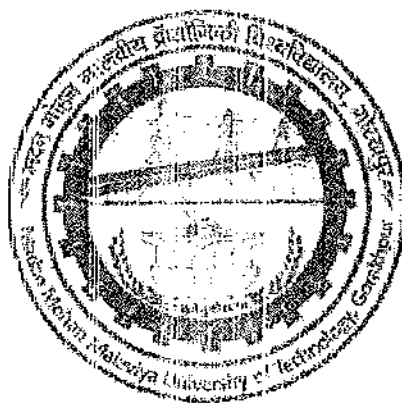


Curriculum Structure & Syllabi
(As per Pharmacy Council of India Regulations and NEP 2020)
of
Bachelor of Pharmacy (B. Pharm.) Programme
(w.e.f. 2026-27)
Vision Mission
Graduate Attributes
Program Educational Objectives
Program Outcomes
Program Specific Outcomes
Pharmacist's Oath
Overall Credit Structure
Curriculum
Syllabus



Offered By
Department of Pharmaceutical Science and Technology
MADAN MOHAN MALAVIYA UNIVERSITY OF TECHNOLOGY GORAKHPUR-273
010, UP, INDIA
JULY 2026

f 30/6/26
Pr. Secy.
Arpit Verma
S.H.
Arpit
Smriti
A *CA*

DISCLAMER

Extrema care has been taken in the compilation of ordinances, course structures, and syllabi of different B. Pharm. program, in case of any dispute regarding the credits of any subjects, pre-requisite subjects given in the course structure, the pre-requisite subjects, and credits given in the syllabi of respective subjects and as available with the dean UGS office of the University will be final.

Therefore, Madan Mohan Malaviya University of Technology is not responsible for any typographical and adverdant errors in the publication.

Approved in a **fifty ninth** meeting of the **Board of Management** held on **30 July 2026**,

AND

In the **forty first** meetings of the **Academic Council** held on **27 July 2026**.

Ribol
17/08/26

Anju Verma

Smeek
17/08/26

Asish

17/08/26

CD

Department of Pharmaceutical Science and Technology
CURRICULA & SYLLABI

Bachelor of Pharmacy (B. Pharm.) Programme

Vision

To develop a globally recognized center for excellence in pharmaceutical education, research, and innovation to drive transformational changes in current pharmacy practice and health services.

Mission

1. to educate, inspire and produce employable pharmacy professionals who are innovators and leaders in transforming health care and meet the needs and goals of industry, academia, and research institutes.
2. to create, disseminate, and apply new knowledge that endows our professionals with the skills, abilities, behaviours, and attitudes necessary to apply the foundational sciences to the provision of inter-professional patient-centered care, management of medication use systems, advocacy of population health, and wellness, and collaborative discovery and implementation of solutions to today's and tomorrow's healthcare problems.
3. to synergistically work with interdisciplinary and inter-professional in collaboration, and to establish partnerships and alliances to raise the level of healthcare sector
4. to develop pharmacy professionals as responsible citizens of society with ethical values, having skill to translate scientific discoveries into new treatments and models of care to improve both health and quality of life.
5. to achieve the greatest contribution through collaborative education, research, and clinical practice with our communities, partners, and alumni.

Smeech *Park* *Bel*
Amal *S. P.* *Arjun Verman*
Soes

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.

(Handwritten signatures and initials at the bottom of the page)

GA
Anju Verma
Suresh
Praveen
Preet

(10)

PROGRAMME EDUCATIONAL OBJECTIVES

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

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

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

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

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

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

Shubh
Bark
Asht
Sobh
S. A.
Anju
Vesma
GA

PROGRAM SPECIFIC OUTCOMES (PSOs)

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PSO 1: Empower graduates with comprehensive theoretical and practical knowledge in core areas of pharmaceutical sciences, including Pharmaceutics, Pharmaceutical Chemistry, Pharmacology, and Pharmacognosy, to meet the evolving demands of the pharmaceutical sector.

PSO 2: Impart professional training to enable graduates to effectively serve as healthcare providers in community and hospital pharmacy settings, while fostering strong communication, leadership, and collaborative skills.

PSO 3: Prepare students for diverse roles in the pharmaceutical industry such as manufacturing, quality control, regulatory affairs, R&D, and marketing while promoting entrepreneurial capabilities to support industry growth and global economic development.

Angu Venma
Andh
Pruthi
Sneha
Pruthi
Pruthi

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 and 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, Artificial Intelligence, and 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 and 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 and 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 and 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, and 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 and Society

Evaluate public health, patient safety, legal, and societal issues related to pharmacy practice and

Smriti *Arjun* *Daksh* *Pradeep* *G. R.* *Arjun Verma*

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 and 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.

Smruti
Anshu
S. H.
Anju Verma, Principal
G. H.
S. H.

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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!



Smriti

✓

✓

Prashant

✓

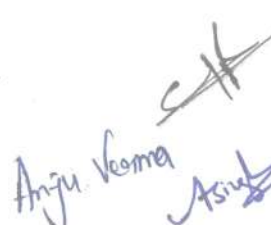
Anjali Kanna

CURRICULUM FOR B. PHARM. PROGRAMS

75

OVERALL CREDIT STRUCTURE FOR BACHELOR OF PHARMACY

Semester	Credit (Linear Entry in I Semester)	Points Entry in III Semester)	Credit Points (Lateral Entry in III Semester)
I	21	-	-
II	26	-	-
III	25	70	70
IV	23	25	25
V	22	22	22
VI	26	26	26
VII	26	26	26
VIII	24	24	24
Total credit points for the program	193	193	193








First Year, Semester I

S.N.	Course Type	Paper Code	Subject	Periods		Continuous mode	Minor Exam		Major Exam		Total Marks	Credit
				L	P		Marks	Duration	Marks	Duration		
1	Core	BPT101T	Basics of Python Programming for Pharmaceutical sciences (Theory)	2	-	10	10	1Hr	30	1.5 Hr	50	2
2	Core	BPT102T	General Pharmacy (Theory)	3	-	15	15	1Hr	45	2 Hr	75	3
3	Core	BPT103T	Healthcare Psychology and Communication Skills (Theory)	1	-	10	10	1Hr	30	1.5 Hr	50	1
4	Core	BPT104T	Human Anatomy, Physiology and Pathophysiology I (Theory)	4	-	20	20	1Hr	60	3 Hr	100	4
5	Core	BPT105T	Introduction to Pharmacognosy (Theory)	3	-	15	15	1Hr	45	2 Hr	75	3
6	Core	BPT106T	Pharmaceutical Inorganic and Analytical Chemistry (Theory)	3	-	15	15	1Hr	45	2 Hr	75	3
7	Core	BPT107P	General Pharmacy (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
8	Core	BPT108P	Healthcare Psychology and Communication Skills (Practical)	-	2	10	10	3 Hr	30	3 Hr	50	1
9	Core	BPT109P	Human Anatomy, Physiology and Pathophysiology I (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
10	Core	BPT110P	Introduction to Pharmacognosy (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
11	Core	BPT111P	Pharmaceutical Inorganic and Analytical Chemistry (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
Total				16	14	135	135	21 Hr	405	27 Hr	675	21

First Year, Semester-II

S.N.	Course Type	Paper Code	Subject	L	P	Continuous mode	Minor Exam		Major Exam		Total Marks	Credit
							Marks	Duration	Marks	Duration		
1	Core	BPT201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)	2	-	10	10	1 Hr	30	1.5 Hr	50	2
2	Core	BPT202T	Biochemistry (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
3	Core	BPT203T	Human Anatomy, Physiology and Pathophysiology II (Theory)	4	-	20	20	1 Hr	60	3 Hr	100	4
4	Core	BPT204T	Pharmaceutical Organic Chemistry (Theory)	4	-	20	20	1 Hr	60	3 Hr	100	4
5	Core	BPT205T	Pharmacognosy and Phytochemistry (Theory)	4	-	20	20	1 Hr	60	3 Hr	100	4
6	Core	BPT206T	Physical Pharmaceutics (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
7	Core	BPT207P	Biochemistry (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
8	Core	BPT208P	Human Anatomy, Physiology and Pathophysiology II (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
9	Core	BPT209P	Pharmaceutical Organic Chemistry (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
10	Core	BPT210P	Pharmacognosy and Phytochemistry (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
11	Core	BPT211P	Physical Pharmaceutics (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
12	Elective	BPT212P SEC1	Communication Skills	2	-	10	10	3 Hr	30	3 Hr	50	1
		BPT212P SEC2	Mental Well-Being, Stress & Conflict Management									
		BPT212P SEC3	Fundamentals of Computer Operations									
Total				22	15	160	160	24 Hr	480	32.5 Hr	800	26







Second Year, Semester-III

S.N.	Course Type	Paper Code	Subject	L	P	Continuous mode	Minor Exam		Major exam		Total	Credit
							Marks	Duration	Exam	Duration		
1	Core	BPT301T	Introduction to Machine Learning in Pharmaceutical Sciences (Theory)	2	-	10	10	1 Hr	30	1.5 Hr	50	2
2	Core	BPT302T	Environmental Sciences (Theory)	1	-	10	10	1 Hr	30	1.5 Hr	50	1
3	Core	BPT303T	Ethics and Universal Human Values (Theory)	1	-	10	10	1 Hr	30	1.5 Hr	50	1
4	Core	BPT304T	General Pharmacology (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
5	Core	BPT305T	Heterocyclic Compounds and Stereochemistry (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
6	Core	BPT306T	Pharmaceutical Dosage Forms I (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
7	Core	BPT307T	Pharmaceutical Engineering (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
8	Core	BPT308T	Pharmaceutical Microbiology (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
9	Core	BPT309P	General Pharmacology (Practical)	-	4	10	10	4 Hr	30	4 Hr	50	2
10	Core	BPT310P	Heterocyclic Compounds and Stereochemistry (Practical)	-	4	10	10	4 Hr	30	4 Hr	50	2
11	Core	BPT311P	Pharmaceutical Dosage Forms I (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
12	Elective	BPT312P AEC*	BPT312P AEC1	2	-	10	10	3 Hr	30	3 Hr	50	1
			BPT312P AEC2									
			BPT312P AEC3									
Total				21	11	145	145	22 Hr	435	28.5	725	25

