sciences- Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
PHAR	BP.402T	Herbal Drug Technology -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.403T	Heterocyclic Compounds & Stereochemistry- Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.404T	Medicinal Chemistry –Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.405T	Pharmaceutical Microbiology-Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.406T	Pharmaceutical Biotechnology-Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.407T	Systemic Pharmacology I–Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
Total															**650**

Category	Course code	Name of the course	Formative assessment				Summative assessment		Total Marks
			Sessional	Day to Day assessment	Attendance	Total Marks	Marks	Duration	
PHAR	BP.408P	Herbal Drug Technology-Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.409P	Medicinal Chemistry - Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.410P	Pharmaceutical Microbiology & Biotechnology- Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.411P	Systemic Pharmacology I - Practical	35	10	5	50	50	4 hrs	100
Total									**400**

Category	Course code	Name of the course	Formative assessment				Summative assessment			Total Marks
			Activity	Class Participation	Attendance	Total Marks	Practical Demonstration	Viva	Total Marks	
ERC	26CUL200	Integrated Amrita Meditation Techniques- Practical*	20	20	20	60	30	10	40	100
Total										**100**

*Audit courses

Semester V

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2							Marks	Duration	
			Sessional		Cycle Test	Sessional		Cycle Test							
			Marks	Duration		Marks	Duration								
PHAR	BP.501T	Biomedicinal Chemistry - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
ERC	BP.502T	Innovation and Startup Ecosystem – Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
PHAR	BP.503T	Pharmaceutical Dosage Forms II - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.504T	Pharmaceutical Quality Assurance - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.505T	Systemic Pharmacology II– Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.506T	Pharmaceutical Jurisprudence - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.507T	Pharmacy Practice –Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
ERC	BP.508T	Life Skill I– Theory	25	1.5 hrs	-	25	1.5hrs	-	-	-	-	50	50	2 hrs	100
Total															**750**

Category	Course code	Name of the course	Formative assessment				Summative assessment		Total Marks
			Sessional	Day to Day assessment	Attendance	Total Marks	Marks	Duration	
PHAR	BP.509P	Biomedicinal Chemistry - Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.510P	Pharmaceutical Dosage Forms II - Practical	35	10	5	50	50	4 hrs	100
PHAR	BP.511P	Systemic Pharmacology II–Practical	35	10	5	50	50	4 hrs	100
Total									**300**

Semester VI

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2							Marks	Duration	
			Sessional		Cycle Test	Sessional		Cycle Test							
			Marks	Duration		Marks	Duration								
PHAR	BP.601T	Advanced Pharmacognosy- Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.602T	Biopharmaceutics and Pharmacokinetics- Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.603T	Intellectual Property Rights - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
ERC	BP.604T	AI in Clinical, Ethics, and Translational Pharmacy- Theory	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
PHAR	BP.605T	Pharmaceutical Analysis-Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.606T	Novel Drug Delivery Systems -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
ERC	BP.607T	Life Skill II–Theory	25	1.5 hrs	-	25	1.5hrs	-	-	-	-	50	50	2 hrs	100
AEC	BP.608 T AEC1//2/ 3/4/5	Green Chemistry Scientific Writing Drug store & Business Management Career Building in Cultivation of Medicinal Plants Active Pharmaceutical Ingredients and Excipient Sciences Industrial Pharmacognosy	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
Total															**700**

Category	Course code	Name of the course	Formative assessment				Summative assessment		Total Marks
			Sessional	Day to Day assessment	Attendance	Total Marks	Marks	Duration	
SEC	BP-609P 1/2/3/4	Computer Aided Drug Design Analytical Method Development and Validation Principles of Preclinical Studies Pharmaceutical Marketing Skills	25	-	-	-	25	2hrs	50
VAC PHAR	BP-610P1/2 BP-611P	Professional Skills Process Analytical Technology and QbD in Formulation Science Pharmaceutical Analysis - Practical	25	-	-	-	25	2 hrs	50
PHAR	BP-612P	Novel Drug Delivery Systems- Practical	35	10	5	50	50	4 hrs	100
Total									**200**

Semester VII

Category	Course code	Name of the course	Formative assessment						PBL	Assignment	Attendance	Total Marks	Summative assessment		Total Marks
			FA1			FA2									
			Sessional		Cycle Test	Sessional		Cycle Test					Marks	Duration	
			Marks	Duration		Marks	Duration								
PHAR	BP.701T	Biostatistics and Research Methodology-Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.702T	Cosmetics and Cosmeceuticals - Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.703T	Modern Analytical Techniques–Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.704T	Pharmacovigilance -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.705T	Regulatory Affairs -Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.706T	Clinical Pharmacotherapy-Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
PHAR	BP.707T	Industrial Pharmacy & Facility Design- Theory	15	1.5 hrs	10	15	1.5hrs	10	15	5	5	50	50	2 hrs	100
AEC	BP.708T1/ 3/4/5/6/7	Current Good Manufacturing Practices (cGMP) Pharmaceutical Automation Modern Techniques in Cellular Biology Medical Devices Transformation of Food Waste into Medicinal Products Biosimilars, Vaccines & Macromolecules Pharmaceutical Management	25	1.5hr	-	25	1.5hr	-	-	-		25	25	1.5 hr	50
ERC	BP.709T	Life Skill III–Theory	25	1.5 hrs	-	25	1.5hrs	-	-	-	-	50	50	2 hrs	100
Total															**850**

Category	Course code	Name of the course	Formative assessment				Summative assessment		Total Marks
			Sessional	Day to Day assessment	Attendance	Total Marks	Marks	Duration	
PHAR	BP.710P	Modern Analytical Techniques - Practical	35	10	5	50	50	4 hrs	100
Total									**100**

Cat.	Course code	Name of the course	Formative Assessment	Summative Assessment	Total Marks
PHAR	BP.711PS	Practice School I	30	20	50

Semester VIII

Cat.	Course code	Name of the course	Formative Assessment	Summative Assessment	Total Marks
PHAR	BP.801PR	Practice School II & Research Project	60	40	100

Table-XI: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95– 100	5	5
90– 94	4	4
85– 89	3	3
80– 84	2	2
Less than 80	0	0

19. Promotion and award of grades

A student shall be declared a Pass and eligible to get a grade in a course of B. Pharm program if he/she secured an aggregate of 50% with a minimum of 40% marks each in formative and summative assessments. For example, to be declared as PASS and to get a grade, the student has to secure a minimum of 20 marks in the formative assessment and 20 marks in the summative assessment of theory examinations and a minimum of 20 marks each in the formative and summative assessment of practical examinations. For Life Skills I, II & III: Students shall secure a minimum of 40% marks in aggregate, including Internal Assessment marks, to successfully complete and pass the course.

20. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 18, then he/she shall reappear for the next university examination of that course. However, his/her marks of the formative Assessment shall be carried over, and he/she shall be entitled to the grade obtained by him/her on passing the summative assessment examination.

21.Supplementary examination of summative assessment

Supplementary examinations of summative assessment shall be conducted as per the schedule given in table XII. The exact dates of examinations shall be notified from time to time.

Table-XII: Tentative schedule of summative assessments

Semester	for Regular Candidates	for Failed Candidates
I, III,V and VII	November/December	May/June
II, IV,VI and VIII	May/June	November/December

Question paper pattern for summative theory examinations (as per blooms taxonomy)

For courses included in CGPA calculations:

I. Multiple Choice Questions (MCQs)	=	20x1=20marks
(Answer all the questions)		
II. Long Answers	=	1x10=10marks
(Answer any 1from 2)	=	4x5=20marks
III. Short Answers		----------
(Answer any 4 from 5)		
Total	=	50marks

For courses having school level exams (Audit courses):

I. Long Answers	=	1x10=10marks
(Answer any 1 from 2)	=	3x5=15marks
II. Short Answers		----------
(Answer any 3 from 4)		
Total	=	25marks

Question paper pattern for summative assessment of practical examinations

I.Synopsis	=	10marks
II.Experiments	=	25 marks
III.Viva voce	=	15marks
	-	----------
Total	=	50marks

22. Eligibility of Examiners & Question Paper Setters

Faculty of Amrita School of Pharmacy who are handling the respective courses with a minimum of 2 years of experience / Ph.D. shall be appointed as examiners/Question paper setters for semester I to semester IV B. Pharm examination and teachers with a minimum of 3 years' experience / Ph.D. shall be appointed as examiners/Question paper setters for the remaining semesters.

External faculty members of reputed universities with relevant teaching experience shall be appointed by the Addl. Controller of Examinations as observers. During the end semester practical examinations, such observers shall be appointed for selected courses randomly in every semester who shall oversee the conduct of the practical examination, verify the practical records, theory QP etc., and submit a report in the prescribed format to the Addl. Controller of Examinations. Faculty with a minimum of 5 years of teaching experience in the subject concerned B. Pharm shall be appointed as observers. One external faculty shall serve as an observer for exams of 2 or 3 courses of B. Pharm if scheduled on the same day or adjacent days.

23.Academic progression

A student shall be eligible to carry forward all the courses of I, II, III, IV, and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of the VII semester until all the courses of the I, II, III, and IV semesters are successfully completed.

A student shall be eligible to attend the Practice School II and Research Project only after successful completion of all the courses till VI semester. The same shall be applicable for the course completion certificate also.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 30.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 30.

Note: Grade AB as well as those students who fail to register for examination(s) of any course in any semester will be treated as grade F for deciding academic progression.

24.Grading of performance

24.1 Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a 10-point relative letter grading at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table– XIII.

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

Letter Grade	Grade Point	Performance
A+	10	Outstanding
A	9	Excellent
B	8	Good
C	7	Fair
D	6	Average
E	5	Pass
F	0	Fail
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.

24.2 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 AB grade awarded in that semester.

24.3 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.

25. 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**

26. Improvement of Internal marks

A student who fails in university examination in the first attempt can apply for improvement sessional exam by submitting the duly filled application form when notified by the Principal.

27. Revaluation

A failed student shall have the right to apply for revaluation of the theory paper by filling the application form along with the required fees within the stipulated time after the publication of the result.

28. Award of Ranks

Ranks and Medals shall be awarded based on the final CGPA. However, candidates who fail in one or more courses during the B. Pharm program shall not be eligible for the award of ranks. Moreover, the candidates should have completed the B. Pharm program in a minimum prescribed number of years, (four years/ three years for B. Pharm Lateral entry) for the award of Ranks.

29. Award of degree

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

30. Duration for completion of the program of study

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.

31. 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).

SEMESTER I

Course code	Course title			Course type
BP 101T	Basics of Python Programming for Pharmaceutical Sciences (Theory)			ERC
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
2	2	-	-	30
Max. Marks	FA			SA
50	25			25

SCOPE

This course provides a foundational understanding of Python programming and its applications in pharmaceutical sciences, enabling students to develop computational skills for data handling, analysis, and visualization. It covers the basic ideas of Python, like programming basics, control structures, functions, data structures, and file handling, and shows how to use them for simple pharmacy problems like calculating dosages and BMI.

The course helps you become better at handling organized healthcare and pharmaceutical data with NumPy and Pandas, covering tasks like importing, cleaning, filtering, combining, and exploring the data. Students gain practical experience in reading and processing CSV and Excel datasets related to pharmacokinetic studies, adverse drug reaction (ADR) reports, and other pharmaceutical data. This course also equips learners with skills to create and interpret scientific visualizations using Matplotlib, enabling effective presentation and interpretation of concentration–time profiles, dissolution data, ADR trends, and other pharmaceutical datasets. Overall, the course establishes a strong computational foundation for evidence-based pharmaceutical research, data-driven decision-making, and advanced studies in bioinformatics, pharmacometrics, and healthcare analytics.

COURSE LEARNING OUTCOMES

Upon successful completion of the subject, the student shall be able to

K1: Discuss the basic concepts of Python programming, including variables, data types, operators, and control structures.

K2: Describe the use of Python functions, data structures, and file handling for simple programming tasks.

K3: Explain the role of NumPy and Pandas in organizing and analyzing pharmaceutical datasets.

K4: Interpret graphical representations of pharmaceutical data created using Matplotlib.

S1: Develop simple Python programs to perform basic pharmaceutical calculations, analyze datasets, and generate scientific plots.

A1: Demonstrate a systematic and responsible approach to handling, analyzing, and presenting pharmaceutical data using Python.

COURSE CONTENTS

UNIT I Introduction to Python programming 6 Hours

• Installing Python and an Integrated Development Environment (IDE) such as Jupyter Notebook, PyCharm, or VS Code offers several advantages over using text editors.
• Python variables and data types (integers, floats, strings, booleans), Type casting and basic operators (arithmetic, comparison, logical), Input and output operations.
• Basic string operations and manipulation techniques. Introduction to standard libraries and third-party libraries, installing and uninstalling libraries.

UNIT II Control Structures & Functions 6 Hours

• 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.

UNIT III Data Structures & File Handling 6 Hours

• 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.

UNIT IV Data Handling with Pandas 6 Hours

• 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.

UNIT V Data Visualization with Matplotlib 6 Hours

• 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.

REFERENCES BOOKS:

1. Weiss, C.J., 2017. Scientific Computing for Chemists with Python. Available at: https://weisscharlesj.github.io/SciCompforChemists/notebooks/introduction/intro.ht ml
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
BP.102T	General Pharmacy (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	-	-	45
Max. Marks	FA			SA
100	50			50

SCOPE:

This course is designed to impart fundamental knowledge on the art and science of handling prescriptions and dispensing medications correctly considering the different dose requirements based on various factors. It is essential for the students to know the history of the pharmacy profession and pharmaceutical industry in India and appreciate their current status. In order to learn the different dosage forms and their preparations, an understanding of the untoward interactions between chemicals in pharmaceutical preparations arising due to the incompatibility of various types is essential. It is also important to know the methods to overcome them as well as the basic and important pharmaceutical calculations.

This course will enable the students to differentiate the different liquid dosage forms as well as the semisolid and powder dosage forms based on their formulation, preparation, uses etc. The different official books of standards (Pharmacopoeias) and their evolvement and importance are also covered.

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, the student shall be able to

K1: Outline the historical background, development, and current status of the profession of pharmacy, pharma industry as well as various pharmacopeias.
K2: Describe the different parts of prescription and the various factors affecting doses of drugs.
K3: Distinguish between the monophasic and biphasic liquid dosage forms in terms of the types, preparation, formulation etc.
K4: Summarize the powders and the semisolid dosage forms considering their advantages, disadvantages, preparation, excipients used etc.
K5: Interpret the English meaning of the Latin terms commonly used in prescriptions.
S1: Perform pharmaceutical calculations related to weights and measures, dilution, isotonicity, alligation, and dosage determination using age, body weight, and body surface area.
A1: Demonstrate confidence in applying pharmaceutical knowledge and skills for accurate prescription handling, and dose calculations of pharmaceutical dosage forms.

COURSE CONTENTS

UNIT I **9 Hours**

- **History of the Profession of Pharmacy in India:** In relation to pharmacy education, pharmaceutical industries and organizations—evolution, development and milestones. (1 hr)
- **Scope of the Pharmacy Profession:** Roles and responsibilities of pharmacists in retail/community pharmacy, hospital and clinical pharmacy, and industrial pharmacy including research and development. (1 hr)
- **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. (2 hrs)
- **Introduction to Prescriptions:** Structure and format/parts of prescription, handling of prescriptions and Errors in prescription, Latin terminology related to prescriptions.(5 hrs)

UNIT II **11 Hours**

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. (5 hrs)
- **Posology:** Definition and dose calculation based on age, body weight and body surface area. (4 hrs)
- **Introduction to Dosage Forms:** Routes of administration and classification of dosage forms. (1 hr)
- **Introduction to Active Pharmaceutical Ingredients and Excipients:** Definition, ideal characteristics and importance. (1 hr)

UNIT-III **9 hours**

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. (4 hrs)

• **Tablets:** Definition, types of tablets including moulded tablets and pills with examples; advantages and disadvantages; introduction to excipients and methods of preparation. (2 hrs)

• **Capsules:** Definition, types of capsules, advantages and disadvantages, capsule sizes; introduction to excipients and methods of preparation. (3 hrs)

UNIT-IV **12 hours**

Monophasic and Biphasic Liquids

- **For internal use** – aromatic waters, syrups, elixirs and linctus (definition and preparation). (2 hrs)
- **For external use and body cavities** – liniments, lotions, throat paints, applications, gargles, mouthwashes, enemas, eye drops, ear drops, nasal drops and tinctures with examples. (2 hrs)
- **Study of official preparations**- Introduction to excipients and methods of preparation. (2 hrs)
- **Suspensions**- Definition and types (flocculated and deflocculated), advantages and disadvantages, formulation excipients and general methods of preparation. (3 hrs)
- **Emulsions-** Definition and types, emulsifying agents, tests for identification of types of emulsions, formulation excipients and general methods of preparation. (3 hrs)

UNIT–V **4 Hours**

Semisolid Dosage Forms

- **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. (4 hours)

ASSIGNMENTS

1. Procure two prescriptions, carefully analyze their details, and subsequently generate a report discussing their level of correctness.
2. "Evolution and Advancement of the Pharmaceutical Industry in India: A Historical Perspective on Growth"
3. "Analyzing the Present State and Envisioning the Future Outlook of the Indian Pharma Sector."
4. Write the Composition, Properties, and Applications of various Powders available in the market.
5. Write the formulation, Characteristics, and pharmaceutical application of various monophasic liquid dosage forms (internal use) available in the market.
6. Write the formulation, Characteristics, and pharmaceutical application of various monophasic liquid dosage forms (external use) available in the market.
7. Analyze the Aqueous -Oil Phases and Emulsifying Agents in Emulsion Products Available in the Market (at least 10).

8. Write the composition of different suspensions available in the market (at least 10).
9. Calculating Pediatric Doses for the Following Drugs:
    A) Levipil
    B) Valparin
    C) Acyclovir
    D) Clobium
    E) Cefriaxone

TEXTBOOKS

1. Carter, S.J., Cooper and Gunn's Dispensing for Pharmaceutical Students. CBS Publishers, New Delhi.
2. Seth A K. A textbook of Pharmaceutics. 2nd edn. S Vikas & Co.Jalandhar; 2017.

REFERENCE BOOKS

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

**Latest edition of the text books & reference books can be referred*

Course code	Course title			Course type
BP.103T	Human Anatomy, Physiology and Pathophysiology I (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
4	4	-	-	60
Max. Marks	FA			SA
100	50			50

SCOPE

The primary goal of this course is to learn how the different bodily systems work together to maintain homeostasis. By understanding the interconnected mechanisms involved in homeostasis, students can appreciate how various processes are controlled and balanced within the body. This knowledge provides the foundation necessary to comprehend pathophysiology and pharmacology, helping students develop the skills to determine various body parameters that offer insight into an individual's health status. These skills are important for healthcare professionals to diagnose, monitor, and treat patients effectively. Furthermore, a solid understanding of this subject empowers individuals to support the healthcare system and educate the public about various aspects of health.

The course also imparts basic knowledge of the physiological changes and mechanisms underlying disease processes, focusing on how normal physiological functions are disrupted or altered in various disease states. It emphasizes the mechanisms and processes involved in the development, progression, and outcomes of different diseases, covering a wide range including infectious diseases, genetic disorders, autoimmune diseases, metabolic disorders, cardiovascular diseases, and neurological disorders. The course examines the causative and risk factors that contribute to disease development, analyzing the influence of genetics, environmental elements, lifestyle decisions, infections, and other triggers in the initiation and progression of diseases. It also addresses how disease processes can lead to altered vital signs, organ dysfunction, pain, and other clinical presentations.

COURSE LEARNING OUTCOMES

Upon successful completion of the subject, the student shall be able to

K1: Define anatomical, physiological, and pathophysiological terminologies.

K2: Describe the physiological processes and interlinked mechanisms.

K3: Classify diseases of various body systems and describe their clinical manifestations.

S1: Distinguish normal versus abnormal tissue/organ structure and inflammatory responses.

S2: Propose disorders based on pathophysiological mechanisms and differentiate structural vs. functional abnormalities.

A1: Exhibit systematic, evidence-based reasoning by incorporating multifactorial risk factors in the analysis of disease development and progression.

UNIT I : Introduction **12 hours**

- **Introduction to the human body**
  - Definition and scope of anatomy, physiology, and pathophysiology. Homeostasis and basic anatomical terminology (1hr).
  - Transport across cell membranes, cell division, and cell junctions (1hr).
  - General principles of cell communication, forms of intracellular signaling—a) contact-dependent, b) paracrine, c) synaptic, d) endocrine (2hrs).
  - The classification of tissues includes the structure, location, and functions of epithelial, muscular, nervous, and connective tissues (2hrs).

- **Basic principles of cell injury and adaptation**
  - Components and types of feedback systems; causes of cellular injury (1hr)
  - pathogenesis (cell membrane damage, mitochondrial damage, ribosome damage, and nuclear damage) (2hrs)
  - morphology of cell injury—adaptive changes (atrophy, hypertrophy, hyperplasia, metaplasia, and dysplasia); cell swelling; intracellular accumulation; and cell death (2hrs)
  - Definitions of commonly used relevant medical terminologies (1hr)

UNIT II: Integumentary system and wound healing **12 hours**

- Structure and functions of skin (1hr).
- Skin disorders: Psoriasis and dermatitis and pathophysiology of leprosy (1hr).
- Basic principles of wound healing (1hr).
- Skeletal system and joints: Divisions of the skeletal system, types of bones, salient features (2hrs),
- functions of bones of axial and appendicular skeletal systems (2hrs).
- Organization of skeletal muscle (1hr),
- physiology of muscle contraction, neuromuscular junction (hr1).
- Structural and functional classification of joints (1hr).
- Diseases of bones and joints Pathophysiology of rheumatoid arthritis, osteoporosis, and gout (3hrs).

UNIT III: Body fluids, blood, and lymphatic system **12 hours**

- Body fluids, composition and functions of blood (1hr)
- hemopoiesis, formation of hemoglobin (1hr),
- mechanisms of coagulation (1hr),
- blood grouping, Rh factors, and transfusion (1hr).
- Lymphatic organs and tissues, lymphatic vessels, lymph formation, circulation, and functions of the lymphatic system (2hrs).
- Basic mechanism of inflammation and repair, classification, and pathophysiology of inflammation and its mediators (2hrs).
- Hematological diseases: Pathophysiology of iron deficiency, megaloblastic anemia (Vit. B12 and folic acid) (2hrs)

- sickle cell anemia, thalassemia (1hr)
- hereditary acquired anemia, and hemophilia (1hr)**.**

UNIT IV: Peripheral nervous system & special senses 12 hours

- Classification of the peripheral nervous system: structure and functions of sympathetic and parasympathetic nervous systems (2hrs).
- Origin and functions of spinal and cranial nerves (1hr).
- Structure and functions of the eye, ear , nose, and tongue (4hrs).
- Pathophysiology of special sense disorders: glaucoma, cataract, myopia, otitis externa, otitis media, vertigo, and anosmia (4hrs).

UNIT V: Cardiovascular system 12 hours

- Anatomy of the heart (1hr)
- blood circulation (1hr)
- blood vessels, structure and functions of arteries, veins, and capillaries (1hr)
- elements of the conduction system of the heart and heartbeat, its regulation by the autonomic nervous system, cardiac output, and cardiac cycle (2hrs)
- Regulation of blood pressure, pulse, and electrocardiogram (1hr)
- Pathophysiology of hypertension (1hr)
- cardiac arrhythmias, congestive heart failure, and ischemic heart disease (angina, myocardial infarction, atherosclerosis, and coronary artery disease). (5hrs)

ASSIGNMENTS

1. Pathophysiology of common skin disorders and their causes in daily life
2. Pathophysiology of various types of anemia.
3. Pathophysiology of common ear and eye disorders encountered in day-to-day life
4. Influence of lifestyle habits on cardiovascular health and heart diseases

TEXTBOOKS

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.

REFERENCE BOOKS:

1. Susan Standring. (Eds.). Gray's Anatomy: The Anatomical Basis of Clinical Practice.42nd edn, UK: Elsevier. London.2020.
2. Barrett KE, Barman SM, Brooks HL, Yuan JJ, (Eds.). Ganong's Review of Medical Physiology, 26th edn. McGraw Hill.2019
3. Tortora GJ, Derrickson B. Principles of anatomy & physiology. 15th edn. Inc. Hoboken, New Jersey: John Wiley & Sons.2017
4. David E. Golan, Ehrin J. Armstrong, April W. Armstrong. Principles of pharmacology: The pathophysiologic basis of drug therapy: 4th edn, Wolters Kluwer India; 2016
5. Gary D. Hammer, Stephen J. McPhee. Pathophysiology of Disease: An Introduction to Clinical Medicine, 8th edn McGraw-Hill Education, New York; 2019.
6. Kathryn L, McCance & Sue E Huether, Pathophysiology: The Biologic Basis for Disease in Adults and Children, 8th edn, Elsevier Health Sciences; 2018.

Course code	Course title			Course type
BP.104T	Introduction to Pharmacognosy (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
2.5	2	0.5	-	30
Max. Marks	FA			SA
100	50			50

SCOPE

This course is designed to impart the fundamentals of Pharmacognosy and provides students with a comprehensive understanding of sources of drugs, good agricultural and collection practices (GACP) for medicinal plants, and quality control parameters for standardization. The introduction to traditional systems of medicine bridges the gap between traditional knowledge and modern evidence-based medicine, enabling graduates to work in areas such as herbal product development and nutraceuticals. The scope of the course aims to equip students with the fundamental skills necessary for the accurate identification, authentication, standardization, and quality control of medicinal plant materials, which is the essential first step for any research, industrial, or regulatory activity involving herbal drugs.

COURSE LEARNING OUTCOMES

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

K1: Describe the historical development, classification, and scope of Pharmacognosy.
K2: Identify primary and secondary metabolites with their therapeutic relevance.
K3: Explain cultivation, processing, and conservation techniques for medicinal plants.
K4: Justify the clinical applications of phytotherapeutic agents
S1: Apply quality evaluation methods to crude drugs using organoleptic, microscopic, and chemical parameters.
A1: Improve critical thinking skills.

COURSE CONTENTS

UNIT I **08 Hours**

- **Fundamentals of Pharmacognosy**
  Definition, history, present status, scope and development of pharmacognosy. (1 hr)
- **Sources of drugs:** Plants, animals, microbial, marine, mineral and plant tissue culture. (2 hr)
- **Historical milestones in drug discovery:** Morphine, quinine, aspirin, warfarin, penicillin, cephalosporin, taxol and artemisinin. (1 hr)
- **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. (2 hr)

- **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. (2 hr)

UNIT II **05 Hours**

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. (3 hr)
- Plant hormones and their applications in cultivation of medicinal plants. Application of polyploidy, mutation and hybridization concepts with reference to secondary metabolites. (2 hr)

UNIT III **05 Hours**

Quality Control of Drugs of Natural Origin (WHO Guidelines)

- Adulteration of drugs of natural origin. Evaluation of drugs using organoleptic, microscopic (qualitative and quantitative), physical, chemical and biological methods. (2 hr)
- Physicochemical parameters: extractive values, moisture content, 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. (3hr)

UNIT IV **08 Hours**

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. (3 hr)
- Primary Metabolites
- General classification and identification tests
- Pharmacognostic study (biological source, distribution, chemical constituents, specific tests, therapeutic uses, and commercial applications) of Carbohydrates:(1hr)
  - Acacia,
  - Agar
  - Tragacanth
  - Honey

  Proteins and Enzymes:(2 hr)
  - Gelatin
  - Casein
  - Proteolytic enzymes: Papain, Bromelain, Serratiopeptidase, Urokinase, Streptokinase, Pepsin

  Lipids (Waxes, Fats, Fixed Oils): (2 hr)
  - Castor oil
  - Olive oil
  - Cocoa butter
  - Wool fat
  - Beeswax

UNIT V **04 Hours**

Phyto-therapeutic Agents

Biological source, major constituents and uses of the following classes of drugs:

- Adaptogens and Immunomodulators: Ashwagandha, Tulsi, Amla
- Cardiovascular drugs: Garlic, Arjuna (1hr)
- Hepatoprotectives: Milk thistle, Kutki
- Antidiabetics: Gymnema, Fenugreek (1hr)
- Anti-inflammatory and analgesics: Turmeric, Boswellia
- CNS drugs: Brahmi
- Antimicrobial and antivirals: Giloy, Neem, Andrographis (1hr)
- Gastrointestinal drugs: Psyllium
- Dermatological agents: Aloe
- Drugs used in women's health: Chasteberry, Shatavari
- Respiratory drugs: Vasaka (1 hr)

Assignment topics:

- Discuss the history, present status, scope and development of Pharmacognosy.
- Explain the historical and scientific journey that led to the discovery of warfarin
- Analyze the pre- and post-harvest factors influencing the collection and storage of medicinal plants, and their impact on chemical constituents and quality of the drug.
- Assess the role of polyploidy, mutation and hybridization with reference to secondary metabolites in cultivation of medicinal plants.

TEXTBOOKS

1. EvansWC. Trease and Evans Pharmacognosy. 16th edn. W.B. Sounders & Co. London; 2009.
2. Tyler VE, BradyLR and Robbers JE. *Pharmacognosy*. 9th edn. Lea & Febiger.Philadelphia:1988.
3. Wallis TE. Text Book of Pharmacognosy.5th edn. CBS Publishers &Distribution; New Delhi: 2005.
4. Kokate CK, Purohit AP, Gokhlae SB. Text book of Pharmacognosy.37th edn. Nirali Prakashan; New Delhi: 2007.

REFERENCE BOOKS

1. Ali M. Pharmacognosy and Phytochemistry. Vol. I & II, 1st edn. CBS Publishers & Distribution; New Delhi: 2009.
2. World Health Organization, *WHO traditional medicine strategy 2002–2005*. World Health Organization; Geneva: 2005.
3. World Health Organization. *Quality control methods for medicinal plant materials*. World Health Organization, Geneva: 1998.
4. World Health Organization. *WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants*. World Health Organization; Geneva: 2003.

Additional reading materials:

1. Ansari SH. Essentials of Pharmacognosy. 2nd edn. Birla publications; New Delhi: 2007.
2. Mukherjee PK. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. 1st edn. Business Horizons Publishers; New Delhi: 2002.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.105T	Pharmaceutical Inorganic & Analytical Chemistry (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	0.5	-	45
Max. Marks	FA			SA
100	50			50

SCOPE:

Pharmaceutical Inorganic and Analytical Chemistry lays the foundational framework for understanding the quality, safety, and efficacy of pharmaceutical substances. The scope of this subject encompasses the systematic study of sources and types of errors, along with the identification and control of impurities in pharmaceutical raw materials and finished products, which is essential for maintaining pharmacopoeial standards. It provides a comprehensive understanding of buffer systems and their physiological and formulation-based applications, including isotonicity calculations for parenteral and ophthalmic preparations. The subject develops practical competencies in performing and interpreting limit tests and various titrimetric methods of analysis (acid-base, non-aqueous, precipitation, complexometric, and redox) which are fundamental to pharmaceutical quality control.

Furthermore, it emphasises the therapeutic and pharmaceutical importance of inorganic compounds such as gastrointestinal agents, expectorants, antidotes, and astringents, as well as an introduction to radiopharmaceuticals and their safe handling; and finally, the scope includes the synthesis, purification, and assay of inorganic compounds of pharmaceutical relevance, thereby equipping students with the analytical skills necessary for drug development, manufacturing, and regulatory compliance. Overall, this subject serves as an essential prerequisite for all subsequent pharmaceutical analysis and formulation courses.

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, the student shall be able to;

K1: Explain the different techniques of pharmaceutical analysis, methods of expressing solution strength, and the use of primary and secondary standards with examples.

K2: Describe the sources, types, and regulatory importance of impurities in pharmaceuticals and the relevance of limit tests in identifying the impurities.

K3: Discuss the buffer equation, buffer capacity, significance of buffers in pharmaceutical systems, and their role in maintaining physiological acid-base balance.