*Additional Subjects for only for Lateral Entry Students

1	CS	BPT101T	Basics of Python Programming for Pharmaceutical sciences (Theory)	2	-	10	10	1 Hr	30	1.5 Hr	50	2	
2	DC	BPT103T	Healthcare Psychology and Communication Skills (Theory)	1	-	10	10	1 Hr	30	1.5 Hr	50	1	
3	DC	BPT108P	Healthcare Psychology and Communication Skills (Practical)	-	2	10	10	3 Hr	30	3 Hr	50	1	
Total lateral entry courses				24	13	175	175	27 Hr	525	34.5 Hr	875	29	
Credit Transferred for D. Pharm. Qualification													41
*Total (for lateral entry students)													70

***Note:** Lateral Entry students shall register for the regular Semester III B.Pharm. courses carrying **25 credits** and shall additionally register and complete the above courses carrying **4 credits**. In accordance with the credit-transfer provisions for lateral entry, **41 credits shall be awarded for the D.Pharm. qualification**. Thus, the cumulative credits recognized at the commencement III semester of the lateral-entry B.Pharm. program shall be **70 credits (25 + 4 + 41)**.

Second Year, Semester-IV

S.N.	Course Type	Paper Code	Subject	L	P	Continuous mode	Minor Exam		Major Exam		Total	Credit
							Marks	Duration	Marks	Duration		
1	Core	BPT401T	Herbal Drug Technology (Theory)	3	-	15	1 Hr	45	2 Hr	75	3	
2	Core	BPT402T	Medicinal Chemistry (Theory)	3	-	15	1 Hr	45	2 Hr	75	3	
3	Core	BPT403T	Pharmaceutical Biotechnology (Theory)	3	-	15	1 Hr	45	2 Hr	75	3	
4	Core	BPT404T	Social Pharmacy and Public Health (Theory)	2	-	10	1 Hr	30	1.5 Hr	50	2	
5	Core	BPT405T	Systemic Pharmacology I (Theory)	3	-	15	1 Hr	45	2 Hr	75	3	
6	Core	BPT406P	Herbal Drug Technology (Practical)	-	3	10	3 Hr	30	3 Hr	50	1	
7	Core	BPT407P	Medicinal Chemistry (Practical)	-	3	10	3 Hr	30	3 Hr	50	1	
8	Core	BPT408P	Pharmaceutical Biotechnology (Practical)	-	3	10	3 Hr	30	3 Hr	50	1	

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9	Core	BPT409P	Social Pharmacy and Public Health (Practical)	-	2	10	10	3 Hr	30	3 Hr	50	1
10	Core	BPT410P	Systemic Pharmacology I (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
11	Core	BPT411I	Internship (Mandatory)	-	-	-	-	-	100	4 Hr	100	4
			Total	14	14	120	120	20	460	28.5 Hr	700	23
*Additional Subjects for only for Lateral Entry Students												
1	Core	BPT201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)	2	-	10	10	1 Hr	30	1.5 Hr	50	2
			Total (for lateral entry students)	16	14	130	130	21 Hr	490	30 Hr	750	25

***Note:** Lateral Entry students shall register for the regular Semester IV B. Pharm. courses carrying **23 credits** and shall additionally register and complete the above course carrying **2 credits**. Thus, the cumulative credits recognized at the commencement of IV Semester of lateral-entry B. Pharm. program shall be **25 credits (23 + 2)**.

Third Year, Semester-V

S.N.	Category	Paper Code	Subject	L	P	Continuous Mode	Minor Exam		Major Exam		Total	Credit
							Marks	Duration	Marks	Duration		
1	Core	BPT501T	Biomedical Chemistry (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
2	Core	BPT502T	Industrial Pharmacognosy (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
3	Core	BPT503T	Innovation and Startup Ecosystem (Theory)	2	-	10	10	1 hr	30	1.5 Hr	50	2
4	Core	BPT504T	Pharmaceutical Dosage Form II (Theory)	2	-	10	10	1 Hr	30	1.5 hr	50	2
5	Core	BPT505T	Pharmaceutical Quality Assurance (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
6	Core	BPT506T	Systemic Pharmacology II (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3
7	Core	BPT507P	Biomedical Chemistry (Practical)	-	4	10	10	4 Hr	30	4 Hr	50	2
8	Core	BPT508P	Industrial Pharmacognosy (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1

9	Core	BPT509P	Pharmaceutical Dosage Form II (Practical)	-	3	10	10	3 Hr	30	3 Hr	50	1
10	Core	BPT510P	Systemic Pharmacology II(Practical)	-	4	10	10	4 Hr	30	4 hr	50	2
Total				16	14	120	120	20 Hr	360	25 Hr	600	22

Third Year, Semester-VI

S.N.	Category	Paper Code	Subject	L	P	Continuous Mode	Minor Exam		Major Exam		Total	Credit	
							Marks	Duration	Marks	Duration			
1	Core	BPT601T	Advanced Pharmacognosy (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3	
2	Core	BPT602T	Biopharmaceutics and Pharmacokinetics (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3	
3	Core	BPT603T	Intellectual Property Rights (Theory)	2	-	10	10	1 Hr	30	1.5 Hr	50	2	
4	Core	BPT604T	AI applications in Pharmaceutical Sciences (Theory)	2	-	10	10	1 Hr	30	1.5 Hr	50	2	
5	Core	BPT605T	Pharmaceutical Analysis (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3	
6	Core	BPT606T	Pharmaceutical Jurisprudence (Theory)	3	-	15	15	1 Hr	45	2 Hr	75	3	
7	Core	BPT607T AEC*	BPT607T AEC1	1	-	10	10	1 Hr	30	1.5 Hr	50	1	
8	Core		BPT607T AEC2										Green Chemistry
			BPT607T AEC3										
			BPT607T AEC4										Scientific Writing
9	Elective		BPT607T AEC5										
			BPT607T AEC6										
10	Core	BPT608P	Biopharmaceutics and Pharmacokinetics	3	-	10	10	3 Hr	30	3 Hr	50	1	

 Anju Verma
 Pooja
 S. K. Singh

		AEC	AEC1	Manufacturing Practices (cGMP)								
			BPT708T AEC2	Pharmaceutical Automation								
			BPT708T AEC3	Modern Techniques in Cellular Biology								
			BPT708T AEC4	Medical Devices								
			BPT708T AEC5	Transformation of Food Waste into Medicinal Products								
			BPT708T AEC6	Biosimilars, Vaccines & Macromolecules								
9	Core	BPT709P	Modern Analytical Techniques (Practical)		3	10	10	3 Hr	30	3 Hr	50	1
10	Core	BPT710RP	Research Project		--	--			150	4 Hr	150	6
Total					19	3	110	11 Hr	480	21 Hr	700	26

Fourth Year, Semester-VIII

S.N.	Category	Paper Code	Subject	L	P	Continuous Mode	Minor Exam		Major Exam		Total	Credit
							Marks	Duration	Marks	Duration		
1	Core	BPT801T	Ethical Considerations and Translational Applications of AI in Pharmacy (Theory)	2	--	10	1 Hr	10	30	1.5 Hr	50	2
2	Core	BPT802T	Clinical Pharmacotherapeutics (Theory)	2	--	10	1 Hr	10	30	1.5 Hr	50	2
3	Core	BPT803T	Industrial Pharmacy and Facility Design (Theory)	3	--	15	1 Hr	15	45	2 Hr	75	3
4	Core	BPT804T	Pharmaceutical Management (Theory)	2	--	10	1 Hr	10	30	1.5 Hr	50	2
5	Core	BPT805T	Sterile Dosage Forms and Novel Drug Delivery System (Theory)	3	--	15	1 Hr	15	45	2 Hr	75	3
6	Elective	BPT806T AEC*	BPT806T AEC1	2	--	10	1 Hr	10	30	1.5 Hr	50	2
			BPT806T AEC2									
			Supply Chain Management									

Dr. Arzu Varma

BPT101T: BASICS OF PYTHON PROGRAMMING FOR PHARMACEUTICAL SCIENCES-Theory	
Course Type	Core
Pre-requisite Subject	--
Contact hours/week	Lecture: 2
No of Credits	2
Course Assessment Methods	Continuous assessment through attendance, home assignments, quizzes and minor test, major theory test.
Course Objectives	The objectives of this course are to: 1. Introduce the fundamentals of Python programming for pharmaceutical sciences. 2. Develop basic programming skills using control structures, functions, and data structures. 3. Provide knowledge of data handling techniques for structured dataset management. 4. Familiarize students with data analysis tools such as NumPy and Pandas for healthcare datasets. 5. Enable students to visualize and interpret pharmaceutical data.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Explain the fundamentals of Python programming, including variables, data types, operators, and libraries. 2. Analyze program logic using control structures and functions. 3. Organize, manipulate, and retrieve data using data structures and file handling techniques. 4. Analyze pharmaceutical datasets using Python libraries. 5. Visualize and interpret pharmaceutical data using graphical tools.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	1	-	2	-	-	-	-	-	-	1	2	-	2
CO2	2	3	1	2	1	-	-	-	-	-	1	2	-	3
CO3	2	2	1	3	1	-	-	-	-	-	1	2	-	3
CO4	2	3	2	3	2	-	1	-	-	-	1	2	1	3
CO5	1	2	2	3	2	-	2	-	1	-	1	1	1	3
Average	1.8	2.2	1.2	2.6	1.2	0.0	0.6	0.0	0.2	0.0	1.0	1.8	0.4	2.8