K4: Compare the functions of major physiological electrolytes and relate their application in replacement and combination therapy.

K5: Distinguish the preparation, properties, identification tests, therapeutic uses, and storage conditions of gastrointestinal agents, radiopharmaceuticals, expectorants, emetics, haematinics, and antidotes.

K6: Differentiate the theories, indicators, and methodologies involved in various types of analytical methods.

S1: Perform qualitative and quantitative analytical procedures, including limit tests, titrimetric methods and preparation of inorganic pharmaceutical compounds, in accordance with pharmacopoeial standards.

A1: Demonstrate confidence in applying analytical and inorganic chemistry principles to pharmaceutical quality control.

COURSE CONTENTS

UNIT I **8 Hours**

Introduction to pharmaceutical analysis

- Different techniques of analysis (1hour)
- Methods of expressing concentration of solutions, Primary and secondary standards with examples. (1 hour)

Errors

- Sources and types of errors, Methods of minimizing errors (1 hour)
- Accuracy, precision and significant figures. (1 hour)

Impurities

- Definition, types, contents and regulatory importance. (1 hour)
- Sources and types of impurities in Pharmaceuticals. (1 hour)
- Limit tests for chloride, sulphate, iron, arsenic, lead, heavy metals, and modified limit test for chloride and sulphate. (2 hours)

UNIT II **15 Hours**

Acid base titrations (3 hours)

- Theories of acid base indicators, classification of acid base titrations. (1hour)
- Preparation and standardization of titrants (HCl, NaOH), Theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves, Assay of Ammonium Chloride. (2 hours)

Non-aqueous titrations (2 hours)

- Types of solvents (1 hour)
- Acidimetric and Alkalimetric titration using nonaqueous solvents (1 example each). Estimation of Sodium benzoate. (1 hour)

Gravimetry and Precipitation titrations

Gravimetry (2 hours)

- Principle and steps involved in gravimetric analysis. (1 hours)
- Estimation of barium sulphate by gravimetry. (1 hour)

Precipitation titrations (2 hours)

- Mohr's method, Volhard's, Modified Volhard's, Fajans method. (2 hours)

Complexometric titrations (3 hours)

- Classification, metal ion indicators, masking and demasking reagents (2 hours)
- Preparation and standardization of disodium EDTA, Estimation of Magnesium sulphate and Calcium gluconate* (1 hour)

Redox titrations (3 hours)

- Concepts of oxidation and reduction (1 hour)
- Types of redox titrations (1 example each)
- Permanganometry, Cerimetry, Iodimetry, Iodometry and titrations with potassium iodate. (2 hours)

UNIT III **3 Hours**

Radiopharmaceuticals

- Basics of radioactivity (Definition, Types of radiation, units, Half-life) (1 hour)
- Applications of radioisotopes of Sodium Iodide I-131, Technetium-99m, Cobalt-60, Phosphorus-32, Measurement of radioactivity- GM Counter (1 hour)
- Safe handling, storage, and disposal of radiopharmaceuticals, adhering to regulatory guidelines for safety. (1 hour)

UNIT IV **3 hours**

Acid-Base Chemistry and Buffer Systems in Pharmacy

- Definition of acids, bases, buffers, pH Scale and its significance. (1 hour)
- Buffer equation, calculation of pH for Buffer solution. (1 hour)
- Isotonicity and its application in IV Fluids and Ophthalmic Solutions. (1 hour)

General methods of preparation, assay for the compounds superscripted with an asterisk (*), properties, medicinal uses and storage conditions of inorganic compounds belonging to the following classes.

UNIT V **16 hours**

Gastrointestinal agents (4 hours)

- Acidifiers: Sodium acid phosphate and Dilute Hydrochloric acid. (1 hour)

- Antacids: Ideal properties of antacids, combinations of antacids, Sodium bicarbonate*, Aluminium hydroxide gel*. (2 hours)
- Agents promote bowel movements: Magnesium hydroxide, Sodium orthophosphate, Sodium Potassium tartrate and magnesium trisilicate. (1 hour)

Antimicrobials (3 hours)

- Mechanism, classification (1 hour)
- Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations (2 hours)

Major extra and intracellular electrolytes (4 hours)

- Functions of major physiological ions (1 hour)
- Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium chloride and Oral Rehydration Salt (ORS) (2 hours)
- Physiological acid base balance (1 hour)

Miscellaneous Compounds (5 hours)

- **Expectorants:** Potassium iodide, Ammonium chloride*. (1 hour)
- **Emetics**: Copper sulphate*, Sodium potassium tartrate. (1 hour)
- **Haematinics**: Ferrous sulphate*, Ferrous gluconate. (1 hour)
- **Poison and Antidote**: Definition, classification of antidotes, Sodium thiosulphate, Sodium nitrite. (2 hours)

ASSIGNMENTS

1. Comparative study of properties uses and storage of various inorganic compounds as constituents in various dental products.
2. Brief analysis of various official formulations of Oral Rehydration Salt and their pharmaceutical applications.
3. Case study on applications of pharmaceutical inorganic compounds as antidotes.
4. Medicinal importance of pharmaceutical inorganic compounds in disorders related to electrolyte imbalances.
5. Comparative study of properties, applications, storage of various inorganic compounds as components in various antacids and combination antacids.
6. Provide a brief overview of the common methods for expressing solution concentration: moles, molarity, normality, molality, percentage concentration, parts per million (ppm), and serial dilution

1. Preparation and standardization of 1M molar solutions of
- Oxalic acid
- Hydrochloric acid
- Sodium thiosulphate
- Ceric ammonium sulphate

2. Preparation and standardization of 1N molar solutions of
- Sodium hydroxide
- Sulphuric acid
8. Discuss on different types of Redox titrations. What are the major difference between?
Iodimetry and Iodometry
Bromatometry and Iodatometry

TEXTBOOKS

1. Atherden LM. Bentley and Driver's Textbook of Pharmaceutical Chemistry. 8th edn. India: Oxford; 2020
2. Chatwal GR. Pharmaceutical Chemistry-Inorganic. 5th edn. Himalaya Publishers. India; 2021
3. Alagarsamy V. Pharmaceutical Inorganic Chemistry. 2nd edn. PharmaMed Press. India; 2022
4. Driver, John Edmund. Bentley & Driver's text-book of pharmaceutical chemistry. 8th Edn. 2020.
5. P. Gundu Rao. Inorganic Pharmaceutical Chemistry. 1st edn. Vallabh Prakshan, India; 2008
6. Kennedy, John H., and John H. Kennedy. Analytical chemistry: principles. Harcourt Brace Jovanovich, 2011.

REFERENCE BOOKS

1. Beckett, A. H., and J. B. Stenlake. Practical Pharmaceutical chemistry: Part two. 4th Edn, Athlone Press University of London. 2005.
2. J Mendham, R C Denny, J D Barnes, M Thomas & B Sivasankar. Vogel's textbook of quantitative chemical analysis. 6th edn. Pearson Education. Germany; 2009.
3. Vogels Textbook of Quantitative Chemical Analysis. India: Pearson Education; 2006.
4. Indian Pharmacopoeia. "Government of India ministry of health and family welfare, published by Indian Pharmacopoeial commission". Government of India Ghaziabad 2022.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.106RMT	Remedial Maths (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
2	2	-	-	30
Max. Marks	FA			SA
50	25			25

SCOPE:

This is an introductory course in mathematics. This subject deals with the introduction to Sets, Matrices, Relations and Functions, Permutations and Combinations, Sequences and Series, Mathematical Reasoning.

Calculus is a significant mathematic tool for investigating drug movement quantitatively. Differential equations are used to relate the absorptions of drugs in various body organs over time. Integrated equations are regularly used to model the cumulative therapeutic or toxic reactions of drugs in the body.

COURSE LEARNING OUTCOMES:

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

K1: Define set theory in mathematics
K2: Classify different types of matrices
K3: Illustrate relations and functions in set theory
K4: Describe the relationship between Arithmetic Mean (A.M) and Geometric Mean (G.M)
K5: Explain statements and compound statements in mathematical reasoning
S1: Apply fundamental concepts of sets, matrices, series, logic, and integration to solve mathematical problems.
A1: Demonstrate positive attitudes, ethical practices, teamwork, active participation, and professionalism in academic and collaborative activities.

COURSE CONTENTS

UNIT I **6 Hours**

Sets

- Introduction, Sets and their Representations (1 hr)
- The Empty Set, Finite and Infinite Sets (1 hr)
- Equal Sets, Subsets (1 hr)
- Power Set, Universal Set (1 hr)
- Venn Diagrams, Operations on Sets (1 hr)
- Complement of a Set, Practical Problems on Union and Intersection of Two Sets (1 hr)

UNIT II **6 Hours**

Matrices

- Introduction matrices, Types of matrices (1 hr)
- Operation on matrices (1 hr)
- Transpose of a matrix (1 hr)
- Matrix Multiplication (1 hr)
- Properties of matrix addition and multiplication (1 hr)
- Symmetric and skew-symmetric matrices, Invertible matrices (1 hr)

UNIT III **3 Hours**

Relations and Functions

- Introduction, Cartesian Product of Sets (1 hr)
- Relations (1 hr)
- Functions (1 hr)

UNIT IV **6 Hours**

Sequences and Series

- Introduction, Sequences (1 hr)
- Series (1 hr)
- Arithmetic Progression (A.P.) (1 hr)
- Geometric Progression (G.P.) (1 hr)
- Relationship between Arithmetic Mean (A.M) and Geometric Mean (G.M) (1 hr)
- Sum to n terms of Special Series (1 hr)

UNIT V **3 Hours**

Mathematical Reasoning

- Introduction, Statements (1 hr)
- New Statements from Old, Special Words/Phrases (1 hr)
- Implications, Validating Statements (1 hr)

UNIT VI **6 Hours**

Calculus

- **Differentiation: Introductions**, Derivative of a function, Derivative of a constant (1 hr)
- Derivative of a product of a constant and a function, Derivativeof the sum or difference of two functions (1 hr)
- Derivative of the product of twofunctions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof (1 hr)
- **Integration:** Introduction, Definition (1 hr)
- Standard formulae, Rules of integration (1 hr)
- Method of substitution, Method of Partial fractions (1 hr)

TEXTBOOKS:

1. Mathematics Textbook for Class 11& 12, NCERT

REFERENCE BOOKS:

1. R. D Sharma, Mathematics class XI, Volume 1, Dhanpat Rai Publication
2. R.S. Aggarwal, Mathematics Class 11, Bharti Bhavan

**Latest edition of text books and reference books can be referred.*

Course code	Course title			Course type
BP.106RBT	Remedial Biology (Theory)			ERC
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
2	2	-	-	30
Max. Marks	FA			SA
50	25			25

SCOPE

This subject is designed to provide fundamental knowledge about the various organ system and functions of the human body. This course covers the fundamental aspects of living organisms, including their classification, salient features, cellular structure and function of cells and cell organelles, and the morphological and physiological processes of plants and animals. It provides the foundation for understanding core pharmacy subjects such as pharmacology and pharmacognosy. It helps students to develop the skills to distinguish different plant tissues based on their microscopic characteristics. This course will enable students to understand the concepts of species, taxonomic hierarchy, and the five-kingdom classification.

COURSE LEARNING OUTCOMES:

On successful completion of the course, the student shall be able to:

K1: Outline the organization of the human nervous system, generation of nerve impulse, reflex action, and mechanism of breathing

K2: Explain the structure and function of cell organelles, plant cell inclusions, and the cell cycle in plant and animal cells .

K3: Describe the role of growth regulators in regulating plant growth and development.

K4: Apply the universal rules of binomial nomenclature to correctly write any given scientific name.

S1: Demonstrate the calculation of heart rate, breathing rate, and interpret the regulation of kidney function.

A4: Cultivate critical thinking skills.

COURSE CONTENTS

UNIT–I **07 Hours**

Cell- The Unit of Life

- Concept of species and taxonomical hierarchy; Binomial nomenclature. (1 hr)
- Structure, Function of Plant and Animal Cell and cell organelles. (2 hr)
- Cell cycle & cell division. (1 hr)
- Plant cell inclusions. (1 hr)
- Structure of a human cell, Plasma membrane, and Organelles (1 hr)
- Types, functions, and location of Glandular epithelial cells (1 hr)

UNIT–II **05 Hours**

Structural Organization of Plants

- Morphology and modifications; Tissues, types, location, and its functions; (2 hr)
- Types of stomata and trichomes (1 hrs)
- Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence, flower, fruit, and seed. (2 hrs)

UNIT–III **04 Hours**

Plant Physiology

- Transport in plants: Movement of water, gases, and nutrients; Cell-to-cell transport– Diffusion, facilitated diffusion, active transport (2 hr).
- Growth regulators–auxin, gibberellin, cytokinin, ethylene, ABA (2 hrs).

UNIT–IV **09 Hours**

Human Physiology

- **Body fluids and circulation**
  Composition of the blood, lymph, Disorders of blood, and Structure of blood vessels.(1 hr) Differences between artery and vein Blood vessels of vital organs, Heart sound, and Disorders of the cardiovascular system.(1 hr)
- **Neural control and coordination**
  Organization of the nervous system, Neurons, types of neurons, classification, and properties of the nerve fibre. (1 hr)
  Classification of the peripheral nervous system, Structure, and functions of the sympathetic and parasympathetic nervous systems. (1 hr)
  Generation and conduction of nerve impulse, Reflex action; Sensory perception. (1 hr)
- **Respiration**
  Mechanism of breathing and its regulation in humans– Exchange of gases, transport of gases and regulation of respiration. (1 hr)
  Artificial respiration, Resuscitation methods. (1 hr)
- **Digestion and absorption**
  Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; (1 hr)
  Peristalsis, digestion, absorption, and assimilation of proteins, carbohydrates, and fats. (1 hr)

UNIT–V **5 hours**

- **Excretory products and their elimination**
  Modes of excretion – Ammonotelism, ureotelism, uricotelism; Human excretory system– structure and function of kidney and nephron. (1 hr)
  Regulation of kidney function– Renin-angiotensin, Atrial Natriuretic Factor, ADH, and Diabetes insipidus; Role of other organs in excretion. (1 hr)
- **Chemical coordination and regulation**
  Endocrine glands and hormones; Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads. (1 hr)
- Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (examples only). (1 hr)

- **Reproductive system**
  Genetic basis of sex determination, Primary and secondary sex organs, Role of sex hormones in reproductive development. (1 hr)

TEXTBOOKS:

1. Ghose KC, Manna B. Fundamental of Zoology. 1st edn. New Central book agency Pvt. Ltd, Kolkata, 2003.
2. Randhawa SS, Atul Kabra. 2nd edn. Remedial Biology. S Vikas and Company Pvt. Ltd., New Delhi, 2009

REFERENCE BOOKS:

1. Gokhale SB, Kokate CK, Bidarkar DS. Pharmaceutical Biology. Nirali Prakashan, Pune, 2007.
2. Dutta AC, Dutta TC. Botany for Degree Students. 6th edn. Oxford University Press, India, 2013.
3. Kokate CK, Purohit, Gokhlae. Textbook of Pharmacognosy. 37th edn. Nirali Prakashan, New Delhi, 2007.
4. Pandey PB. Botany for Degree Students. 2nd edn. S Chand & Company Pvt.Ltd., New Delhi, 2009

**Latest edition of text books and reference books can be referred*

Course code	Course title			Course type
BP.107T (22AVP103)	Mastery Over Mind (MAOM) (Theory)			ERC
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	1	-	-	15
Max. Marks	FA			SA
50	25			25

SCOPE:

Mastery Over the Mind (MAOM) is an Amrita initiative to implement schemes and organize university-wide programs to enhance health and wellbeing of all students. This program as part of our efforts for sustainable stress reduction gives an introduction to immediate and long-term benefits and equips every attendee to manage stressful emotions and anxiety facilitating inner peace and harmony. The meditation technique offered by Amrita University Chancellor and world-renowned humanitarian and spiritual leader, Sri Mata Amritanandamayi Devi (Amma), is completely dedicated for guided practical meditation session and theory aspects of MAOM. The theory section comprises principle of meditation, stress management, research and science of meditation, principles of conscious communication.