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Introduction to Python programming Installing Python and an Integrated Development Environment (IDE) [Jupyter Notebook, PyCharm, VS Code etc.], Advantages of IDEs over text	6 Hours

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	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.	
2	Control Structures & Functions Conditional statements (if, if-else, if-elif-else), nested conditions, Loops (for loop, while loop), Break and continue statements, Defining and calling functions, passing arguments and returning values, Writing modular programs for simple pharmaceutical applications- dosage calculation and BMI calculation.	6 Hours
3	Data Structures & File Handling Lists, tuples, and dictionaries, Indexing and slicing lists, basic operations on lists and dictionaries, string manipulation techniques, Introduction to NumPy arrays, basic operations using NumPy (array creation, arithmetic operations), Reading and writing CSV files, Understanding structured healthcare datasets, Importing small pharmaceutical datasets and performing basic data access and manipulation tasks.	6 Hours
4	Data Handling with Pandas Introduction to Pandas library, Pandas Series and DataFrame structures, Reading CSV and Excel files-PK study datasets and ADR reports, Inspecting datasets using functions such as head(), tail(), info(), and describe(), Data cleaning techniques and handling missing values, Filtering and selecting data based on conditions, Grouping data and performing aggregation functions.	6 Hours
5	Data Visualization with Matplotlib Introduction to Matplotlib, Creating line plots, histograms, scatter plots, and box plots, Labeling axes, titles, and legends, Create plots and visualize pharmaceutical datasets - concentration-time curves for oral and IV administration, ADR reporting rates across drugs, dissolution profiles, Scientific interpretation of plots.	6 Hours

Textbook

1. K. Sembulingam, and P. Sembulingam, Essentials of Medical Physiology, Jaypee Brothers Medical Publishers, New Delhi.
2. Janet S. Ross, and Kathleen J. W. Wilson, Anatomy and Physiology in Health and Illness, 6th Edition, Churchill Livingstone, 1987
3. O. P. Tandon, and Y. Tripathi, Best and Talyor's Physiological basis of Medical Practice-Best and Tailor, 13th Edition, Wolters Kluwer India Pvt. Ltd., 2011.
4. Arthur C, Guyton and John. E. Hall, Text book of Medical Physiology, Miamisburg, OH, U.S.A.
5. Tortora Grabowski, Principles of Anatomy and Physiology by. Palmetto, GA, U.S.A.

Reference Book

1. Weiss, C.J., 2017. Scientific Computing for Chemists with Python. Available at: <https://weisscharlesj.github.io/SciCompforChemists/notebooks/introduction/intro.html>
2. Perkovic, L., 2015. Introduction to Computing Using Python: An Application Development Focus. 2nd ed. Hoboken: Wiley.

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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.

BPT102T: GENERAL PHARMACY (Theory)	
Course Type	Core
Pre-requisite Subject	--
Contact hours/week	Lecture: 3
No of Credits	3
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Provide knowledge about evolution and development of Pharmacy profession in India and the growth of the Pharmaceutical Industries over the years. 2. Provide understanding of different types of pharmacopoeias and other official books in maintaining the standards of medicines. 3. Provide knowledge about the basic pharmaceutical calculations used in dispensing and compounding. 4. Understand the role of active pharmaceutical ingredients and pharmaceutical excipients in drug formulations. 5. Impart basic knowledge about formulation and preparation of Various solid, liquid and semisolid dosage forms
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Describe the history and evolution of the pharmacy profession, including pharmacopeial practices and prescription handling. 2. Perform accurate pharmaceutical calculations required in the formulation and preparation of various types of dosage forms. 3. Explain the properties and functions of active pharmaceutical ingredients (APIs) and excipients and demonstrate the methods of preparation of solid dosage forms. 4. Illustrate the formulation principles of liquid dosage forms by analyzing the role of APIs and excipients involved. 5. Compare and evaluate the formulation of semisolid dosage forms based on the characteristics of APIs, excipients, and preparation methods.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	15	15	
75	30		45

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CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	2	-	-	2	1	-	2	-	1	3	2	1
CO2	3	3	3	-	-	-	-	-	-	-	1	3	-	1
CO3	3	2	3	-	1	-	-	-	-	-	1	3	-	2
CO4	3	2	3	-	1	-	-	-	-	-	1	3	-	2
CO5	3	3	3	-	1	-	-	-	-	-	1	3	-	2
Average	3.0	2.2	2.8	0.0	0.6	0.4	0.2	0.0	0.4	0.0	1.0	3.0	0.4	1.6

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Introduction to the Profession of Pharmacy Introduction to the Profession of Pharmacy, History of the Profession of Pharmacy in India: In relation to pharmacy education, pharmaceutical industries and organizations – evolution, development and milestones, Scope of the Pharmacy Profession: Role and responsibilities of pharmacists in retail/community pharmacy, hospital and clinical pharmacy, and industrial pharmacy including research and development, Pharmacopoeias: Introduction to IP, BP, USP, BPC, International Pharmacopoeia, other pharmacopoeias and the National Formulary of India; structure and content of the Indian Pharmacopoeia; study of one model IP monograph, Introduction to Prescription: Structure and format/parts of prescription, handling of prescriptions, Latin terminology related to prescriptions.	9 Hours
2	Introduction to Pharmaceutical Calculations and Dosage Forms Metric system of weights and measures; calculations based on alligation, proof spirit, isotonic solutions, dilute solutions (percentage and ratio) and geometric dilution; scientific notation of units and measures, Posology: Definition and dose calculation based on age, body weight and body surface area, Introduction to Dosage Forms: Routes of administration and classification of dosage forms, Introduction to Active Pharmaceutical Ingredients and Excipients: Definition, ideal characteristics and importance.	9 Hours
3	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, Tablets: Definition, types of tablets including moulded tablets and pills with examples; advantages and disadvantages; introduction to excipients and methods of preparation, Capsules: Definition, types of capsules, advantages and disadvantages, capsule sizes; introduction to excipients and methods of preparation.	9 Hours
4	Monophasic and Biphasic Liquids For internal use – aromatic waters, syrups, elixirs and linctus (definition and preparation), For external use and body cavities – liniments, lotions, throat paints, applications, gargles, mouthwashes, enemas, eye drops, ear drops, nasal drops and tinctures with examples, Study of official preparations- Introduction to excipients and methods of preparation,	9 Hours

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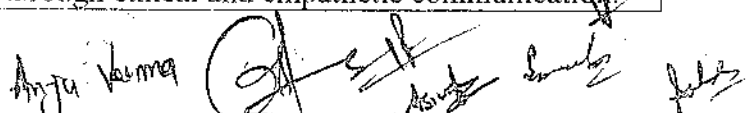
Anju Sharma

	Suspensions- Definition and types (flocculated and deflocculated), advantages and disadvantages, formulation excipients and general methods of preparation, Emulsions- Definition and types, emulsifying agents, tests for identification of types of emulsions, formulation excipients and general methods of preparation.	
5	Semisolid Dosage Forms Definitions, classification, advantages and disadvantages, ointment bases and other excipients used in semisolid dosage forms; general methods of preparation of ointments, pastes, creams and gels, Suppositories / Pessaries: Definition, types of suppositories, advantages and disadvantages, formulation excipients used in suppositories, properties of ideal suppository bases, types of suppository bases, displacement value and general method of preparation.	9 Hours

Recommended References (Preferably Latest Editions):

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

BPT103T: HEALTHCARE PSYCHOLOGY AND COMMUNICATION SKILLS- Theory	
Course Type	Core
Pre-requisite Subject	Basic Biology
Contact hours/week	Lecture: 1
No of Credits	1
Course Assessment Methods	Continuous assessment through attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Introduce the fundamental concepts and branches of psychology relevant to healthcare. 2. Help students understand human behavior, development, and psychological responses to illness. 3. Develop awareness of common psychological disorders and coping mechanisms in healthcare contexts. 4. Equip students with effective health communication skills for clinical and community settings. 5. Promote professional interaction with patients, caregivers, and healthcare teams through ethical and empathetic communication.



Course Outcome	Upon successful completion of this course, the students will be able to: 1. Explain the fundamental concepts of psychology and their relevance in healthcare settings. 2. Describe the stages of human development, personality traits, and behavioral responses associated with illness and recovery. 3. Apply effective communication models and techniques in clinical and interdisciplinary healthcare scenarios. 4. Demonstrate professional communication skills including active listening, empathetic interaction, and accurate clinical documentation. 5. Analyze psychological and behavioral interventions that promote mental health, treatment adherence, and stigma reduction.
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Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	1	1	-	2	-	1	-	2	-
CO2	1	2	-	-	-	2	2	-	2	-	1	-	2	-
CO3	-	2	1	-	-	2	3	1	2	-	1	-	3	-
CO4	-	1	2	-	-	3	3	1	2	-	1	-	3	-
CO5	1	3	-	-	1	2	2	-	3	1	2	-	3	-
Average	0.6	2.0	0.6	0.0	0.2	2.0	2.2	0.4	2.2	0.2	1.2	0.0	2.6	0.0

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Introduction to Psychology in Healthcare Definition, scope, and relevance of psychology in health sciences. Branches of psychology with healthcare relevance: clinical, health, behavioural, and developmental psychology. Sensation, perception, and attention in clinical assessment. Learning and memory: reinforcement in health behaviour change. Emotion and motivation: theories and implications in health contexts.	3 Hours
2	Developmental and Behavioural Psychology Human developmental stages and healthcare needs. Personality theories and patient interaction styles. Psychological factors affecting illness perception and recovery. Common psychological disorders in healthcare: anxiety, depression, and somatization. Coping strategies, resilience, and stress management techniques.	3 Hours
3	Foundations of Health Communication Elements and models of communication in healthcare. Types of	3 Hours

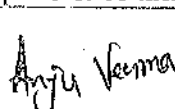
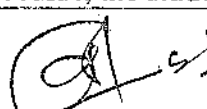
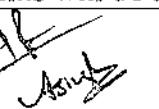
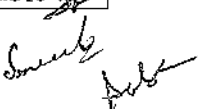


	communication: interpersonal, group, mass, and telehealth communication. Barriers to effective communication in clinical settings. Active listening, questioning techniques, and empathy. Culturally appropriate and inclusive communication.	
4	Professional Communication in Healthcare Settings Communication with patients, caregivers, and interdisciplinary teams. Delivering difficult news and handling emotionally charged situations. Legal and ethical issues in health communication (confidentiality, consent). Writing patient records, reports, and discharge summaries. Use of technology and digital communication tools in healthcare services.	3 Hours
5	Health Psychology and Behavioural Interventions Health belief models and illness behaviour. Psychosomatic illnesses and the mind-body connection. Behaviour change theories (e.g., CBT, TTM) in treatment adherence. Psychological first aid and crisis communication. Mental health promotion and stigma reduction through communication.	3 Hours

Recommended References (Preferably Latest Editions):

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

BPT104T: HUMAN ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY I (THEORY)	
Course Type	Core
Pre-requisite Subject	Basic Biology
Contact hours/week	Lecture-4
No of Credits	4
Course Assessment Methods	Continuous assessment through attendance, assignment, daily practical work and practical test.
Course Objectives	The objectives of this course are to: 1. Understand the structural organization of the human body from cells to systems. 2. Comprehend physiological functions of various body systems and the principles of homeostasis. 3. Learn the cellular basis of disease including injury, adaptation, and inflammation. 4. Recognize common pathological conditions related to skin, bones, joints, blood, cardiovascular system, and special senses. 5. Establish the groundwork for clinical interpretation of symptoms and disease mechanisms relevant to pharmacy and therapeutics.
Course Outcome	Upon successful completion of this course, the students will be able to:

	1. Explain the fundamental concepts of Human Anatomy, Physiology and Pathophysiology. 2. Explain the gross morphology, structure and functions of various organs of the human body. 3. Understand the etiology and pathogenesis of diseases/disorders associated with integumentary system, peripheral nervous system and cardiovascular system. 4. Understand the basic mechanism behind inflammation. 5. Identify and differentiate the various tissues and organs of different systems of human body.
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Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	20	20	
100	40		60

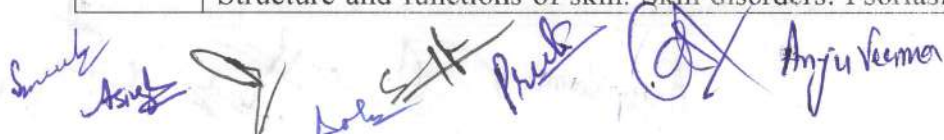
CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	1	-	1	3	1	-
CO2	3	2	2	-	-	-	-	-	1	-	1	3	1	-
CO3	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO4	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO5	3	2	3	-	-	-	-	-	1	-	1	3	1	-
Average	3.0	2.4	2.0	0.0	0.4	0.0	0.0	0.0	1.4	0.0	1.0	3.0	1.4	0.0

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Introduction to human body Cellular and tissue level of organization, Definition and scope of anatomy, physiology and pathophysiology, Levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminologies, Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, forms of intracellular signalling a) Contact-dependent, b) Paracrine, c) Synaptic, d) Endocrine Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues. Basic principles of cell injury and adaptation Components and types of feedback systems, causes of cellular injury, pathogenesis (cell membrane damage, mitochondrial damage, ribosome damage and nuclear damage), morphology of cell injury – adaptive changes (atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia), cell swelling, intra cellular accumulation and cell death. Definitions of commonly used relevant medical terminologies.	12 Hours
2	Integumentary system and wound healing Structure and functions of skin. Skin disorders: Psoriasis and dermatitis	12 Hours



	and pathophysiology of Leprosy. Basic principles of wound healing. Skeletal system and joints Divisions of skeletal system, types of bones, salient features and functions of bones of axial and appendicular skeletal system. Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction. Structural and functional classification of joints. Diseases of bones and joints Pathophysiology of rheumatoid arthritis, osteoporosis and gout.	
3	Body fluids, blood and lymphatic system Body fluids, composition and functions of blood, hemopoiesis, formation of haemoglobin, mechanisms of coagulation, blood grouping, Rh factors and transfusion, Lymphatic organs and tissues, lymphatic vessels, lymph formation, circulation and functions of lymphatic system. Basic mechanism of inflammation and repair Introduction, classification and pathophysiology of inflammation, mediators of inflammation. Haematological diseases Pathophysiology of iron deficiency, megaloblastic anaemia (Vit B12 and folic acid), sickle cell anaemia, Thalassemia, hereditary acquired anaemia and haemophilia.	12 Hours
4	Peripheral nervous system Classification of peripheral nervous system: structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves. Special senses Structure and functions of eye, ear, nose and tongue. Special sense Structure and functions of eye, ear, nose and tongue. Pathophysiology of special sense disorders- glaucoma, cataract, myopia, otitis externa, otitis media, vertigo and anosmia	12 Hours
5	Cardiovascular system Anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram. Pathophysiology of hypertension, cardiac arrhythmias, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and coronary artery disease).	12 Hours

Recommended References (Preferably Latest Editions):

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

BPT105T: INTRODUCTION TO PHARMACOGNOSY-Theory	
Course Type	Core
Pre-requisite Subject	Basic Biology

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Contact hours/week	Lecture: 3
No of Credits	3
Course Assessment Methods	Continuous assessment through attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Explain the origin, history, and classification of natural drugs. 2. Understand cultivation and conservation methods for medicinal plants. 3. Study quality control and evaluation of crude drugs. 4. Study primary and secondary metabolites with their therapeutic relevance. 5. Introduce traditional systems of medicine and phyto-therapeutic agents.
Course Outcome	Upon completion of this course the student should be able to: 1. Describe the historical development, classification, and scope of Pharmacognosy. 2. Explain cultivation, processing, and conservation techniques for medicinal plants. 3. Apply quality evaluation methods to crude drugs using organoleptic, microscopic, and chemical parameters. 4. Identify primary and secondary metabolites with their therapeutic relevance. 5. Recognize traditional systems of medicine and commonly used phyto-therapeutic agents.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	15	15	
75	30		45

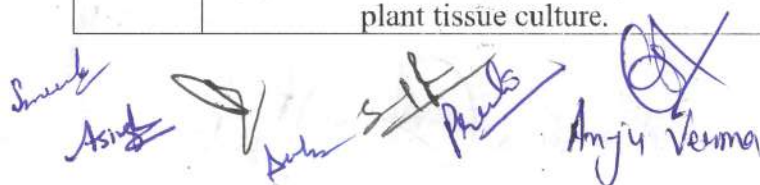
CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	1	-	1	3	-	1
CO2	3	2	2	-	1	-	-	-	1	3	1	3	-	1
CO3	3	3	3	-	1	-	-	-	-	-	1	3	-	2
CO4	3	2	2	-	2	-	-	-	1	-	1	3	-	2
CO5	3	1	1	-	1	1	-	-	2	-	1	2	1	1
Average	3.0	1.8	1.8	0.0	1.0	0.2	0.0	0.0	1.0	0.6	1.0	2.8	0.2	1.4

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Fundamentals of Pharmacognosy (a) Definition, history, present status, scope and development of pharmacognosy. (b) Sources of drugs: Plants, animals, microbial, marine, mineral and plant tissue culture.	10 Hours



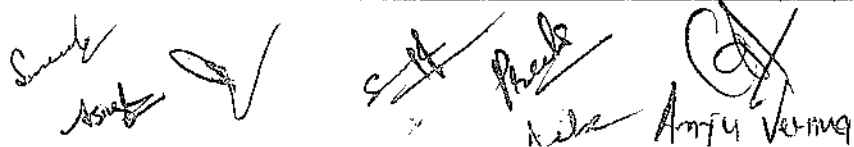
 Anjali Verma

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

BPT106T: PHARMACEUTICAL INORGANIC AND ANALYTICAL CHEMISTRY- Theory	
Course Type	Core
Pre-requisite Subject	Basic Chemistry
Contact hours/week	Lecture: 3
No of Credits	3
Course Assessment Methods	Continuous assessment through attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Understand the importance of errors, impurities in pharmaceuticals. 2. Comprehend the principles of buffer systems. 3. Develop skills in performing and interpreting limit tests and titrimetric analysis. 4. Emphasize the importance of inorganic compounds and radiopharmaceuticals in Pharmacy 5. Explain synthesis and analysis of inorganic compounds/products of pharmaceutical importance
Course Outcome	Upon completion of this course the student should be able to: 1. Identify sources and types of errors in pharmaceutical analysis, and impurities products. 2. Apply concepts of acid-base chemistry, buffer systems with importance of electrolytes. 3. Describe and differentiate various analytical techniques used in pharmaceutical analysis, including titrimetric methods, and their specific applications in quality assessment. 4. Analyze the properties, mechanisms, and therapeutic uses of gastrointestinal agents, radiopharmaceuticals, expectorants, antidotes, and other pharmaceutical compounds, illustrating their roles in therapy and safety considerations. 5. Describe the drugs used in expectorants, emetics, haemintics, poison and antidote and astringents.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	