This course promotes a sense of control and autonomy in the Universal Human Value System, compassion, empathy, responsibility and practicing meditation for the wholesome wellbeing of an individual. This course enhance the understanding of experiential learning based on university's mission: "Education for Life along with Education for Living", and is aimed to allow learners to realize and rediscover the infinite potential of one's true Being and the fulfilment of life's goals. During practice session students are trained through guided meditation session of different level. They experience Mind and body relaxation, get rid of energy blockage, pure unconditional love, light of consciousness, positive energy and compassion.

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, student shall be able to

K1: Explain the fundamental principles and scientific theories of meditation.
K2: Analyze the physiological and psychological impacts of chronic stress on human wellbeing.
K3: Illustrate how individual mindfulness practices drive positive global and societal transformation.
S1: Demonstrate the correct step-by-step execution of the MAOM meditation technique.
S2: Evaluate the personal benefits of a consistent meditation routine using a structured self-tracking tool.
A1: Apply the principles of conscious communication and humility to resolve team conflicts and foster a harmonious group work environment.

LECTURE WISE CONTENTS:

UNIT 1 - Causes of Stress **4 Hours**

- The problem of not being relaxed. Need for meditation. Basics of stress management at home and workplace. (1 hr)
- Traditions and Culture, Principles of meditation, (1hr) Promote a sense of control and autonomy in the Universal Human Value System. (1 hr)
- Different stages of Meditation. Various Meditation Models. Various practices of Meditation techniques in different schools of philosophy and Indian Knowledge System. (1 hr)

UNIT 2- Improving work and study performance **5 Hours**

- Meditation in daily life. Cultivating compassion and good mental health with an attitude of openness and acceptance. (1hr)
- Research and Science of Meditation: Significance of practicing meditation and perspectives from diverse fields like science, medicine, technology, (1hr) philosophy, culture, arts, management, sports, economics, healthcare, environment etc. (1hr)
- The role of meditation for stress and anxiety reduction in one's life with insights based on recent cutting-edge technology. (1hr)
- The effect of practicing meditation for the wholesome wellbeing of an individual. (1hr)

UNIT 3 – Self communications: **5 Hours**

- Principles of conscious communication. Relationships and empathy. Meditative approach in managing and maintaining better relationships in life during the interactions in the world(1hr)
- Role of MAOM in developing compassion, empathy and responsibility, (1hr)
- Instilling interest, and orientation to humanitarian projects as a key to harness intelligence and compassion in youth. (1hr)
- Methodologies to evaluate effective awareness and relaxation gained from meditation. (1hr)
- Evaluating the global transformation through meditation by instilling human values which leads to service learning and compassion driven research. (1hr)

Practice Session:
During practice sessions, students are trained through guided meditation of different levels. It starts with the relaxation of the body through step-by-step instructions. This helps them to relax physically. They are then instructed to focus on their breathing, which helps them relax and focus. Students are then instructed to keep their attention on their thoughts, followed by inhalation and exhalation with the vibration of the sound Ma-Om. This makes them experience stillness and inner expansiveness. Finally, they are instructed to practice White Flower Meditation for global peace and harmony. Through this White Flower meditation, they can connect with the universe and experience oneness.

ASSIGNMENT

1. Explain the major causes of stress and the basic principles of meditation for stress management.

2. Describe the stages, models, and different meditation practices followed in the Indian Knowledge System and various schools of philosophy.

3. Demonstrate how meditation can be incorporated into daily life to improve academic performance, workplace efficiency, and mental well-being.

4. Compare the scientific evidence on the effects of meditation in healthcare, psychology, management, sports, and technology.

5. Evaluate the role of meditation in developing empathy, conscious communication, compassion, and universal human values.

6. Develop an evidence-based meditation framework to enhance self-awareness, stress resilience, and compassionate behavior in higher education.

TEXT BOOKS:

1. Mata Amritanandamayi Devi, "Cultivating Strength and vitality," published by Mata Amritanandamayi Math, Dec 2019
2. Swami Amritaswarupananda Puri ,"The Color of Rainbow " published by MAM, Amritapuri.(latest edition)

REFERENCES:

1. Craig Groeschel, "Winning the War in Your Mind: Change Your Thinking, Change Your Life" Zondervan Publishers, February 2019
2. Swami Amritaswarupananda Puri "Awaken Children Vol 1, 5 and 7 - Dialogues with Amma on Meditation", August 2019
3. Secret of Inner Peace- Swami Ramakrishnananda Puri, Amrita Books, Jan 2018.

Course code	Course title			Course type
BP.108P	General Pharmacy (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1.5	-	-	3	45
Max. Marks	FA			SA
100	50			50

SCOPE:

This practical course is designed to provide hands-on training in the fundamental pharmaceutical techniques involved in prescription handling, dispensing, compounding, and preparation of pharmaceutical dosage forms. The course enables students to develop proficiency in pharmaceutical calculations, weighing and measuring operations, and the preparation of various liquids, semisolids, and powder dosage forms according to standard pharmaceutical procedures. The practical sessions emphasize the application of theoretical principles in the formulation, preparation, packaging, labeling, and evaluation of pharmaceutical preparations. Students will gain experience in calculating and adjusting the strength and tonicity of solutions, performing dose calculations, and selecting suitable formulation approaches for different drugs and dosage forms.

The course also familiarizes students with good laboratory practices, safety measures, professional ethics, and proper documentation required in pharmaceutical compounding and dispensing. Through these exercises, students will acquire the technical skills and professional competence necessary for accurate dispensing, pharmaceutical calculations, and preparation of quality pharmaceutical products in community, hospital, and industrial pharmacy settings.

COURSE LEARNING OUTCOMES:

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

K1: Demonstrate knowledge of pharmaceutical calculations and the formulation, preparation, packaging, labeling, and dispensing requirements of common dosage forms such as solutions, syrups, powders, granules, lotions, and semisolid preparations.

S1: Perform accurate weighing and measuring techniques required for pharmaceutical dispensing and compounding.

S2: Formulate various solid dosage forms, including powders, using appropriate pharmaceutical techniques.

S3: Formulate pharmaceutical solutions of required strength and adjust their tonicity using suitable methods.

A1: Exhibit a systematic and organized approach during pharmaceutical laboratory activities.

A2: Demonstrate responsibility and accuracy in the preparation of pharmaceutical formulations.

LIST OF EXPERIMENTS

Preparation, packing, labeling, and dispensing of the following dosage forms against the given prescriptions

1. Pharmaceutical Calculations Solutions based on allegation and dilution methods

2. Solutions

a) Strong solution of ammonium acetate – IP

b) Cresol with soap solution – IP

c) Lugol's solution – BPC

3. Syrups

a) Simple Syrup – IP

4. Suspensions

a) Calamine lotion

5. Emulsions

a) Castor oil emulsion

d) Arachis oil emulsion

6. Powders & Granules

a) ORS powder – WHO

b) Effervescent granules – IP

c) Dusting powder – IP

d) Divided powders – IP

7. Suppositories

a) Glycerogelatin suppository – BPC

b) Cocoa butter suppository – IP

c) Zinc Oxide suppository – IP

8. Gargles & Mouthwashes

a) Iodine gargle – BPC

b) Chlorhexidine mouthwash – IP

TEXTBOOKS

1. Carter S J. Cooper and Gunn's Dispensing for Pharmaceutical Students. 12th edn. CBS Publishers & Distributors New Delhi; 2008.

2. Seth A K. A textbook of Pharmaceutics. 2nd edn. S Vikas & Co. Jalandhar; 2017.

REFERENCE

1. Indian Pharmacopoeia Commission, Indian Pharmacopoeia, Vol. I. Ghaziabad: IPC.

2. United States Pharmacopeial Convention, United States Pharmacopeia–National Formulary (USP–NF). Rockville, MD, USA.

3. British Pharmacopoeia Commission, British Pharmacopoeia Codex. London: The Stationery Office.

4. World Health Organization, Oral Rehydration Salts (ORS) Formulation Guidelines. Geneva: WHO.

**Latest edition of the reference books can be referred.*

Course code	Course title			Course type
BP.109P	Introduction to Pharmacognosy (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
1.5	-	-	3	45
Max. Marks	SE			ESE
100	35			50

SCOPE

This course focuses on the evaluation of crude drugs and medicinal plants using morphological and microscopical characters as well as physicochemical parameters. It also provides an introduction to standardization and quality control of herbal materials. The course offers foundational competency in the authentication, quality evaluation, and documentation of crude drugs of plant origin.

COURSE LEARNING OUTCOMES

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

K1: Discuss the application of leaf constants in the evaluation of crude drugs.

S1: Identify medicinal plants and crude drugs using morphological and microscopical characters.

S2: Analyze powdered drugs microscopically to identify diagnostic cell contents.

S3: Perform quantitative microscopy for stomatal and vein parameters.

S4: Evaluate the quality and purity of crude drugs using physicochemical parameters

S5: Collect medicinal plants and prepare voucher specimens during field visits.

A1: Demonstrate integrity by recording raw observations without fabrication or alteration.

A2: Comply with all lab safety protocols and equipment handling procedures.

LIST OF PRACTICAL EXPERIMENTS

(Minimum 12 experiments must be performed)

1. Organoleptic evaluation and powder microscopical characters of the following drugs: Tulsi and Ashwagandha.
2. Organoleptic evaluation and powder microscopical characters of the following drugs: Amla and Arjuna.
3. Chemical tests for identification of Agar, Acacia, Tragacanth, Honey.
4. Chemical tests for identification of Castor oil, Olive oil, Wool fat, Beeswax.
5. Chemical tests for identification of Asafoetida, Catechu, Aloe.
6. Determination of moisture content 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. Determination of percentage purity of powder drug using lycopodium spore method
14. Experiential learning-based experiments involving collection, identification of medicinal plant material, preparation of voucher specimens and excursion visits to medicinal plant garden.

TEXTBOOKS

1. Kokate CK, Purohit AP, Gokhlae SB. Practical Pharmacognosy. 13th edn. NiraliPrakashan; New Delhi: 2009. (Practicals)
2. Mukherjee PK. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. 1st edn. Business Horizons Publishers; New Delhi: 2002.

REFERENCE BOOKS

1. Wallis TE.Text Book of Pharmacognosy.5th edn. CBS Publishers &Distribution; New Delhi: 2005.
2. EvansWC. Trease and Evans Pharmacognosy. 16th edn. W.B. Sounders & Co. London; 2009.
3. Tyler VE, BradyLR and Robbers JE. *Pharmacognosy*. 9th edn. Lea & Febiger. Philadelphia:1988.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.110P	Pharmaceutical Inorganic & Analytical Chemistry (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	-	-	2	30
Max. Marks	FA			SA
100	50			50

SCOPE

The practical course in Pharmaceutical Inorganic and Analytical Chemistry is designed to develop hands-on competencies in the quality evaluation and preparation of inorganic pharmaceutical substances. It covers the performance of limit tests (chloride, sulphate, iron, lead, arsenic) and modified limit tests as per Indian Pharmacopoeia standards to detect and quantify impurities. Students will prepare important inorganic compounds such as aluminium hydroxide, potash alum, ferrous sulphate, and magnesium sulphate. The course also includes purity assessment of pharmaceutical materials, including swelling power of bentonite and acid-neutralizing capacity of aluminium hydroxide gel.
Additionally, students will perform quantitative assays of inorganic compounds using various titrimetric techniques – acid-base, cerimetry, iodometry, complexometry, permanganometry, non-aqueous, and precipitation (Modified Volhard's) methods. Through these experiments, learners develop analytical accuracy, precision, and the ability to interpret results in compliance with pharmacopoeial standards, thereby preparing for quality control roles in the pharmaceutical industry.

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

K1: Explain the principle, procedure, and pharmacopoeial limits for various limit tests, preparation methods of inorganic pharmaceuticals, purity tests, and assay techniques along with standardization of titrants.
S1: Perform limit tests for chloride, sulphate, iron, and arsenic as per Indian Pharmacopoeia, and interpret the results by comparing with standard turbidity or color.
S2: Prepare inorganic pharmaceuticals (potash alum, ferrous sulphate, magnesium sulphate) and calculate the percentage yield.
S3: Carry out assays of inorganic compounds including standardization of the titrant, and calculate the percentage purity of the compounds.
A1: Value the importance of adhering to pharmacopoeial standards while performing limit tests, purity assessments, and assays to ensure drug safety and quality.
A2: Demonstrate responsibility in handling reagents, titrants, and inorganic compounds during preparations and assays, showing concern for accuracy, waste disposal, and laboratory safety.

LIST OF PRACTICAL EXPERIMENTS

1. Limit tests

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 Arsenic

2. Preparation of inorganic pharmaceuticals

a. Preparation of potash alum

b. Preparation of ferrous sulphate

c. Preparation of Magnesium sulphate from magnesium hydroxide or magnesium carbonate

3. Test for Purity

a. Assessment of swelling power of bentonite as per Indian Pharmacopoeia

b. Determination of potassium iodate and iodine in potassium Iodide

4. Assay of the following inorganic compounds including standardization of titrant

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

TEXTBOOKS

1. Chatwal GR. Pharmaceutical Chemistry-Inorganic. 5th edn. Himalaya Publishers. India; 2021
2. Alagarsamy V. Pharmaceutical Inorganic Chemistry. 2nd edn. PharmaMed Press. India; 2022
3. P. Gundu Rao. Inorganic Pharmaceutical Chemistry. 1st edn. Vallabh Prakshan, India; 2008

REFERENCE BOOKS

1. Beckett, A. H., and J. B. Stenlake. Practical pharmaceutical chemistry: Part two. 4th Edn, Athlone Press University of London.2005.
2. J Mendham, R C Denny, J D Barnes, M Thomas & B Sivasankar. Vogel's textbook of quantitative chemical analysis. 6th edn. Pearson Education. Germany; 2009.
3. Vogels Textbook of Quantitative Chemical Analysis. India: Pearson Education; 2006.

**Latest edition of the text books & reference books can be referred.*

SEMESTER II

Course code	Course title			Course type
BP.201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)			ERC
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
2	2	-	-	30
Max. Marks	FA			SA
50	25			25

SCOPE

This course introduces the fundamental concepts of biostatistics and their application in pharmaceutical sciences, with an emphasis on data interpretation and evidence-based decision-making. It covers descriptive statistics, probability, statistical distributions, sampling methods, hypothesis testing, correlation, and regression, enabling students to understand and interpret data generated from clinical trials, pharmacovigilance, pharmacokinetic studies, and pharmaceutical quality control.

The course integrates statistical analysis with Python programming using libraries such as NumPy, Pandas, SciPy, Statsmodels, and Scikit-learn, allowing students to perform basic statistical analyses, visualize data, and interpret analytical outputs. Through case-based learning using real pharmaceutical datasets, students develop the ability to prepare statistical reports and draw scientifically valid conclusions. Overall, the course gives a solid basis in biostatistics and data analysis, which helps in research for pharmaceuticals, clinical studies, and making healthcare decisions.

COURSE LEARNING OUTCOMES

Upon successful completion of the subject, the student shall be able to

K1: Explain the basic concepts of descriptive statistics and their applications in pharmaceutical sciences.
K2: Describe the principles of probability, statistical distributions, correlation, and simple linear regression used in pharmaceutical data analysis.
K3: Interpret the concepts of hypothesis testing, confidence intervals, p-values, and statistical significance.
S1: Perform basic statistical analysis and data visualization using Python libraries on pharmaceutical datasets.
S2: Interpret statistical outputs and prepare simple statistical reports to support pharmaceutical decision-making.
A1: Demonstrate a systematic and ethical approach to the analysis, interpretation, and reporting of pharmaceutical and healthcare data.