 Sanjay, Anshu, S. H., Pankaj, Nilesh, Anshu Verma

	(c) Historical milestones in drug discovery: Morphine, quinine, aspirin, warfarin, penicillin, cephalosporin, taxol and artemisinin. (d) Introduction to different herbal / traditional pharmacopoeias: Indian Pharmacopoeia, British Herbal Pharmacopoeia, United States Pharmacopoeia – Herbal Medicines and Dietary Supplements, Ayurvedic Pharmacopoeia of India, Unani Pharmacopoeia of India and American Herbal Pharmacopoeia. (e) Official and non-official; codified and non-codified drugs. Classification of crude drugs: alphabetical, morphological, taxonomical, chemical, pharmacological and chemotaxonomic classification along with their merits and limitations.	
2	Cultivation, Collection, Processing and Storage of Drugs of Natural Origin Methods of plant cultivation and Good Agricultural and Collection Practices (WHO / GAP / GCP guidelines) for medicinal plants. Factors influencing cultivation, collection and storage of medicinal plants, Plant hormones and their applications in cultivation of medicinal plants. Application of polyploidy, mutation and hybridization concepts with reference to secondary metabolites. Ex-situ and in-situ conservation and strategies for value addition of medicinal plants. Role of eco-pharmacognosy in sustainable conservation of endangered medicinal plants such as kutki and chirata.	8 Hours
3	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. 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.	8 Hours
4	Introduction to Metabolites of Plant Origin Definition and general properties of plant metabolites. Primary and secondary metabolites such as carbohydrates, proteins, lipids, alkaloids, glycosides, flavonoids, tannins, terpenoids, volatile oils and resins. Traditional Systems of Medicine Basic principles of treatment of diseases in different systems of medicine including AYUSH and TCM. Types of dosage forms in AYUSH medicines. Role of pharmacognosy in allopathy and traditional systems of medicine such as AYUSH and TCM.	12 Hours
5	Phyto-therapeutic Agents Biological source, major constituents and uses of the following classes of drugs: Adaptogens and Immunomodulators: Ashwagandha, Tulsi, Amla Hepatoprotectives: Milk thistle, Kutki, Cardiovascular drugs: Garlic, Arjuna Antidiabetics: Gymnema, Fenugreek, Anti-inflammatory and analgesics: Turmeric, Boswellia, CNS drugs: Brahmi Antimicrobial and antivirals: Giloy, Neem, Andrographis • Gastrointestinal drugs: Psyllium • Dermatological agents: Aloe, Drugs used in women's health: Chasteberry, Shatavari • Respiratory drugs: Vasaka	7 Hours

Recommended References (Preferably latest editions):

	15	15	
75	30	45	

CO-PO/PSO mapping (1 to 3 scale)

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PS O1	PS O2	PS O3
CO1	3	3	2	-	1	-	-	-	-	-	1	3	-	2
CO2	3	2	2	-	1	-	-	-	1	-	1	3	1	1
CO3	3	3	3	1	2	-	-	-	-	-	1	3	-	2
CO4	3	2	2	-	1	-	-	-	2	-	1	3	2	1
CO5	3	1	2	-	-	-	-	-	2	-	1	3	2	1
Average	3.0	2.2	2.2	0.2	1.0	0.0	0.0	0.0	1.0	0.0	1.0	3.0	1.0	1.4

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Introduction to pharmaceutical analysis Different techniques of analysis, Methods of expressing strength of solutions, Primary and secondary standards with examples. Errors Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures. Impurities Definition, types, contents and regulatory importance. Sources and types of impurities in Pharmaceuticals, limit tests for chloride, sulphate, iron, arsenic, lead, heavy metals, and modified limit test for chloride and sulphate.	7 Hours
2	Acid-Base Chemistry and Buffer Systems in Pharmacy Definition of acids, bases, buffers, pH Scale and its significance, Buffer equation, calculation of pH for Buffer solution. Isotonicity and its application in IV Fluids and Ophthalmic Solutions. Major extra and intracellular electrolytes Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium chloride and Oral Rehydration Salt (ORS), Physiological acid base balance.	8 Hours
3	Acid base titrations Theories of acid base indicators, classification of acid base titrations. Preparation and standardization of titrants viz. hydrochloric acid and sodium hydroxide. Theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves. Assay of Ammonium hydroxide. Non-aqueous titrations Types of solvents used, acidimetric and alkalimetric titration using nonaqueous solvents. Preparation and standardization of acidic and basic titrants. Estimation of weakly acidic and basic substances using nonaqueous titrants, estimation of Sodium benzoate.	14 Hours

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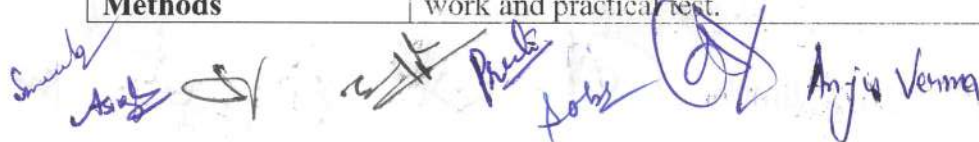
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	Precipitation titrations and gravimetry Principle and steps involved in gravimetric analysis, Mohr's method, Volhard's, Modified Volhard's, Fajans method. Estimation of barium sulphate by gravimetry. Complexometric titrations Classification, metal ion indicators, masking and demasking reagents, preparation and standardization of disodium EDTA. Estimation of Magnesium sulphate and Calcium gluconate*. Redox titrations Concepts of oxidation and reduction, Types of redox titrations viz. Permanganometry, Cerimetry, Iodimetry, Iodometry and titrations with potassium iodate.	
4	Gastrointestinal agents Acidifiers: Sodium acid phosphate and Dilute Hydrochloric acid. Antacids: Ideal properties of antacids, combinations of antacids, Sodium bicarbonate*, Aluminium hydroxide gel*. Agents promote bowel movements: Magnesium hydroxide, Sodium orthophosphate, Sodium Potassium tartrate and magnesium trisilicate. Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations. Radiopharmaceuticals Basics of radioactivity, applications of radioisotopes of Sodium Iodide I-131, Technetium-99m, Cobalt-60, Phosphorus-32 including safe handling, storage, and disposal of radiopharmaceuticals, adhering to regulatory guidelines for safety.	10 Hours
5	Miscellaneous Compounds Expectorants: Potassium iodide, Ammonium chloride*. Emetics: Copper sulphate*, Sodium potassium tartrate. Haematinics: Ferrous sulphate*, Ferrous gluconate. Poison and Antidote: Definition, classification of antidotes, Sodium thiosulphate.	6 Hours

Recommended References (Preferably latest editions):

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

BPT107P: GENERAL PHARMACY- PRACTICAL	
Course Type	Core
Pre-requisite Subject	--
Contact hours/week	3
No of Credits	1
Course Assessment Methods	Continuous assessment through attendance, assignment, daily practical work and practical test.



Course Objective	The objectives of this course are to: 1. Familiarize students with essential pharmaceutical calculations including dilution, concentration, and allegation methods required for accurate formulation of dosage forms. 2. Impart practical skills in the preparation of official and non-official dosage forms such as solutions, syrups, powders, granules, suppositories, semisolids, gargles, and mouthwashes in accordance with pharmacopeial standards. 3. Develop understanding of formulation principles related to selection of ingredients, dosage form design, stability, and patient acceptability. 4. Train students in the application of pharmacopoeial specifications (IP, BPC, WHO) during compounding, labeling, and evaluation of pharmaceutical preparations. 5. Enhance hands-on competency and professional confidence required for dispensing practice and pharmaceutical compounding in hospital and community pharmacy settings.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Perform accurate pharmaceutical calculations using dilution and allegation principles for the preparation of various dosage forms. 2. Prepare and dispense liquid dosage forms such as solutions, syrups, gargles, and mouthwashes following official pharmacopeial procedures. 3. Formulate solid dosage forms including powders, divided powders, dusting powders, and effervescent granules as per standard guidelines. 4. Prepare semisolid and specialized dosage forms such as ointments, liniments, and suppositories using appropriate bases and techniques. 5. Compile and evaluate a compendium of marketed dosage forms, demonstrating compliance with pharmacopeial standards, labeling requirements, and patient centric considerations

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PS O1	PS O2	PS O3
CO1	2	3	3	-	-	-	-	-	-	-	1	3	-	1
CO2	2	2	3	-	-	1	1	-	1	-	1	3	1	1
CO3	2	2	3	-	-	1	-	-	-	-	1	3	-	1

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Prashant

Dr. Anshu Sharma

CO4	2	2	3	-	-	1	-	-	-	-	1	3	-	1
CO5	2	2	2	-	1	2	2	-	2	-	1	2	2	1
Average	2.0	2.2	2.8	0.0	0.2	1.0	0.6	0.0	0.6	0.0	1.0	2.8	0.6	1.0

3 = High, 2 = Moderate, 1 = Low

Practical's

1. Pharmaceutical Calculations

Solutions based on allegation and dilution methods

2. Solutions

- Strong solution of ammonium acetate – IP
- Cresol with soap solution – IP
- Lugol's solution – BPC

3. Syrups

- Simple Syrup – IP

4. Powders & Granules

- ORS powder – WHO
- Effervescent granules – IP
- Dusting powder – IP
- Divided powders – IP

5. Suppositories

- Glycerogelatin suppository – BPC
- Cocoa butter suppository – IP
- Zinc Oxide suppository – IP

6. Semisolids

- Sulphur ointment – IP
- Non-staining iodine ointment with methyl salicylate – BPC

7. Gargles & Mouthwashes

- Iodine gargle – BPC
- Chlorhexidine mouthwash – IP

Note:

- Preparation of compendia of dosage forms (marketed products), is recommended.
- Any other practical relevant to the syllabus can be introduced.
- Minimum 12 experiments must be performed covering all dosage forms.

Recommended References (Preferably latest editions):

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

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BFT108P: HEALTHCARE PSYCHOLOGY AND COMMUNICATION SKILLS - Practical	
Course Type	Core
Pre-requisite Subject	English
Contact hours/week	Practical:2
No of Credits	1
Course Assessment Methods	Continuous assessment through attendance, assignment, daily practical work and practical test.
Course Objective	The objectives of this course are: 1. To develop effective communication skills essential for diverse clinical and community health scenarios. 2. To enhance empathetic interaction through role plays, simulations, and reflective practices. 3. To promote collaborative learning and peer feedback in communication-based tasks. 4. To encourage application of psychological principles in real-life healthcare contexts. 5. To build confidence in delivering health education and awareness activities in community settings.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Demonstrate patient-centered communication through role plays and clinical simulations. 2. Analyze healthcare communication challenges using case study discussions. 3. Practice reflective listening, paraphrasing, and team-based communication strategies. 4. Design and deliver effective health education messages for the community. 5. Reflect on personal emotional growth and improvement in communication competencies.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	1	2	-	-	2	3	1	2	-	1	-	3	-
CO2	-	3	1	-	-	1	2	1	2	-	1	-	3	-
CO3	-	2	2	-	-	2	3	2	1	-	1	-	3	-
CO4	1	2	1	-	1	2	3	2	3	1	1	-	3	-
CO5	-	2	-	-	-	2	2	1	1	-	3	-	2	-
Average	0.2	2.0	1.2	0.0	0.2	1.8	2.6	1.4	1.8	0.2	1.4	0.0	2.8	0.0

3 = High, 2 = Moderate, 1 = Low

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Practical's

1. Role Plays and Simulations

Counselling a patient with chronic illness
Breaking bad news in a clinical setting
Empathetic listening in crisis response

2. Case Study Discussions

Mental health cases in primary care
Impact of miscommunication in healthcare errors

3. Peer-to-Peer Practice Sessions

Reflective listening and paraphrasing
Effective team communication and decision-making

4. Community Engagement Tasks

Designing IEC materials for public health awareness
Conducting mock health education sessions

5. Journaling & Self-Reflection Logs

Weekly reflection on emotional responses during care simulations
Growth in communication skill development over the semester

Recommended References (Preferably latest editions):

1. Morgan, C.T. and King, R.A., *Introduction to Psychology*. New York: McGraw-Hill.
2. Taylor, S.E., *Health Psychology*. New York: McGraw-Hill Education.
3. Hargie, O., *Skilled Interpersonal Communication: Research, Theory and Practice*. London: Routledge.
4. Balzer-Riley, J., *Communication in Nursing and Healthcare*. Boston: Pearson.
5. Weinman, J., Petrie, K.J. and Moss-Morris, R., *The Psychology of Health and Illness*.
6. London: Routledge.

BPT109P: HUMAN ANATOMY, PHYSIOLOGY AND PATHOPHYSIOLOGY I- Practical

Course Type	Core
Pre-requisite Subject	Biology
Contact hours/week	Practical:3
No of Credits	1
Course Assessment Methods	Continuous assessment through attendance, assignment, daily practical work and practical test.
Course Objectives	The objectives of this course are to: 1. Provide fundamental knowledge of the structure and functions of various organ systems of the human body. 2. Understand the mechanisms of homeostasis and their role in maintaining normal physiological functions. 3. Introduce the basic concepts of pathophysiology and the causes of diseases affecting different organ systems. 4. Explain the body's physiological responses to disease-producing agents. 5. Lay the foundation for understanding clinical conditions through the study of functional alterations in organs and systems.
Course Outcome	Upon completion of the course, the student shall be able to 1. Explain the principles, applications, and experimental use of microscopy techniques, and perform basic laboratory experiments

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	related to the nervous system and special senses. 2. Describe the gross morphology, microscopic structure, and coordinated functioning of major human organs and organ systems, emphasizing their roles in maintaining normal physiology. 3. Estimate and interpret key hematological parameters, and explain the mechanisms of homeostasis along with related physiological and pathological disorders. 4. Discuss the etiology and pathogenesis of selected disease states, linking structural and functional changes to clinical manifestations. 5. Identify and explain common diseases with respect to their signs and symptoms, risk factors, diagnostic methods, preventive measures, treatment strategies, and possible complications.
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Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20	30	

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	1	-	1	3	1	-
CO2	3	2	2	-	-	-	-	-	1	-	1	3	1	-
CO3	3	3	3	-	1	-	-	-	2	-	1	3	2	-
CO4	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO5	3	2	2	-	-	-	1	-	3	-	1	3	2	-
Average	3.0	2.4	2.4	0.0	0.4	0.0	0.2	0.0	1.8	0.0	1.0	3.0	1.6	0.0

3 = High, 2 = Moderate, 1 = Low

Practical's

Practical HAPP allows the verification of physiological processes discussed in theory classes through experiments on living tissues, simulated videos, models and charts.

1. Study of compound microscopes.
2. Microscopic study of epithelial and connective tissue.
3. Microscopic study of muscular and nervous tissue.
4. Identification of axial bones.
5. Identification of appendicular bones.
6. Introduction to hemocytometry.
7. Demonstration of total blood count by cell analyser.
8. Enumeration and interpretation of white blood cell (WBC) count, differential count.
9. Enumeration and interpretation of total red blood corpuscles (RBC) count.
10. Determination of bleeding time and clotting time.
11. Estimation and interpretation of hemoglobin content.
12. Determination of blood group.
13. Determination and interpretation of erythrocyte sedimentation rate (ESR).
14. Determination of pulse rate, heart rate and blood pressure.
15. Recording and interpretation of ECG.

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16. To study the cardiovascular system and integumentary system.
17. Case studies/files of patients with anaemia, thalassemia, haemophilia, leprosy, gout, hypertension and ischemic heart disease.

Recommended References (Preferably latest editions):

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

BPT110P: INTRODUCTION TO PHARMACOGNOSY- PRACTICAL	
Course Type	Core
Pre-requisite Subject	Biology
Contact hours/week	Practical:3
No of Credits	1
Course Assessment Methods	Continuous assessment through attendance, assignment, daily practical work and practical test.
Course Objectives	The objectives of this course are to: 1. Identify medicinal plants and crude drugs using morphological and microscopical characters. 2. Analyze powdered drugs and perform quantitative microscopy. 3. Evaluate crude drugs using physicochemical parameters. 4. Introduce standardization and quality control of herbal materials. 5. Collect medicinal plants and prepare voucher specimens.
Course Outcome	Upon completion of the course, the student shall be able to: 1. Identify medicinal plants and crude drugs using morphological and microscopical characters. 2. Analyze powdered drugs microscopically to identify diagnostic cell contents. 3. Perform quantitative microscopy for stomatal and vein parameters. 4. Evaluate quality and purity of crude drugs using physicochemical parameters. 5. Collect medicinal plants and prepare voucher specimens during field visits.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	1	3	-	1
CO2	2	3	3	-	1	-	-	-	-	-	1	3	-	1

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CO3	2	3	3	-	1	-	-	-	-	-	1	3	-	1
CO4	3	3	3	-	2	-	-	-	-	-	1	3	-	2
CO5	2	1	2	-	1	-	-	-	1	3	1	3	-	1
Average	2.4	2.4	2.8	0.0	1.0	0.0	0.0	0.0	0.2	0.6	1.0	3.0	0.0	1.2

3 = High, 2 = Moderate, 1 = Low

Practical's

1. Morphological study of medicinal plants (as mentioned in Unit V Theory).
2. Organoleptic evaluation and powder microscopical characters of the following drugs: Tulsi and Ashwagandha.
3. Organoleptic evaluation and powder microscopical characters of the following drugs: Amla and Arjuna.
4. Organoleptic evaluation and powder microscopical characters of the following drugs: Turmeric and Psyllium husk.
5. Organoleptic evaluation and powder microscopical characters of the following drugs: Brahmi and Fenugreek.
6. Determination of 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.

Recommended References (Preferably Latest Editions):

1. Evans, W.C., 2009. *Trease and Evans Pharmacognosy*. 16th ed. London: W.B. Saunders & Co.
2. Tyler, V.E., Brady, L.F. and Robbers, J.E., 1988. *Pharmacognosy*. 9th ed. Philadelphia: Lea & Febiger.
3. Wallis, T.E., *Textbook of Pharmacognosy*. London: J. & A. Churchill Ltd.