COURSE CONTENTS

UNIT I Descriptive Statistics **6 hours**

- Types of data in pharmaceutical sciences (nominal, ordinal, interval, ratio) (1 hr)
- Sources of data in pharmacy: clinical trials, pharmacovigilance, quality control, PK studies (1 hr)
- Measures of central tendency: mean, median, mode, their calculation and interpretation (1 hr)
- Measures of dispersion (range, variance, standard deviation) and their interpretation using pharmaceutical data (1 hr)
- Skewness and understanding distribution shape in biological measurements (1 hr)
- Perform descriptive statistical analysis using Python libraries such as NumPy and Pandas, with focus on Interpretation of results (1 hr)

UNIT II Probability & Statistical Distributions in Healthcare **6 hours**

- Basic probability concepts and laws (addition and multiplication rules), conditional probability and its interpretation (1hr)
- Bayes' theorem and its application in clinical decision-making (1hr)
- Concept of random variables (discrete and continuous) (0.5 hr)
- Normal distribution and its importance in biological and pharmaceutical measurements, (0.5 hr)
- Binomial distribution demonstrating applications in clinical trial outcomes (1 hr)
- Poisson distribution for modeling rare events such as adverse drug reactions (1 hr)
- Graphical visualization of these probability distributions using Python (1hr)

UNIT III Sampling & Statistical Inference **6 hours**

- Population versus sample, sampling techniques used in clinical research, Sampling error and bias (1 hr)
- Conceptual understanding of the Central Limit Theorem (1 hr)
- Confidence intervals and their interpretation (1 hr)
- Hypothesis testing framework (null and alternative hypotheses) (0.5 hr)
- Type I and Type II errors, p-value and statistical significance (0.5 hr)
- Demonstration, calculation and interpretation of these parameters using python with pharmaceutical data (2 hrs)

UNIT IV Basics of Correlation & Regression **6 hours**

Conceptual understanding of the following concepts with emphasis on their interpretation-

- Correlation and Pearson correlation coefficients (1 hr)
- Interpretation of positive and negative correlations (1 hr)
- Scatter plots and trend visualization using pharmaceutical data such as dose-response relationships (1 hr)

- Simple linear regression concept, intrpretation of regression coefficients (2 hrs)
- Introduction to odds ratio and its application in clinical risk analysis (1 hr)

UNIT V Statistical Analysis Using Python – Case based learning 6 hours

- Demonstration of descriptive statistics, correlation analysis and linear regression using Python libraries- SciPy / Statsmodels / Scikit-learn on pharmaceutical datasets (3 hrs)
- Interpretation of the output summaries and p-values, Preparation of statistical reports (3 hrs**)**

ASSIGNMENTS

1.Identify and classify 20 variables from pharmaceutical, clinical, or healthcare settings as nominal, ordinal, interval, or ratio data. Justify the classification and discuss its impact on statistical analysis.

2. Calculate the mean, median, mode, range, variance, and standard deviation for a healthcare or pharmaceutical dataset containing at least 20 observations, and discuss the significance of these measures in data interpretation.

3. Identify three real-world healthcare or pharmaceutical scenarios where Normal, Binomial, and Poisson distributions can be applied. Explain the suitability of each distribution for the selected scenario.

4. Examine ethical issues in healthcare data management and reporting, and suggest measures to ensure data integrity and transparency

5. Identify examples of different sampling techniques from published studies and compare their advantages, limitations, and potential sources of bias in healthcare research.

6. Identify five examples of variables from pharmaceutical research that may exhibit positive, negative, or no correlation. Explain the possible relationships and their practical significance.

TEXT BOOKS:

1. Bolton S. and Bon C. Pharmaceutical Statistics: Practical and Clinical Applications, 5th Edition: New York: Informa Healthcare, 2010.
2.De Muth J.E. Basic Statistics and Pharmaceutical Statistical Applications, Boca Raton, 3rd Edition:FL: CRC Press; 2014
3. Sundaram K R, Dwivedi S N and Sreenivas V. Medical Statistics: Principles and Practice, 2nd Edition: Wolters Kluwer | Lippincott Williams and Wilkins India; 2014.
4. Saha I, Paul B. Essentials of biostatistics & research methodology. 3rd Edition: Kolkata: Academic Publishers; 2021.

REFERENCE BOOKS:

1. Gupta S. C. Fundamentals of Statistics. 7th Edition: Himalaya Publishing House; 2017.
2. Douglas C. M. Design and Analysis of Experiments. 10th Edition: Wiley India; 2019.
3. Sanford B. Pharmaceutical statistics- Practical and clinical applications. 5th Edition: Marcel Dekker Inc. New York; 2010.
4.Walters, S.J., Campbell, M.J. and Machin, D. Medical Statistics: A Textbook for the Health Sciences. 5th Edition: NJ: Wiley-Blackwell;2021.
5.Rowe, P., Essential Statistics for the Pharmaceutical Sciences. 2nd Edition:London: Pharmaceutical Press;2016

**Latest edition of the textbooks & reference books can be referred*

Course code	Course title			Course type
BP.202T	Biochemistry (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
2.5	2	0.5	-	30
Max. Marks	FA			SA
100	50			50

SCOPE

The scope encompasses the study of enzymology, including enzyme kinetics, regulation, and clinical applications of enzymes and isoenzymes. It covers the biochemical aspects of carbohydrates, lipids, proteins, and nucleic acids, along with their metabolic pathways such as glycolysis, TCA cycle, gluconeogenesis, HMP shunt, β-oxidation, fatty acid synthesis, and the urea cycle. The course also explores bioenergetics, biological oxidation, and the electron transport chain. A significant component is dedicated to clinical chemistry, including the interpretation of liver function tests (LFT), renal function tests (RFT), and the biochemical basis of common metabolic disorders such as diabetes mellitus, hyperlipidemias, hyperuricemia (gout), and inborn errors of metabolism (e.g., phenylketonuria, albinism).

The syllabus also introduces nucleic acid metabolism, the central dogma, and the clinical relevance of DNA repair disorders. Overall, the course establishes a strong biochemical foundation for understanding disease mechanisms, drug action, and rational pharmacotherapy.

COURSE LEARNING OUTCOMES:

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

K1: Explain the organization of the mammalian genome and the properties of the genetic code.
K2: Discuss the IUB classification, kinetics, inhibition, regulation, and therapeutic/diagnostic applications of enzymes.
K3: Describe the chemical nature, biological functions, and structural classification of biomolecules.
K4: Outline the concept of bioenergetics and the role of energy-rich compounds.
K5: Illustrate the mechanisms of biological oxidation, including the electron transport chain and oxidative phosphorylation.
K6: Interpret the metabolic pathways of carbohydrates, lipids, amino acids, and nucleic acids under physiological and pathological conditions.
S1: Relate the clinical laboratory data to identify metabolic disorders and inborn errors of metabolism.
A1: Demonstrate systematic reasoning by evaluating multifactorial biochemical parameters in understanding metabolic disorders.

COURSE CONTENTS

UNIT I **9 Hours**

Enzymes

- Introduction, properties, nomenclature, and IUB classification of enzymes and coenzymes (1 hr)
- Factors affecting enzyme activity, Enzyme kinetics (Michaelis plot, Lineweaver– Burk plot) (1 hr)
- Enzyme inhibitors with examples (1 hr)
- Regulation of enzymes: enzyme induction and repression, allosteric enzyme regulation (1 hr)
- Therapeutic and diagnostic application of enzymes and isoenzymes. (1 hr)

Dietary Micro & Macronutrients

- Digestion, absorption of Vitamins and Minerals (1 hr)
- Biochemical functions & associated diseases (1 hr)

Clinical Biochemistry

- Liver function tests (routinely performed tests based on liver function). (1 hr)
- Renal function tests (routinely performed tests based on kidney function, ELISA test) (1 hr)

UNIT II **13 Hours**

Biomolecules

- Introduction of carbohydrate, lipids, nucleic acids, amino acids and proteins.(3 hrs) (definition, structure, classification, functions)

Bioenergetics

(Concept of free energy; relationship between free energy, enthalpy, and entropy; redox potential - SDL)

- Energy-rich compounds (ATP, GTP, etc.) and their biological significance. (1 hr)

Carbohydrate Metabolism and their role in Diabetes mellitus

- Overview and significance of major pathways: Glycolysis, Citric Acid Cycle (TCA), Gluconeogenesis, Hexose Monophosphate (HMP) shunt, and Glycogen metabolism. (4 hrs)
- regulation of blood glucose levels; metabolic adaptations during fed state, fasting, and prolonged starvation; metabolic derangements in diabetes mellitus and related disorders. (2 hrs)

Biological Oxidation

- Electron Transport Chain (ETC) (1 hr)
- oxidative phosphorylation, and mechanisms of ATP synthesis (1 hr)
- regulation and clinical implications of mitochondrial dysfunction and oxidative stress (1 hr)

UNIT III **7 Hours**

Lipid Metabolism

- Classification, functions, and properties of lipids and lipoproteins (HDL, LDL, VLDL, chylomicrons) (1 hr)
- β-oxidation and de-novo synthesis of fatty acids: Ketone bodies: synthesis, utilization, and clinical significance (3 hrs)
- Biological significance of cholesterol, lipid profile, and its clinical significance (1hr)
- Disorders associated with lipid metabolism: Hyperlipidaemias and hypercholesterolemia, lipid storage diseases, atherosclerosis, fatty liver disease, and obesity (2 hrs)

UNIT IV **9 Hours**

Amino acids and protein metabolism

- 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). (3 hrs)
- 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. (4 hrs)
- Biochemical significance of neurotransmitters and hormones derived from amino acids: 5-HT (serotonin), melatonin, dopamine, noradrenaline, adrenaline (1 hr)
- Catabolism of heme and related disorders (jaundice). (1 hr)

UNIT V **7 Hours**

Nucleic acid metabolism and genetic information transfer

- 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. (3 hrs)
- (b. Genome Structure and Central Dogma: Organization of the mammalian genome. Introduction to DNA replication, Transcription, and Translation-SDL)
- Genetic Code and Regulation of Protein Synthesis: Properties of the genetic code: Inhibitors of transcription and translation (antibiotics, toxins) (2 hrs)
- DNA Repair and Related Disorders: DNA damage types, Repair mechanisms. Overview of clinical disorders associated with faulty DNA repair. (2 hrs)

ASSIGNMENTS

1. Draw the four complexes of the electron transport chain and show how electrons flow from NADH and $FADH_2$ to oxygen. Explain the chemiosmotic theory of ATP making. Calculate how many ATP molecules are made per NADH versus per $FADH_2$.
2. Make a simple table of vitamins (A, D, E, K, B1, B2, B3, B6, B12, C, folate) and minerals (iron, calcium, iodine, zinc). For each, write one function, one deficiency disease, and one food

source. Explain why fat-soluble vitamin deficiencies take months to appear. Describe the basic cause of pernicious anemia and neural tube defects.

3. List the common liver function tests and sort them into three groups: synthetic, excretory, and enzyme tests. Explain why doctors measure serum creatinine, BUN, and eGFR to check kidney function. Describe how ELISA works and give two kidney-related examples where it is used.
4. Draw a simple map showing what happens to glucose in the body: glycolysis, TCA cycle, gluconeogenesis, HMP shunt, glycogen making, and glycogen breakdown. Show where each happens and one key control point.
5. State the central dogma of biology (DNA → RNA → protein). List four properties of the genetic code. Name two drugs that block transcription and two that block translation and tell how they work. Explain base excision repair and nucleotide excision repair. Name one disease caused by faulty DNA repair.

TEXTBOOKS

1. Satyanarayana U, Chakrapani U. Biochemistry. 6th edn. Elsevier; 2021.
2. Nelson DL, Cox MM. Lehninger Principles of Biochemistry. 8th edn. W. H. Freeman and Company; New York: 2021.
3. Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of Biochemistry for Medical Students. 9th edn. Jaypee Brothers Medical Publishers (P) Ltd; New Delhi. 2019.

REFERENCE BOOKS

1. Rodwell VW, Bender DA, Botham KM, Kennelly PJ, Weil PA. Harper's Illustrated Biochemistry. 31st edn. McGraw Hill; New York: 2022.
2. Kennelly PJ, Botham KM, McGuinness OP, Rodwell VW, Weil PA. Harper's Illustrated Biochemistry. 32nd ed. New York: McGraw-Hill; 2023.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.203T	Human Anatomy, Physiology and Pathophysiology II (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
4	4	-	-	60
Max. Marks	FA			SA
100	50			50

SCOPE

The primary goal of this course is to learn how the different bodily systems work together to maintain homeostasis. By understanding the interconnected mechanisms involved in homeostasis, students can appreciate how various processes are controlled and balanced within the body. This knowledge provides the foundation necessary to comprehend pathophysiology and pharmacology, helping students develop the skills to determine various body parameters that offer insight into an individual's health status. These skills are important for healthcare professionals to diagnose, monitor, and treat patients effectively. Furthermore, a solid understanding of this subject empowers individuals to support the healthcare system and educate the public about various aspects of health.

The course also imparts basic knowledge of the physiological changes and mechanisms underlying disease processes, focusing on how normal physiological functions are disrupted or altered in various disease states. It emphasizes the mechanisms and processes involved in the development, progression, and outcomes of different diseases, covering a wide range including infectious diseases, genetic disorders, autoimmune diseases, metabolic disorders, cardiovascular diseases, and neurological disorders. The course examines the causative and risk factors that contribute to disease development, analyzing the influence of genetics, environmental elements, lifestyle decisions, infections, and other triggers in the initiation and progression of diseases. It also addresses how disease processes can lead to altered vital signs, organ dysfunction, pain, and other clinical presentations.

COURSE LEARNING OUTCOMES:

Upon successful completion of the subject, the student shall be able to

K1: Describe the physiological processes and interlinked mechanisms. (Understanding)
K2: Classify diseases of various body systems and describe their clinical manifestations. (Understanding)
S1: Distinguish normal versus abnormal tissue/organ structure and inflammatory responses. (Understanding)
S2: Apply physiological principles to compute and interpret body system functions. (Applying)
S3: Propose disorders based on pathophysiological mechanisms and differentiate structural vs. functional abnormalities. (Applying)
A1: Exhibit systematic, evidence-based reasoning by incorporating multifactorial risk factors in the analysis of disease development and progression. (Evaulation)

UNIT I: **14 Hours**

Nervous System

- Organization of nervous system: Neuron, neuroglia (1hr), classification and properties of nerve fibre, electrophysiology (1hr), action potential (1hr), nerve impulse, receptors, synapse and neurotransmitters (1hr).
- Central nervous system: Meninges (1hr), ventricles of brain and cerebrospinal fluid (1hr). Structure and functions of brain (cerebrum, brain stem and cerebellum) (2hrs), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity) (2hrs).
- Pathophysiology of epilepsy, Parkinson's disease (1hr), stroke, migraine (1hr), depression, schizophrenia (1hr), Alzheimer's disease and meningitis (1hr).

UNIT II: **12 Hours**

Gastrointestinal System

- 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) (2hrs). Anatomy and functions of small intestine and large intestine (1hr). Anatomy and functions of salivary glands (1hr), pancreas and liver (1hr). Movements of GIT, digestion and absorption of nutrients (2hrs).
- Pathophysiology of inflammatory bowel diseases (1hr), peptic ulcer (1hr), jaundice (1hr), hepatitis (1hr), typhoid (1hr).

UNIT III: **12 Hours**

Respiratory System and Urinary System

- Anatomy of respiratory system with special reference to anatomy of lungs (1hr). Mechanism of respiration and regulation of respiration (1hr). Lung volumes and capacities, transport of respiratory gases, artificial respiration and resuscitation methods (1hr).
- Pathophysiology of asthma (1hr), chronic obstructive pulmonary diseases (1hr) and tuberculosis (1hr).
- Anatomy of urinary tract with special reference to anatomy of kidney and nephrons (1hr). Functions of kidney and urinary tract (1hr). Physiology of urine formation, micturition reflex and role of kidneys in acid–base balance (1hr). Role of Renin Angiotensin Aldosterone System in kidney (1hr).
- Pathophysiology of acute and chronic renal failure (1hr) and urinary tract infections (1hr).