BPT111P: PHARMACEUTICAL INORGANIC AND ANALYTICAL CHEMISTRY - PRACTICAL	
Course Type	Core
Pre-requisite Subject	Basic Chemistry
Contact hours/week	Practical:3
No of Credits	1
Course Assessment Methods	Continuous assessment through attendance, assignment, daily practical work and practical test.
Course Objectives	The objectives of this course are to: 1. Gain practical knowledge on various volumetric titration techniques. 2. Learn the principles of volumetric analysis. 3. Study the preparation and assessment of inorganic compounds. 4. Determine the assay of various inorganic compounds in

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	pharmaceutical use. 5. Develop analytical skill for the qualitative and quantitative analysis of various inorganic compounds.
Course Outcome	Upon completion of the course, the student shall be able to: 1. Perform limit tests to detect and identify impurities in pharmaceutical substances. 2. Prepare various pharmaceutical inorganic compounds following standard procedures. 3. Analyze the significance of quality control in pharmaceutical products and raw materials. 4. Demonstrate proficiency in titrimetric analysis using different volumetric techniques. 5. Competence in applying analytical skills to qualitative and quantitative data.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	3	-	1	-	-	-	-	-	1	3	-	2
CO2	3	2	3	-	1	-	-	-	-	-	1	3	-	2
CO3	3	3	3	-	2	1	-	-	1	-	1	3	1	2
CO4	2	3	3	1	2	-	-	-	-	-	1	3	-	2
CO5	2	3	3	-	2	-	-	-	-	-	1	3	-	2
Average	2.4	2.8	3.0	0.2	1.6	0.2	0.0	0.0	0.2	0.0	1.0	3.0	0.2	2.0

3 = High, 2 = Moderate, 1 = Low

Practical's

1. Limit tests (Any 4 Experiments)

- Limit test and modified limit test for Chloride as per Indian Pharmacopoeia
- Limit test and modified limit test for sulphate as per Indian Pharmacopoeia
- Limit test for Iron
- Limit test for Lead
- Limit test for arsenic

2. Preparation of inorganic pharmaceuticals (Any 3 Experiments)

- Preparation of Aluminium hydroxide
- Preparation of potash alum
- Preparation of ferrous sulphate
- Preparation of Magnesium sulphate from magnesium hydroxide or magnesium carbonate

3. Test for Purity (Any 2 Experiments)

- Assessment of swelling power of bentonite as per Indian Pharmacopoeia



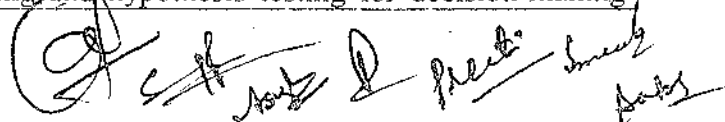
- b. Evaluation of acid neutralizing capacity of aluminium hydroxide gel
 c. Determination of potassium iodate and iodine in potassium Iodide
4. **Assay of the following inorganic compounds including standardization of titrant (Any 5 Experiments)**
- Assay of ammonium chloride by acid base titration.
 - Assay of Ferrous sulphate by Cerimetry.
 - Assay of Copper sulphate by Iodometry.
 - Assay of Calcium gluconate by Complexometry.
 - Assay of Hydrogen peroxide by Permanganometry.
 - Assay of Sodium benzoate by non-aqueous titration.
 - Assay of Sodium Chloride by precipitation titration (Modified Volhard's method)

Recommended References (Preferably Latest Editions):

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

BPT201T: Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)	
Course Type	Core
Pre-requisite Subject	Basic Mathematics
Contact hours/week	Lecture: 2
No of Credits	2
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Explain fundamental statistical concepts relevant to pharmaceutical sciences. 2. Develop the ability to interpret clinical and experimental data scientifically. 3. Apply statistical methods for analyzing pharmaceutical and biomedical data. 4. Demonstrate the use of Python-based tools for statistical analysis and data handling. 5. Recognize the role of statistical analysis in evidence-based decision making and machine learning applications in healthcare.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Classify pharmaceutical data using appropriate descriptive statistics. 2. Apply probability concepts and statistical distributions in clinical and pharmaceutical contexts. 3. Perform sampling and hypothesis testing for decision-making

Amiya Verma



	in research. 4. Analyze correlation and regression relationships in pharmaceutical datasets. 5. Demonstrate statistical analysis using Python and interpret outputs appropriately.
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Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20	30	

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	3	1	1	1	-	-	-	-	-	1	1	-	3
CO2	2	3	1	2	2	-	-	-	1	-	1	1	1	3
CO3	2	3	1	2	3	-	-	-	-	-	1	1	-	3
CO4	2	3	1	2	3	-	-	-	-	-	1	1	-	3
CO5	2	2	1	3	3	-	1	-	-	-	1	1	-	3
Average	2.0	2.8	1.0	2.0	2.4	0.0	0.2	0.0	0.2	0.0	1.0	1.0	0.2	3.0

3 = High, 2 = Moderate, 1 = Low

Course Content

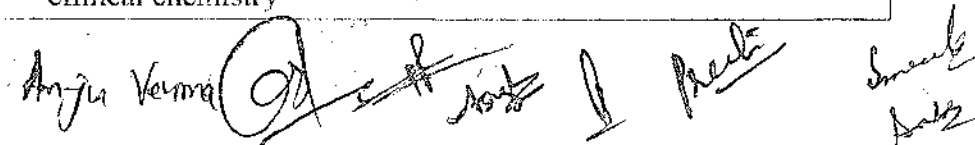
Unit No	Topic	No. of Lectures
1	Descriptive Statistics Types of data in pharmaceutical sciences (nominal, ordinal, interval, ratio), Sources of data in pharmacy: clinical trials, pharmacovigilance, quality control, PK studies, Measures of central tendency: mean, median, mode, their calculation and interpretation, Measures of dispersion (range, variance, standard deviation) and their interpretation using pharmaceutical data, Skewness and understanding distribution shape in biological measurements, Perform descriptive statistical analysis using Python libraries such as NumPy and Pandas, with focus on Interpretation of results.	6 Hours
2	Probability & Statistical Distributions in Healthcare Basic probability concepts and laws (addition and multiplication rules), conditional probability and its interpretation, Bayes' theorem and its application in clinical decision-making, Concept of random variables (discrete and continuous), Normal distribution and its importance in biological and pharmaceutical measurements, Binomial distribution demonstrating applications in clinical trial outcomes, Poisson distribution for modeling rare events such as adverse drug reactions, Graphical visualization of these probability distributions using Python.	6 Hours
3	Sampling & Statistical Inference Population versus sample, sampling techniques used in clinical research, Sampling error and bias, Conceptual understanding of the Central Limit Theorem, Confidence intervals and their interpretation, Hypothesis	6 Hours

	testing framework (null and alternative hypotheses). Type I and Type II errors, p-value and statistical significance, Demonstration, calculation and interpretation of these parameters using python with pharmaceutical data.	
4	Basics of Correlation & Regression Conceptual understanding of the following concepts with emphasis on their interpretation- correlation and Pearson correlation coefficients, Interpretation of positive and negative correlations, Scatter plots and trend visualization using pharmaceutical data such as dose-response relationships, Simple linear regression concept, interpretation of regression coefficients, Introduction to odds ratio and its application in clinical risk analysis.	6 Hours
5	Statistical Analysis Using Python – Case based learning Demonstration of descriptive statistics, correlation analysis and linear regression using Python libraries- SciPy / Statsmodels / Scikit-learn on pharmaceutical datasets, Interpretation of the output summaries and p-values, Preparation of statistical reports.	6 Hours

Recommended References (Preferably Latest Editions):

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

BPT202T: Biochemistry (Theory)	
Course Type	Core
Pre-requisite Subject	Biology, Chemistry
Contact hours/week	Lecture: 3
No of Credits	3
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Know about enzymology and various tests in clinical chemistry. 2. Understand the biochemical pathways and clinical relevance of carbohydrate, lipid and protein metabolism. 3. Describe energetics and biological oxidation. 4. Explain aminoacid and protein metabolism. 5. Understand Nucleic acid metabolism and genetic information.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Explain the principles of enzymology and various tests in clinical chemistry



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	- Describe the classification, the classification, structure, and functions of major biomolecules such as carbohydrates, lipids, proteins, nucleic acids, enzymes, and vitamins. - Explain the principles of bioenergetics, biological oxidation, and the overview of metabolic pathways of biomolecules, along with their clinical significance. - Understand metabolism of lipid and its significance. - Understand metabolism of proteins & its significance and monitoring of metabolic and organ-specific disorders.
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Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20	30	

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	1	-	1	3	2	-
CO2	3	2	1	-	1	-	-	-	1	-	1	3	1	-
CO3	3	3	2	-	2	-	-	-	1	-	1	3	2	1
CO4	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO5	3	3	2	-	2	-	-	-	2	-	1	3	2	-
Average	3.0	2.6	1.8	0.0	1.4	0.0	0.0	0.0	1.4	0.0	1.0	3.0	1.8	0.2

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Enzymology - Introduction, properties, nomenclature, and IUB classification of enzymes and coenzymes. Enzyme kinetics (Michaelis plot, Lineweaver Burk plot). Enzyme inhibitors with examples. Regulation of enzymes: enzyme induction and repression, allosteric enzyme regulation. Therapeutic and diagnostic application of enzymes and isoenzymes. Factors affecting enzyme activity. Digestion, absorption function of dietary Macro and Micronutrients, including Vitamins and Minerals, Biochemical functions of vitamins and associated diseases. - Clinical Chemistry: Liver function tests (routinely performed tests based on liver function). Renal function tests (routinely performed tests based on kidney function, ELISA test)	10 Hours
2	Introduction about biomolecules – Introduction of carbohydrate, lipids, nucleic acids, amino acids and proteins.	10 Hours