UNIT IV: **10 Hours**

Endocrine System

- Classification of hormones and mechanism of hormone action (0.5hr). Structure and functions of pituitary gland (1hr), thyroid gland (1hr), parathyroid gland (0.5hr), adrenal gland (0.5hr), pancreas (1hr), pineal gland (0.5hr) and thymus (0.5hr).
- Pathophysiology of diabetes (2hrs), hypothyroidism (1hr), hyperthyroidism (1hr), and goitre (1hr)

UNIT V: **12 Hours**

Reproductive System and Cancer

- Anatomy of male and female reproductive system (1hr). Functions of male and female reproductive system (1hr), sex hormones (1hr), physiology of menstruation (1hr), fertilization (1hr), spermatogenesis (1hr), oogenesis (1hr), pregnancy and parturition (1hr).
- Pathophysiology of sexually transmitted diseases: AIDS (1hr).
- Etiology and pathogenesis of cancer (3hrs)

ASSIGNMENTS

1. Pathophysiology of alcoholic and non-alcoholic liver diseases
2. Pathophysiology of polyendocrine metabolic ovarian syndrome
3. Pathophysiology of syphilis and gonorrhoea.

TEXTBOOKS:

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.

REFERENCE BOOKS:

1. Susan Standring. (Eds.). Gray's Anatomy: The Anatomical Basis of Clinical Practice.42nd edn, UK: Elsevier. London.2020.
2. Barrett KE, Barman SM, Brooks HL, Yuan JJ, (Eds.). Ganong's Review of Medical Physiology, 26th edn. McGraw Hill.2019
3. Tortora GJ, Derrickson B. Principles of anatomy & physiology. 15th edn. Inc. Hoboken, New Jersey: John Wiley & Sons.2017
4. David E. Golan, Ehrin J. Armstrong, April W. Armstrong. Principles of pharmacology: The pathophysiologic basis of drug therapy: 4th edn, Wolters Kluwer India; 2016
5. Gary D. Hammer, Stephen J. McPhee. Pathophysiology of Disease: An Introduction to Clinical Medicine, 8th edn McGraw-Hill Education, New York; 2019 .
6. Kathryn L, McCance & Sue E Huether, Pathophysiology: The Biologic Basis for Disease in Adults and Children, 8th edn, Elsevier Health Sciences; 2018.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.204T	Pharmaceutical Organic Chemistry I (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	-	-	45
Max. Marks	SE			ESE
50	20			30

SCOPE

This course provides an understanding of chemistry, preparation, properties, reactions, and mechanisms of basic organic compounds. It covers aliphatic saturated and unsaturated hydrocarbons, alkyl halides, aromatic hydrocarbons, and carbonyl compounds, along with few selected pharmaceutical applications.

The course emphasizes important organic reaction mechanisms such as free radical substitution, electrophilic addition, nucleophilic substitution, elimination, nucleophilic addition, and electrophilic aromatic substitution reactions. It also introduces the concepts of electronic effects, reactive intermediates, and IUPAC nomenclature through self-study modules to support the understanding of organic reaction pathways and molecular structure.

COURSE LEARNING OUTCOMES:

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

K1. Describe the preparation, properties, reactions, and pharmaceutical applications of aliphatic saturated and unsaturated hydrocarbons. (Understanding)

K2. Explain the mechanisms, kinetics, stereochemistry, and factors influencing nucleophilic substitution and elimination reactions of alkyl halides. (Understanding)

K3. Apply the principles of carbonyl chemistry to explain the preparation, properties, and reactions of aldehydes and ketones, including condensation, oxidation, and reduction reactions. (Applying)

K4. Analyze organic reaction pathways using concepts of electronic effects, reactive intermediates, and reaction mechanisms to predict product formation and reaction outcomes. (Analyzing)

S1. Predict the products and mechanisms of organic reactions involving hydrocarbons, alkyl halides, and carbonyl compounds by applying mechanistic principles.

S2. Differentiate and justify the reaction pathways of substitution, elimination, addition, and substitution reactions based on substrate structure, reaction conditions, and stereochemical considerations.

A1. Show initiative in applying recent advances in organic reaction mechanisms to enhance understanding of pharmaceutical sciences.

UNIT I – Introduction to Organic Chemistry **6 Hours**

- Introduction to organic chemistry (1.5 hr)
- Electron displacements in organic chemistry (such as; inductive effect, resonance, hyperconjugation). (2 hr) Reaction intermediates (such as; free radicals, carbocations, carbanions, carbenes and nitrenes). (2.5 hr)

Prerequisite Knowledge for the Course (SDL)
Self-Study Module 1: Nomenclature of Organic Compounds (IUPAC and Common Systems)

- Classification of organic compounds.
- Common and IUPAC systems of nomenclature of organic compounds, including alkanes and compounds containing complex substituents.
- IUPAC nomenclature of alkenes, alkynes, and cycloalkenes.
- IUPAC nomenclature of compounds containing alcohol, aldehyde, and ketone functional groups. IUPAC nomenclature of compounds containing terminal functional groups such as carboxylic acids, acid halides, acid amides, esters, nitriles (cyanides), amines, and ethers.
- IUPAC nomenclature of polyfunctional organic compounds containing more than one functional group.

UNIT II – Allkanes, Alkenes and Conjugated Dienes **14 Hours**

Alkanes

- General method of preparation of Alkanes, Alkenes and Conjugated dienes (1 hr)
- Sp^3 hybridization in alkenes, Sp^2hybridization in alkenes (1 hr)
- Halogenation of alkanes, Stability of alkenes, uses of paraffins (1 hr)
- E1 and E2 reaction- kinetics, order of reactivity of alkyl halides, rearrangementof carbocations. E1 vs E2 reactions, Factors affecting E1 and E2 reactions. (2 hrs)
- Ozonolysis, Saytzeffs orientation, and evidence. (1 hr)
- Electrophilic addition reaction of alkenes, Markonikoffs orientation (1 hr)
- Free radical addition of alkenes, Anti Markonikoffs orientation (1hr)
- Stability of conjugated dienes, Diel-Alder reaction (1 hr)
- Electrophilic addition, free radical addition reactions of conjugated dienes (2 hrs)
- Wurtz reaction, Coulson -motiff modification and Sache-mohr Theory (3 hrs)

UNIT III – Alkyl Halides and Alcohols 5 Hours

Alkyl Halides

- SN1 and SN2 reactions- kinetics, order of reactivity of alkyl alides, stereochemistry and rearrangement of carbocation. SN1vs SN2 reactions. (2 hrs)
- Comparison of substitution vs elimination reactions (1 Hour)

Alcohols

- Classification of alcohols, methods to prepare alcohols (oxymercuration - demercuration, reduction of carbonyl compounds) (1hr)
- Primary, secondary and tertiary alcohols Identification and Lucas Test for alcohol (1hr)

SDL: Qualitative test for alcohols, structure and pharmaceutical applications of alcohols (Glycerine, Thymol, Paracetamol)

UNIT IV – Carbonyl Compounds – Aldehydes and Ketones 10 Hours

- General method of preparation of carbonyl compounds (1 hr)
- Nucleophilic addition reactions (1 Hours)
- Aldol condensation and crossed aldol condensation (1.5 Hour)
- Cannizzaro and crossed Cannizzaro reactions (1.5 Hour)
- Benzoin and Perkin condensation (2 Hour)
- Oxidation and reduction reaction (2 hrs)
- Structure and use of Formaldehyde, paraldehyde,acetone, chloral hydrates, hexamine, benzaldehyde, vaniline, cinnamaldehyde and krtoprofen (1 hrs)

UNIT V – Chemistry of Carboxylic acids and Amines 10 Hours

Aliphatic carboxylic acids and Aromatic Carboxylic acids

- Methods to prepare carboxylic acids (1hr)
- Study of acidity of carboxylic acids and effect of substituents on acidity (1 hr)
- Study of chemical reactions of carboxylic acids [Mechanism of nucleophilic acyl substitution, Decarboxylation and Hell-Volhard Zelinsky reaction]. (2 hr)

Aliphatic amines

- Methods to prepare amines (1 hr)
- Reduction of nitro compound, reduction of nitriles and Hofmann degradation of amides (1 hr)
- Study of basicity of amines and effect of substituents on basicity (1 hrs)
- Principle of diazotization and its synthetic application (2 hrs)
- Aromatic amine preparation (1 hr)

ASSIGNMENTS

I. Analyze and Apply IUPAC Nomenclature Principles for Systematic Naming of Organic Compounds Containing Terminal and Multiple Functional Groups

II. Compare and evaluate carbocations, carbanions, free radicals, carbenes, and nitrenes with respect to their structure, hybridization, geometry, electronic configuration, and typical reactivity patterns. Present your answer in a comparative table.

III. Pharmaceutical applications of carboxylic acids (Benzoic acid, Salicylic acid, Acetyl Salicylic acid)

IV. Analyze, Evaluate, and Predict the Influence of Electronic Displacement Effects on the Stability and Reactivity of Organic Molecules

   a. Analyze the relative stability of the following species based on inductive and resonance effects. Justify your answer with suitable structures and explanations.

      i. $CH_3CH_2^+$, $(CH_3)_2CH^+$, $(CH_3)_3C^+$

      ii. CH_3COO^- and $CH_3CH_2O^-$

TEXTBOOKS:

1. Morrison RT, Boyd RN, Bhattacharjee SK. *Organic Chemistry*. Pearson Education India.
2. Finar IL. *Organic Chemistry, Volume I*. Pearson Education.
3. Bahl BS, Bahl A. *Textbook of Organic Chemistry*. S. Chand & Company.
4. Furniss BS, Hannaford AJ, Smith PWG, Tatchell AR. *Vogel's Textbook of Practical Organic Chemistry*. Pearson Education.

REFERENCE BOOKS:

1. Clayden J, Greeves N.& Warren S. Organic Chemistry. 2nd edn. Oxford University press; United Kingdom: 2014
2. March J. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure. Wiley.
3. Carey FA, Sundberg RJ. Advanced Organic Chemistry: Structure and Mechanisms. Springer.
4. Pavia, D. L., Lampman, G. M., Kriz, G. S. and Engel, R. Introduction to Organic Laboratory Techniques. Cengage Learning

**Latest edition of the text books & reference books can be referreds*

Course code	Course title			Course type
BP.205T	Pharmacognosy and Phytochemistry (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
3	3	-	-	45
Max. Marks	FA			SA
100	50			50

SCOPE:

This course provides a comprehensive understanding of the chemistry, biosynthesis, extraction, isolation, identification, characterization, and evaluation of bioactive constituents from natural sources. It covers the study of primary and secondary metabolites, their biological significance, and their roles in therapeutic applications. Students will gain knowledge of the pharmacognostic evaluation of crude drugs, conventional and modern extraction methods, advanced analytical techniques, and recent developments in natural product research. The knowledge and skills acquired through this course will enable students to contribute to herbal drug research and the development of nutraceuticals, cosmeceuticals, phytopharmaceuticals, quality assurance systems, and the evidence-based validation of traditional medicines.

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the students will be able to:
K1: Describe biosynthetic pathways and genetic tools involved in phytoconstituent Production.
K2: Classify crude drugs based on their chemical constituents.
K3: Explain the source and therapeutic application of drugs containing primary and secondary metabolites.
K4: Explain qualitative and quantitative analysis of plant metabolites.
K5: Evaluate identity, purity, and quality of herbal raw materials.
S1: Apply traditional and modern techniques for the extraction and isolation of phytoconstituents.
A1: Update with recent advancements in the subject area.

COURSE CONTENTS

UNIT I **10 Hours**

Metabolic Pathways and Biogenetic Studies

Brief study of basic metabolic pathways and biosynthesis of secondary metabolites including:

• Shikimic acid pathway (1 hr)

• Acetate pathway (2 hr)

• Amino acid pathways (1 hr)

Utilization of radioactive isotopes in biogenetic studies. (3 hr)

Introduction to pathway prediction tools and modern genetic tools such as CRISPR/Cas9 (3hr)

UNIT II **12 Hours**

- **Secondary Metabolites**
- **General classification and identification tests**
- **Pharmacognostic study: B**iological source, distribution, (Cultivation and identifying characters of underlined drugs) chemical constituents, specific tests, therapeutic uses, and commercial applications of:
- **Alkaloids:** Vinca, Rauwolfia, Opium (2 hr)
- **Volatile Oils:** Lemongrass, Clove, Cinnamon, Fennel (2 hr)
- **Tannins:** Myrobalans, Catechu, Pomegranate (1 hr)
- **Resins:** Guggul, Asafoetida (1 hr)
- **Glycosides:**Senna, Liquorice, Digitalis(2 hr)
- **Phenylpropanoids and Flavonoids:** Green Tea, Ginkgo, Flax seed (2 hr)
- **Iridoids, Other Terpenoids and Naphthoquinones:** Gentian, Artemisia (2 hr)

UNIT III **08 Hours**

- **Extraction Methods for Medicinal Plants**
- **Conventional Methods of Extraction:** Infusion, Decoction, Digestion, Maceration, Percolation (2 hr), Reflux Distillation, Soxhlet extraction, Successive solvent extraction (2 hr)
- **Modern Methods of Extraction:** Supercritical fluid extraction, Microwave-assisted extraction, Ultrasonic-assisted extraction (2 hr), Enzyme-assisted extraction, Pressurized liquid extraction (2 hr).

UNIT IV **10 hours**

- **Overview of Isolation, Identification and Characterization Techniques**
- **Separation and Isolation Techniques:** Planar chromatography, Column chromatography, Preparative TLC, Flash chromatography (3 hr)
- **Identification Techniques:** Phytochemical tests, Chromatographic techniques (3 hr)
- Fingerprinting of medicinal plants using TLC/HPTLC. (1 hr)
- **Types and significance of markers (phytochemical reference standards).**
- Screening and analysis of major metabolites: Alkaloids, Glycosides, Saponins, Tannins, Resins, Flavonoids, Phenolics, Steroids (3 hr)

UNIT V **05 Hours**

- **Isolation, Characterization, Commercial Production and analysis of bioactive phytoconstituents**
- Isolation, characterization with commercial production, identification and analysis of bioactive phytoconstituents: Artemisinin, Sennosides, Withanolids, Boswellic acid, Atropine,and Lycopene. (3 hr)
- Commercial production and standardization of volatile oils: Eucalyptus oils, Lavender oil and Peppermint oil, Rosemary oil (2 hr)

ASSIGNMENT:

- Describe the Cultivation of Opium, Clove, Cinnamon, Senna, Liquorice, and Digitalis.
- Compare the identifying characters (macroscopic/microscopic) of
    - Clove and Cinnamon
    - Senna, and Digitalis
    - Liquorice and Fennel
- Critically compare the following conventional extraction methods, justify their use in crude drug extraction, state their advantages and limitations

  Infusion, Decoction, Digestion, Maceration, Percolation

TEXTBOOKS

1. Evans WC. Trease and Evans Pharmacognosy. 16th edn. W.B. Sounders & Co.; London: 2009.
2. Dewick, P.M., *Medicinal Natural Products: A Biosynthetic Approach*. John Wiley & Sons
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 Plant Analysis. Chapman & Hall.
5. Agrawal SS, Paridhavi M. Herbal drug technology. 2nd edn. Universities Press; Hyderabad: 2007.

REFERENCE BOOKS

1. Wallis, T. E. *Textbook of Pharmacognosy.* CBS Publishers & Distributors, New Delhi.
2. Tyler, V. E., Brady, L. R. and Robbers, J. E. *Pharmacognosy.* Lea & Febiger
3. Mukherjee PK. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. 1st edn. Business Horizons Publishers; New Delhi: 2002.
4. Kokate CK, Purohit AP, Gokhlae SB. Text book of Pharmacognosy. 37th edn. NiraliPrakashan; New Delhi: 2007.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.206T	Physical Pharmaceutics (Theory)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
3	3	-	-	45
Max. Marks	FA			SA
100	50			50

SCOPE:

The course provides a comprehensive understanding of physicochemical principles and pharmaceutical processes essential for dosage form design and drug manufacturing. It emphasizes key concepts such as solubility, dissolution, interfacial phenomena, rheology, micromeritics, reaction kinetics, and stabilization techniques that are critical for formulation development, process optimization, quality control, and shelf-life determination of pharmaceutical products.

The course also covers the pharmaceutical applications of surfactants, buffers, complexes, colloidal systems, and coarse dispersions, including suspensions and emulsions, with special focus on their formulation and stabilization. Students gain knowledge of powder and dispersion properties, flow behavior, and protective approaches used to enhance the stability and performance of pharmaceutical products.

Laboratory sessions provide hands-on training in experiments related to solubility, partition coefficient, surface tension, viscosity, zeta potential, adsorption, complexation, and expiry date determination. Through practical work, group discussions, individual assignments, and problem-solving activities, students are encouraged to develop analytical thinking, self-confidence, teamwork, professionalism, and adherence to good laboratory practices.

COURSE LEARNING OUTCOMES:

Upon successful completion of the course, student shall be able to

K1: Describe the fundamental concepts of solubility, buffers, interfacial phenomena, adsorption, complexation, protein binding, micromeritics, and rheology.

K2: Explain the principles and characteristics of colloidal systems, coarse dispersions, emulsions, suspensions, and pharmaceutical stability.

K3: Apply physicochemical principles, including partition coefficient, surface tension, particle size analysis, and reaction kinetics, in pharmaceutical formulation development.

K4: Analyze factors affecting drug stability, sedimentation, emulsification, flow behavior, and the performance of pharmaceutical dosage forms.

K5: Evaluate pharmaceutical systems and formulation variables using principles of reaction kinetics, rheology, and dispersion stability.

S1: Utilize concepts of solubility, rheology, interfacial phenomena, and micromeritics in the design and optimization of pharmaceutical formulations.

S2: Evaluate pharmaceutical systems and recommend strategies to improve the stability, flow behaviour, and performance of dosage forms.

A1: Justify the choice of suitable approaches for improving the stability, flow properties, and performance of pharmaceutical systems.

COURSE CONTENTS

UNIT I **7 Hours**

- Solubility distribution phenomenon & buffers Solubility expression: Solute solvent interactions, Solubility of liquid and liquids, Solubility of solids and liquids, Solubility of Gas in Liquids, (1hr)
- Raoult's Law. Factors affecting solubility (1hr),
- Measurement of saturation Solubility, Effect of pH on solubility (1hr),
- Partition Coefficient – Measurement and significance, Critical Solution Temperature and Applications (1hr).
- Buffers in biological system (1hr),
- pH determination methods (Electrometry and colorimetry). / Factor influencing the pH of buffer solutions (1hr),
- Factor influencing Buffer capacity, Indicators (1hr).

UNIT II **5 Hours**

- Interfacial phenomenon Liquid interface: Surface and interfacial tension, surface free energy, Measurement of surface and interfacial tension (1hr),
- Spreading coefficient, surface active agent, HLB (1hr),
- detergency, types of monolayers at liquid surface (1hr).
- Adsorption at solid interface, Liquid Interface (contact angle, activated charcoal and Wetting) (1hr).
- Adsorption of surface-active agents. Electric properties of interface / Electric double layer, Nernst and zeta potential effect of electrolytes (1hr)

UNIT III **10 Hours**

- Colloidal and Coarse Dispersion Colloidal dispersions: Types of colloidal dispersions (Lyophobic, Lyophilic, Association colloids)(1hr)
- Optical properties of colloids, Kinetic properties of colloids (2hr)
- Electrical properties of colloids, Size and shape of colloidal systems (1hr)
- Stability of colloidal system (peptization and protective action) (1hr)
- Application of Colloidal System (1hr)

- Coarse Dispersions: Suspensions, stokes law (Theory of sedimentation), Effect of Brownian movement / Sedimentation of flocculated particles, sedimentation parameters (1hr)
- Flocculation and controlled structure flocculation (1hr). Theories of emulsification and stabilizaition (DLVO Theory), Monomolecular adsorption, Multimolecular adsorption, Film formation, Solid particle adsorption) (2hr)

UNIT IV **6 Hours**

- Rheological studies Newtonian systems and non-Newtonian systems (1hr)
- Thixotropy – measurement / Bulges and spurs Negative thixotropy (1hr)
- Determination of rheological properties (Viscometers / single and multi-point) (2hr)
- Viscoelasticity, psycho-rheology (1hr)
- Applications of rheology in pharma (1hr)

UNIT V **6 Hours**

- Micromeritics Particle size and size distribution, Particle Shape and Surface area: Methods for determination and significance (2hr)
- Flow properties of powders: determination, significance and methods of enhancement (2hr)
- Advanced flow properties of powers (Powder flow tester) (2hr)

UNIT VI **4 Hours**

- **Complexation and protein binding:** Introduction, Classification of complexation (1hr),
- Applications, methods of analysis (2hr),
- protein binding, complexation and drug action,(1hr)

UNIT-VII **7 Hours**

- **Drug stability:** Reaction kinetics: zero, pseudo-zero, first & second order, units of basic
- rate constants, (2hr)
- determination of reaction order. (1hr)
- Physical and chemical factors influencing the chemical degradation of pharmaceutical products: temperature, solvent, ionic strength, dielectric constant, specific & general acid-base catalysis (2hr)
- and Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. (1hr)
- Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention (1hr)

ASSIGNMENTS:

1. Analyze solubility optimization approaches and suitable buffer systems for pharmaceutical drug formulations.

2. Evaluate the role of interfacial phenomena in the development, stability, and performance of pharmaceutical formulations.

3. Design and justify strategies to prevent hydrolytic, oxidative, and photolytic degradation of pharmaceutical products.

4. Analyze the types of pharmaceutical complexation, analytical methods used for their characterization, and their applications in drug delivery.

5. Assess the importance of powder flow properties in pharmaceutical manufacturing and evaluate the methods used to determine and enhance powder flow.

6. Evaluate the working principles, applications, advantages, and limitations of single-point and multi-point rheometers (viscometers) used for the determination of rheological properties of pharmaceutical systems.

7. Analyze the effects of temperature, solvent, ionic strength, dielectric constant, and acid–base catalysis on the stability of pharmaceutical products.

TEXTBOOKS:

1. Martin A, Bustamante P, Chun AHC. Physical Pharmacy, Physical Chemical Principles in Pharmaceutical Sciences. 4th edn, Lippincott Williams and Wilkins, Philadelphia, 2001.
2. Sateesha SB & Rajamma AJ. Physical Pharmaceutics Principles of Formulation: Buy Physical Pharmaceutics Principles of Formulation, 1st edn, EMMESS Medical publishers, Bangalore, 2020.
3. Subrahmanium CVS. Physical Pharmaceutics. 2nd edn, Vallabh Prakashan, Delhi, 2000.

REFERENCES BOOKS:

1. Remington: The Science and Practice of Pharmacy. 23rd edn, Elsevier, 2020.
2. Subramanyam CVS,Settee JT. Laboratory Manual of Physical Pharmaceutics.Vallabh Publication. 2014
3. Myers, D., Surfaces, Interfaces, and Colloids: Principles and Applications, Wiley-VCH.
4. Ladisch, M.R., Rheology of Fluid and Semisolid Foods: Principles and Applications, Springer.
5. Aulton, M.E. and Taylor, K.M.G. (Eds.), Aulton's Pharmaceutics: The Design and Manufacture of Medicines, Elsevier.

**Latest edition of the text books & reference books can be referred*

Course code	Course title			Course type
BP.207P	Biochemistry (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	2	-	-	30
Max. Marks	FA			SA
100	50			50

SCOPE

The scope of this practical course covers the qualitative and quantitative biochemical analysis of biologically relevant molecules. It includes identification tests for proteins (albumin, casein) and carbohydrates (glucose, fructose, lactose, sucrose, starch); urine analysis for normal and abnormal constituents; estimation of blood glucose, total and HDL cholesterol, urea, creatinine, uric acid, serum total protein and albumin, hemoglobin (Sahli's or cyanmethemoglobin method), glycogen content, and serum bilirubin (total and direct); as well as enzyme kinetic studies including the enzymatic hydrolysis of starch and the effects of temperature and substrate concentration on salivary amylase activity, along with estimation of serum enzymes SGOT and SGPT. Collectively, these experiments equip students with fundamental analytical skills for clinical biochemistry and diagnostic laboratory testing.

COURSE LEARNING OUTCOMES

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

K1: Explain the principle, procedure, and clinical significance of qualitative tests for proteins and carbohydrates, urine analysis, quantitative estimations (glucose, cholesterol, bilirubin, etc.), and enzyme kinetics studies.

S1: Apply qualitative chemical tests to identify proteins and differentiate carbohydrates as well as to detect normal and abnormal constituents in urine samples.

S2: Perform quantitative colorimetric estimations of blood glucose, total cholesterol, HDL cholesterol, serum total protein, albumin, haemoglobin and serum bilirubin.

S3: Calculate the concentration of various biomolecules from standard curves or formula-based calculations, and compare the obtained values with normal reference ranges.

A1: Commitment to evidence-based reasoning when interpreting biochemical test results and correlating them with metabolic disorders.

A2: Demonstrate proper handling of biological samples (blood, urine, serum) and maintain hygiene in the clinical biochemistry laboratory setting.

LIST OF PRACTICAL EXPERIMENTS (Any 12)

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. Estimation of blood glucose.
5. Estimation of total cholesterol and HDL cholesterol.
6. Estimation of urea, creatinine, and uric acid in serum.
7. Estimation of serum total protein and albumin.
8. Study of enzymatic hydrolysis of starch.
9. Study of the effect of temperature on salivary amylase activity.
10. Estimation of haemoglobin in blood by Sahli's method / Cyanmethemoglobin method.
11. Estimation of serum bilirubin (total and direct bilirubin).
12. Estimation of SGOT and SGPT

TEXTBOOKS

1. Satyanarayana U, Chakrapani U. *Biochemistry*. 6th edn. Elsevier; 2021.
2. Nelson DL, Cox MM. *Lehninger Principles of Biochemistry*. 8th edn. W. H. Freeman and Company; New York: 2021.
3. Vasudevan DM, Sreekumari S, Vaidyanathan K. *Textbook of Biochemistry for Medical Students*. 9th edn. Jaypee Brothers Medical Publishers (P) Ltd; New Delhi. 2019.
4. Pattabhiraman TN. *Laboratory Manual & Practical Biochemistry*. 4th edn. All India Publishers & Distributors India; 2015.

REFERENCE BOOKS

1. Rodwell VW, Bender DA, Botham KM, Kennelly PJ, Weil PA. *Harper's Illustrated Biochemistry*. 31st edn. McGraw Hill; New York: 2022.
2. Kennelly PJ, Botham KM, McGuinness OP, Rodwell VW, Weil PA. *Harper's Illustrated Biochemistry*. 32nd ed. New York: McGraw-Hill; 2023.

**Latest edition of the text books & reference books can be referred.*

Course Code	Course Title			Course Type
BP.208P	Human Anatomy, Physiology & Pathophysiology II Practical			Core
Credit	Hours per Week			Max. Hours
	L	T	P	
1	-	-	2	30
Max. Marks	FA			SA
100	50			50

SCOPE

The course focuses on developing hands-on skills to measure, observe, and interpret physiological and pathological changes, including accurate measurement of blood parameters, vital signs, and basic body parameters to correlate deviations with homeostatic imbalance and disease states; performing functional assays such as spirometry, electrocardiography, reflex testing, and urinalysis to assess organ system performance; identifying normal anatomical structures and tissues via models, charts, and slides while comparing them with common pathological specimens; conducting simulated or case-based physiological challenges (exercise, posture changes, and thermal stress) to observe homeostatic regulation like baroreflex and thermoregulation; interpreting clinical data from lab results, imaging, and case scenarios to link disrupted physiology with underlying disease mechanisms; and ethical handling of biological samples.

COURSE LEARNING OUTCOMES:

Upon successful completion of the subject, the student shall be able to

K1: Explain principles and procedures associated with various experiments.

K2: Describe various abnormalities associated with basic body parameters.

K3: Discuss the etiology and pathogenesis of selected disease states, linking structural and functional changes to clinical manifestations.

S1: Identify the various human organs and bones.

S2: Evaluate vital signs and basic body parameters

A1: Demonstrate proper equipment handling and hygiene in the laboratory setting.

LIST OF PRACTICALS

1. Identification of axial bones. and appendicular bones
2. Enumeration and interpretation of white blood cell (WBC) count
3. Enumeration and interpretation of total red blood corpuscle (RBC) count
4. Determination of bleeding time and clotting time

5. Estimation and interpretation of hemoglobin content.
6. Determination of blood group.
7. Determination of pulse rate, heart rate, and blood pressure.
8. Recording and interpretation of ECG.
9. Demonstration of visual acuity.
10. Recording of body temperature.
11. Determination of tidal volume and vital capacity.
12. Recording of body mass index (BMI).
13. Determination and interpretation of random blood glucose levels using a OneTouch glucometer.
14. Determination and interpretation of blood oxygen level using a pulse oximeter and the need for oxygen therapy.
15. Study of family planning devices and pregnancy diagnosis tests.
16. Hands-on training in cardiopulmonary resuscitation (CPR).
17. Case studies/files of patients with anemia, thalassemia, hemophilia, leprosy, gout, hypertension, ischemic heart disease, IBD, peptic ulcer, jaundice, hepatitis, typhoid, asthma, tuberculosis, diabetes, and thyroid disorders.

Course code	Course title			Course type
BP.209P	Pharmaceutical Organic Chemistry (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	3	-	-	45
Max. Marks	FA			SA
100	50			50

SCOPE:

This course provides practical training in the identification, characterization, and purification of organic compounds relevant to pharmaceutical sciences. It focuses on the systematic qualitative analysis of unknown organic compounds through preliminary tests, elemental analysis, functional group identification, and confirmation by derivative preparation and physical constant determination. The course helps students develop a three-dimensional understanding of molecular structure, chemical bonding, and stereochemical relationships through molecular model building exercises. The course provides hands-on training in the purification of organic compounds through crystallization techniques. The knowledge and laboratory skills acquired through this course provide a foundation for further studies in medicinal chemistry, pharmaceutical organic chemistry, drug synthesis, heterocyclic chemistry, and pharmaceutical analysis.

COURSE LEARNING OUTCOMES

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

K1. Explain the principles and procedures involved in the qualitative analysis and identification of organic compounds. (Understanding)

K2. Describe the methods used for elemental detection, functional group analysis, derivative preparation, and purification of organic compounds. (Understanding)

S1. Perform systematic qualitative analysis of unknown organic compounds using preliminary tests, elemental analysis, and functional group identification.

S2. Prepare suitable derivatives and determine melting point or boiling point for the confirmation of organic compounds.

S3. Synthesize simple organic compounds and their derivatives using standard laboratory methods.

A1. Maintain accurate observations and systematic records during the analysis and identification of organic compounds.

A2. Adhere to laboratory safety guidelines, good laboratory practices (GLP), and ethical standards while performing organic chemistry experiments.

A3. Justify the selection of appropriate analytical tests and purification methods for the identification and characterization of organic compounds.

LIST OF EXPERIMENTS

(Minimum 12 experiments must be performed)

1. Systematic Qualitative Analysis of a Minimum of Five Water-Insoluble or Water-Immiscible Unknown Organic Compounds from Different Chemical Classes

a. **Preliminary Tests**

- Colour
- Odour
- Solubility tests
- Tests for aromaticity
- Tests for saturation/unsaturation
- Other relevant preliminary examinations

b. **Detection of Elements**

- Nitrogen
- Sulphur
- Halogens

Using **Lassaigne's Test**

c. **Functional Group Analysis**

- Phenols
- Amides
- Amines
- Carboxylic acids
- Aldehydes and ketones
- Alcohols
- Esters
- Aromatic hydrocarbons
- Halogenated hydrocarbons
- Nitro compounds

d. **Preparation and Confirmation of Unknown Compound**

- Preparation of suitable derivatives
- Identification by melting point determination

- Identification by boiling point determination

2. Building Molecular Models

- Construction of molecular structures using ball-and-stick models
- Understanding molecular geometry
- Understanding chemical bonding
- Understanding stereochemistry

3. Crystallization Method

- Purification of three organic compounds using crystallization techniques
- Evaluation of purity of the purified compounds

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Clayden J, Greeves N.& Warren S. Organic Chemistry. 2nd edn. Oxford University press; United Kingdom: 2014
2. March J. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure. Wiley.
3. Carey FA, Sundberg RJ. Advanced Organic Chemistry: Structure and Mechanisms. Springer.
4. Pavia, D. L., Lampman, G. M., Kriz, G. S. and Engel, R. Introduction to Organic Laboratory Techniques. Cengage Learning

**Latest edition of the text books & reference books can be referred*

Course code	Course title			Course type
BP.210P	Pharmacognosy and Phytochemistry (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
1.5	-	-	3	45
Max. Marks	FA			SA
100	50			50

SCOPE

This course covers the fundamental aspects of crude drug evaluation, including chemical identification of unorganized drugs and microscopic evaluation of organized crude drugs. The course also emphasizes the application of suitable extraction techniques and the isolation of key phytoconstituents and volatile oils using standard procedures. Learners will develop skills to evaluate herbal raw materials from field or market sources against official pharmacopoeial standards. Overall, the course provides practical competency in the quality control, standardization, and authentication of crude drugs of plant origin.

COURSE LEARNING OUTCOMES

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

K1: Describe the identifying characteristics and specific chemical tests of crude drugs

S1: Identify unorganized crude drugs using specific chemical tests

S2: Analyze organized crude drugs through microscopy and powder analysis.

S3: Perform appropriate extraction methods for herbal drugs.

S4: Isolate and characterize phytoconstituents using laboratory techniques and TLC.

S5: Assess and compare the quality and purity of herbal raw materials with official Standards.

A1: Record the results accurately and honestly, without fabricating data.

A2: Demonstrate commitment to safety by correctly handling organic solvents, wearing gloves during all chemical tests, and disposing of chemical waste in designated containers.

LIST OF PRACTICAL EXPERIMENTS

(Minimum 12 must be performed)

1. Transverse section and powder microscopy of a cinnamon bark.
2. Transverse section and powder microscopy of a fennel fruit.
3. Transverse section and powder microscopy of a clove flower bud.
4. Study of effect on different extraction techniques on yield of crude extract (maceration, decoction, soxhlation).

5. Isolation of volatile oil and its TLC.
6. Isolation of caffeine from tea.
7. Isolation of Hesperidin from lemon peel.
8. Isolation of Glycyrhizin from liquorice roots.
9. Isolation of Pectin from orange peel.
10. Separation of amino acid by paper chromatography
11. Preparative TLC of curcuminoids.
12. Isolation and identification of Piperine.
13. Isolation and identification of Lycopene.
14. Experiential learning based experiment involving evaluation and comparison of field/market collected herbal raw materials with Pharmacopoeial standards.

TEXTBOOKS

1. Wagner H, Bladt S. Plant drug analysis: A thin layer chromatography atlas. 2nd ed. Berlin: Springer-Verlag; 1996.
2. Mukherjee PK. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. 1st edn. Business Horizons Publishers; New Delhi: 2002.
3. Iyengar MA, Nayak SGK. Anatomy of Crude Drugs. 12th edn. PharmaMed Press; Hyderabad:2011. (Practical)
4. Iyengar MA, Pharmacognosy of Powdered Crude Drugs, 10th edn. PharmaMed Press; Hyderabad: 2000.

REFERENCE BOOKS

1. Harborne, J.B., Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Chapman & Hall.
2. Wallis, T. E. *Textbook of Pharmacognosy.* CBS Publishers & Distributors, New Delhi.
3. Tyler, V. E., Brady, L. R. and Robbers, J. E. *Pharmacognosy.* Lea & Febiger.

**Latest edition of the text books & reference books can be referred.*

Course code	Course title			Course type
BP.211P	Physical Pharmaceutics (Practical)			Core
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	-	-	2	30
Max. Marks	FA			SA
100	50			50

SCOPE:

This practical course is designed to provide students with a comprehensive understanding of the physicochemical principles underlying pharmaceutical formulations and drug delivery systems. The course offers hands-on training in the measurement and evaluation of important physical properties of pharmaceutical materials, including surface and interfacial phenomena, rheological behavior, micromeritic characteristics, solubility, partitioning, adsorption, and buffer systems.

Students will gain practical experience in determining surface tension, critical micellar concentration, viscosity, hydrophilic-lipophilic balance (HLB), isotonicity, particle size distribution, powder flow properties, density, and porosity. The course also enables students to study drug solubility in different pH environments, evaluate drug partitioning between immiscible solvents, investigate phase behavior in binary liquid systems, and assess adsorption characteristics of pharmaceutical adsorbents. Furthermore, students will learn to determine buffer capacity and pKa values, which are essential for the design of stable and effective pharmaceutical formulations.

Through these experiments, students will develop laboratory skills, data analysis capabilities, and a scientific understanding of how physicochemical properties influence formulation development, manufacturing processes, product performance, and quality control. The knowledge gained will serve as a foundation for advanced studies in pharmaceutics, formulation research, and pharmaceutical product development.

COURSE LEARNING OUTCOMES

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

K1: Demonstrate knowledge of the physicochemical principles, calculations, and experimental methods used for the characterization of pharmaceutical systems, including surface and interfacial properties, rheology, isotonicity, particle size analysis, powder properties, solubility, partitioning, adsorption, and buffer systems. (Apply)

S1: Evaluate the surface and interfacial properties of pharmaceutical systems, including surface tension, critical micellar concentration, and hydrophilic-lipophilic balance (HLB), using appropriate experimental methods.(Evaluate)

S2: Analyze the rheological and micromeritic properties of pharmaceutical materials, including viscosity, particle size distribution, density, porosity, and powder flow characteristics.(Analyze)

S3: Perform physicochemical studies to determine drug solubility, partition coefficient, and phase behavior in different solvent and buffer systems.(Analyse)

S4: Calculate the pharmaceutical parameters such as isotonicity, buffer capacity, and pKa using experimental data and pharmaceutical calculations. (Evaluate)

A1: Exhibit strict adherence to laboratory safety protocols and standard operating procedures during physical pharmaceutics experiments.

A2: Demonstrate accuracy, honesty, and responsibility in performing experiments, recording observations, and reporting results.

LIST OF EXPERIMENTS

1. Determination of Critical Micelle Concentration (CMC) of Surfactants by Surface Tension Measurements
2. Determination of viscosity of liquids using Ostwald's viscometer and Brookfield viscometer.
3. Determination of HLB value of a surfactant.
4. Calculation of isotonicity by different methods (Sodium Chloride Equivalent Method).
5. Determination of densities and derived properties of powders (angle of repose, bulk density, tapped density, Hausner ratio, Carr's compressibility index), true density, and porosity.
6. Determination of solubility of a drug at different pH/buffer systems at room temperature.
7. Determination of partition coefficient of a drug in benzene and water system.
8. Determination of critical solution temperature and composition of phenol–water system.
9. Determination of specific surface area of charcoal by adsorption of acetic acid on activated charcoal.
10. Determination of buffer capacity at various stages of titration of a weak acid against a strong base and determination of pKa.
11. Establish the shelf life of pharmaceuticals by accelerated stability studies.

TEXT BOOKS:

1. Martin A, Bustamante P, Chun AHC. Physical Pharmacy, Physical Chemical Principles in Pharmaceutical Sciences. 4th edn, Lippincott Williams and Wilkins, Philadelphia, 2001.
2. Sateesha SB & Rajamma AJ. Physical Pharmaceutics Principles of Formulation: Buy Physical Pharmaceutics Principles of Formulation, 1st edn, EMMESS Medical publishers, Bangalore, 2020.
3. Subramanyam CVS, Settee JT. Laboratory Manual of Physical Pharmaceutics. Vallabh Publication. 2014.

REFERENCE

1. Sinko, P. J. Martin's Physical Pharmacy and Pharmaceutical Sciences. Lippincott Williams & Wilkins.
2. Aulton, M. E. and Taylor, K. M. G. Aulton's Pharmaceutics: The Design and Manufacture of Medicines. Elsevier.
3. Lachman, L., Lieberman, H. A. and Kanig, J. L. The Theory and Practice of Industrial Pharmacy. CBS Publishers & Distributors.
4. Allen, L. V., Popovich, N. G. and Ansel, H. C. Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems. Lippincott Williams & Wilkins.
5. Cooper, S. J. and Gunn, C. Cooper and Gunn's Tutorial Pharmacy. CBS Publishers & Distributors

**Latest edition of reference books can be referred.*

Course code	Course title			Course type
BP.212P SEC1	Communication Skills (Practical)			Elective
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
1	-	-	2	30
Max. Marks	FA			SA
50	25			25

SCOPE:

To develop effective verbal, non-verbal, written, interpersonal, and digital communication skills essential for academic, professional, and pharmacy practice settings. The course emphasizes patient counselling, professional communication, ethical and responsible communication practices, and effective interaction with patients, healthcare professionals, and the community. It also focuses on presentation skills, group communication, professional documentation, and the appropriate use of digital communication tools. Through practical and experiential learning activities, the course aims to enhance confidence, professionalism, teamwork, and communication competence required for successful pharmacy practice and lifelong professional development.

COURSE LEARNING OUTCOMES:

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

K1. Explain the principles, processes, and significance of effective verbal, non-verbal, written, and digital communication in pharmacy practice.

K2. Discuss barriers to communication, patient-centred communication, interprofessional communication, and the ethical aspects of professional healthcare communication

S1. Demonstrate effective verbal, non-verbal, interpersonal, and patient-centred communication skills in academic, professional, and healthcare settings.

S2. Prepare and deliver professional communications, including presentations, interviews, group discussions, emails, reports, patient information materials, and healthcare documentation.

S3. Apply digital communication tools and interprofessional communication strategies appropriately to support professional and healthcare-related communication.

A1. Appreciate the importance of effective, ethical, and patient-centred communication in promoting professional practice, patient care, and positive healthcare outcomes.

A2. Demonstrate professionalism, empathy, respect, cultural sensitivity, confidence, teamwork, responsibility, and a commitment to continuous improvement in communication practices.

LIST OF PRACTICAL /ACTIVITY

1. Introduction to Communication Skills in Pharmacy Practice – Verbal and Non-verbal Communication Activities
2. Listening Skills, Interpersonal Communication, and Empathetic Communication Exercises
3. Patient Counselling for Prescription and Non-prescription Medications – Role Plays
4. Communication with Special Populations and Handling Difficult/Angry Patients – Simulation Activities
5. Interprofessional Communication with Healthcare Professionals and SBAR-based Communication Activities
6. Professional Written Communication – E-mails, Reports, Applications, and Documentation Exercises
7. Preparation of Patient Information Leaflets, Drug Labels, Medication Instructions, and Health Awareness Materials
8. Presentation Skills – Planning, Structuring, Delivery Techniques, and Evaluation
9. Interview Skills, Self-introduction, and Mock Interview Sessions
10. Group Discussion, Team Communication, and Leadership Activities
11. Digital and Professional Communication Etiquette, Telecommunication, and Social Media Awareness in Healthcare Practice

TEXTBOOKS:

1. Dr. Pragi Arora, Dr. Varun Arora, Dr. Jagdeep Singh Dua, Davinder Kumar**.** Communication Skills (For B.Pharmacy 1st Semester as per syllabus issued by Pharmacy Council of India, New Delhi), PV Books, Punjab, 2017.
2. Sanjay Kumar, Pushpalata. Communication skills, 2nd Edition, Oxford University Press, New Delhi, 2015.
3. Gopala Swamy Ramesh, Mahadevan Ramesh. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, 5th Edition, Pearson, 2013.

REFERENCE BOOKS:

1. Kelly, W. J., and Svarstad, B. L. Communication Skills in Pharmacy Practice: A Practical Guide for Students and Practitioners. 7th Edition, Wolters Kluwer Health, Philadelphia.
2. Langford, C. Developing Communication Skills for Pharmacy. Pharmaceutical Press, London.
3. Beardsley, R. S., Kimberlin, C. L., and Tindall, W. N. Communication Skills in Pharmacy Practice. 6th Edition, Lippincott Williams & Wilkins.
4. Raman, M., and Sharma, S. Technical Communication: Principles and Practice. Oxford University Press, New Delhi.
5. Wallace, H., Masters, D., and others. Personal Development for Life and Work. Cengage Learning India Pvt. Ltd.

6. World Health Organization (WHO). Guidelines on Patient Counselling and Effective Healthcare Communication. Geneva.
7. Basic Communication Skills for Technology and Pharmacy Students. Universities Press (India) Pvt. Ltd.
8. Singh, U. Communication Skills for Professionals. CBS Publishers and Distributors Pvt. Ltd., New Delhi.
9. Organizational Behaviour, Stephen .P. Robbins, 1st Edition, Pearson, 2013.
10. Andreja. J. Ruther Ford. Basic communication skills for Technology, 2nd Edition, Pearson Education, 2011.
11. Gill Hasson. Brilliant- Communication skills, 1st Edition, Pearson Life, 2011.
12. Deborah Dalley, Lois Burton, Margaret, Green hall. Developing your influencing skills, 1st Edition Universe of Learning LTD, 2010

Course code	Course title			Course type
BP.212P 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
Max. Marks	FA			SA
50	25			25

SCOPE:

This course equips students with essential personal and professional competencies to effectively manage stress, regulate emotions, enhance self-awareness, and resolve interpersonal conflicts. Through self-assessment tools, reflective practices, mindfulness techniques, time management exercises, cognitive restructuring, relaxation methods, and team-based activities, students develop emotional resilience, communication skills, and healthy coping strategies. The course prepares learners to maintain psychological well-being and foster positive interpersonal relationships in academic, healthcare, and professional environments.

COURSE LEARNING OUTCOMES:

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

K1: Explain the concepts, sources, and impact of stress, emotional well-being, and conflict management in personal and professional settings.

K2: Describe the principles and applications of mindfulness, cognitive restructuring, time management, and relaxation techniques for promoting mental well-being.

S1: Apply stress assessment tools, mindfulness practices, relaxation techniques, and cognitive restructuring strategies to effectively manage stress and anxiety.

S2: Analyze personal strengths, weaknesses, emotional responses, and coping mechanisms using reflective practices, SWOT analysis, and emotional journaling.

S3: Demonstrate effective communication, teamwork, time management, and conflict resolution skills through role plays, case studies, and group activities.

A1: Demonstrate a positive attitude towards self-care, emotional resilience, empathy, and collaborative behavior in personal and professional environments.

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

TEXTBOOKS:

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

**Latest edition of the text books & reference books can be referred*

Course code	Course title			Course type
BP.212P SEC3	Fundamentals of Computer Operations (Practical)			Elective
Credit	Hours Per Week (L-T-P)			Max Hours
	L	T	P	
1	-	-	2	30
Max. Marks	FA			SA
50	25			25

SCOPE:

This course provides students with fundamental computer and digital literacy skills essential for academic learning and professional pharmacy practice. It covers operating system navigation, file management, document preparation, spreadsheet applications, data visualization, presentations, internet and scientific literature searching, professional email communication, cloud computing, digital health technologies, pharmacy information systems, and online learning platforms. The course enables students to efficiently manage digital information, prepare professional documents, analyze pharmacy-related data, and utilize modern information technology tools for education, research, and healthcare practice.

COURSE LEARNING OUTCOMES:

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

K1: Explain the principles and applications of computer systems, digital tools, and information technology used in academic and pharmacy practice.

K2: Describe the functions and significance of office productivity software, internet resources, cloud computing, digital health technologies, and pharmacy information systems.

S1: Apply operating system functions, document processing, spreadsheet applications, presentation software, and cloud-based tools to prepare and manage academic and pharmacy-related information.

S2: Analyze and organize pharmacy-related data using spreadsheet formulas, charts, and digital information management tools for effective decision-making and reporting.

S3: Demonstrate effective digital communication, academic information retrieval, online collaboration, and the use of pharmacy-related digital platforms for professional and lifelong learning.

A1: Demonstrate professionalism, ethical responsibility, and confidence in the appropriate and responsible use of digital technologies for academic and pharmacy practice.

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.

TEXT BOOKS:

1. Introduction to Computers – Peter Norton, McGraw-Hill Education

2. Computer Basics: Absolute Beginner's Guide – Michael Miller, Que Publishing

**Latest edition of the text books & reference books can be referred*