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	b. Bioenergetics: Concept of free energy; relationship between free energy, enthalpy, and entropy; redox potential; energy-rich compounds (ATP, GTP, etc.) and their biological significance. c. Carbohydrate Metabolism and their role in diabetes mellitus: Overview and significance of major pathways: Glycolysis, Citric Acid Cycle (TCA), Gluconeogenesis, Hexose Monophosphate (HMP) shunt, and Glycogen metabolism; regulation of blood glucose levels; metabolic adaptations during fed state, fasting, and prolonged starvation; metabolic derangements in diabetes mellitus and related disorders. d. Biological Oxidation: Electron Transport Chain (ETC), oxidative phosphorylation, and mechanisms of ATP synthesis; regulation and clinical implications of mitochondrial dysfunction and oxidative stress.	
3	Lipid metabolism a. Classification, functions, and properties of lipids and lipoproteins (HDL, LDL, VLDL, chylomicrons) b. β-oxidation and de-novo synthesis of fatty acids: Ketone bodies: synthesis, utilization, and clinical significance c. Biological significance of cholesterol, lipid profile, and its clinical significance d. Disorders associated with lipid metabolism: Hyperlipidaemias and hypercholesterolemia, lipid storage diseases, atherosclerosis, fatty liver disease, and obesity.	7 Hours
4	Amino acids and protein metabolism a. Classification and Biological Functions: Classification and physiological roles of amino acids. Structure and functions of proteins and plasma proteins b. General Metabolism of Amino Acids: Transamination, oxidative and non-oxidative deamination, decarboxylation. Urea cycle – nitrogen disposal and detoxification. Fate of carbon skeletons of amino acids (glucogenic vs ketogenic). c. Catabolism of Specific Amino Acids and Related Disorders: Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, Alkaptonuria, Tyrosinemia) and inborn errors of branched chain and aromatic amino acids d. Biochemical significance of neurotransmitters and hormones derived from amino acids: 5-HT (serotonin), melatonin, dopamine, noradrenaline, adrenaline e. Catabolism of heme and related disorders (jaundice).	10 Hours
5	a. Nucleic acid metabolism and genetic information transfer a. Nucleotide Metabolism and their related disorders: Biosynthesis of purine and pyrimidine nucleotides. Catabolism of purine nucleotides (uric acid formation). Clinical significance of Hyperuricemia and Gout. b. Genome Structure and Central Dogma: Organization of the mammalian genome. Introduction to DNA replication, Transcription, and Translation. b. Genetic Code and Regulation of Protein Synthesis: Properties of the genetic code: Inhibitors of transcription and translation (antibiotics, toxins) c. DNA Repair and Related Disorders: DNA damage types, Repair	8 Hours

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Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

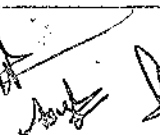
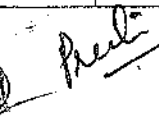
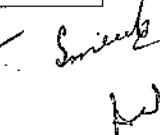
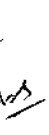
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	1	-	1	3	1	-
CO2	3	2	2	-	-	-	-	-	1	-	1	3	1	-
CO3	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO4	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO5	3	3	3	-	1	-	1	-	2	-	1	3	2	-
Average	3.0	2.6	2.0	0.0	0.6	0.0	0.2	0.0	1.6	0.0	1.0	3.0	1.6	0.0

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Nervous System a) Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse and neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem and cerebellum). spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity). b) Pathophysiology of epilepsy, Parkinson's disease, stroke, migraine, depression, schizophrenia, Alzheimer's disease and meningitis.	14 Hours
2	Gastrointestinal System a. Anatomy of GI tract with special reference to anatomy and functions of stomach (acid production in the stomach and its regulation through parasympathetic nervous system; role of pepsin in protein digestion). Anatomy and functions of small intestine and large intestine. Anatomy and functions of salivary glands, pancreas and liver. Movements of GIT, digestion and absorption of nutrients. b. Pathophysiology of inflammatory bowel diseases, peptic ulcer, jaundice, hepatitis, typhoid and alcoholic and non alcoholic fatty liver disease	12 Hours
3	a. Respiratory System Anatomy of respiratory system with special reference to anatomy of lungs. Mechanism of respiration and regulation of respiration. Lung volumes and capacities, transport of respiratory gases, artificial respiration and resuscitation methods. b. Pathophysiology of asthma, chronic obstructive pulmonary diseases and tuberculosis. c. Urinary System	12 Hours

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	Anatomy of urinary tract with special reference to anatomy of kidney and nephrons. Functions of kidney and urinary tract. Physiology of urine formation, micturition reflex and role of kidneys in acid-base balance. Role of Renin Angiotensin Aldosterone System in kidney. d. Pathophysiology of acute and chronic renal failure and urinary tract infections.	
4	Endocrine System a. Classification of hormones and mechanism of hormone action. Structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland and thymus. b. Pathophysiology of diabetes, hypothyroidism, hyperthyroidism, goitre and polycystic ovary syndrome.	10 Hours
5	Reproductive System and Cancer a. Anatomy of male and female reproductive system. Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition. b. Pathophysiology of sexually transmitted diseases: AIDS, syphilis and gonorrhea. c. Etiology and pathogenesis of cancer.	12 Hours

Recommended References (Preferably latest editions):

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

BPT204T: Pharmaceutical Organic Chemistry (Theory)	
Course Type	Core
Pre-requisite Subject	Chemistry
Contact hours/week	Lecture: 4
No of Credits	4
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Develop a clear understanding of the chemistry of saturated hydrocarbons. 2. Study the chemistry and reactions of unsaturated hydrocarbons. 3. Understand the chemistry and reaction mechanisms of alkyl halides. 4. Explain the chemistry of aromatic hydrocarbons and their derivatives.

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	5. Provide an understanding of carbonyl compounds and fundamental organic reaction mechanisms relevant to pharmaceuticals.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Describe the chemical reactions and mechanisms of aliphatic saturated hydrocarbons. 2. Explain the reactions and mechanisms of aliphatic unsaturated hydrocarbons. 3. Understand nucleophilic substitution and elimination reactions of alkyl halides. 4. Explain electrophilic aromatic substitution reactions and the effect of substituents. 5. Apply knowledge of carbonyl compounds and reaction mechanisms in pharmaceutical chemistry.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	25	15	
100	40		60

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	1	-	-	-	-	-	1	3	-	2
CO2	3	2	1	-	1	-	-	-	-	-	1	3	-	2
CO3	3	3	1	-	1	-	-	-	-	-	1	3	-	2
CO4	3	3	1	-	2	-	-	-	-	-	1	3	-	2
CO5	3	3	2	-	2	-	-	-	-	-	1	3	-	3
Average	3.0	2.6	1.2	0.0	1.4	0.0	0.0	0.0	0.0	0.0	1.0	3.0	0.0	2.2

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Aliphatic Saturated Hydrocarbons Alkanes: Methods of preparation: Wurtz reaction, Kolbe's reaction, Clemmensen reduction, Wolff-Kishner reduction, Chemical reactions of alkanes, Mechanism of free radical substitution (halogenation), Pharmaceutical applications of alkanes: Liquid paraffin, soft paraffin, hard paraffin Cycloalkanes: Baeyer's strain theory and its limitations, Coulson-Moffitt modification, Sachse-Mohr theory	12 Hours
2	Aliphatic Unsaturated Hydrocarbons Alkenes: Methods of preparation: Dehydration of alcohols, Dehydrohalogenation of alkyl halides, Dehalogenation of vicinal dihalides, Wittig reaction, Chemical reactions of alkenes, Mechanism of electrophilic addition reactions, Markovnikov's and anti-Markovnikov's rule, Ozonolysis	12 Hours

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	Conjugated Dienes: Stability of conjugated dienes, Mechanism of Diels–Alder reaction Electrophilic and free radical addition reactions, 1,2- and 1,4-addition reactions.	
3	Alkyl Halides: Nucleophilic substitution reactions: SN1 and SN2 o Mechanism, kinetics, substrate structure, solvent effect, stereochemistry, Elimination reactions: E1 and E2 o Mechanism, kinetics, substrate structure, solvent effect, stereochemistry, Zaitsev's (Saytzeff's) rule with examples, Comparison of substitution vs elimination reactions	12 Hours
4	Benzene and Its Derivatives: IUPAC nomenclature of mono- and di-substituted benzene derivatives, Structure of benzene, Molecular orbital picture and resonance, Aromaticity and Hückel's rule, Electrophilic aromatic substitution reactions: Nitration, Halogenation, Friedel–Crafts alkylation and its limitations, Friedel–Crafts acylation, Sulphonation and desulphonation Effect of substituents on reactivity and orientation	12 Hours
5	Carbonyl Compounds - Aldehydes and Ketones Preparation and properties of carbonyl compounds, Nucleophilic addition reactions, Aldol condensation and crossed aldol condensation, Cannizzaro and crossed Cannizzaro reactions, Benzoin and Perkin condensation, Oxidation and reduction reactions, pharmaceutical applications of carbonyl compounds: Chloral, Paraldehyde, Ketoprofen	12 Hours

Recommended References (Preferably latest editions):

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

BPT205T: Pharmacognosy and Phytochemistry (Theory)	
Course Type	Core
Pre-requisite Subject	Biology
Contact hours/week	Lecture: 4
No of Credits	4
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Understand major metabolic pathways and the biogenetic origin of primary and secondary phytoconstituents, including the use of modern tools for pathway studies. 2. Study and interpret the pharmacognostic features of crude drugs containing primary metabolites such as carbohydrates, proteins/enzymes, and lipids. 3. Study and interpret the pharmacognostic features of crude drugs containing secondary metabolites such as alkaloids, glycosides, tannins, resins, volatile oils, flavonoids, phenolics, and terpenoids. 4. Impart knowledge of conventional and modern extraction

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Anju Verma

	techniques and enable selection of appropriate extraction methods. 5. Develop competency in isolation, identification, characterization, and quality evaluation of medicinal plants and botanicals.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Describe biosynthetic pathways and genetic tools involved in phytoconstituent production 2. Classify and explain drugs containing primary and secondary metabolites. 3. Apply traditional and modern extraction and isolation methods. 4. Explain qualitative and quantitative analysis of plant metabolites. 5. Evaluate identity, purity, and quality of herbal raw materials.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	25	15	
100	40		60

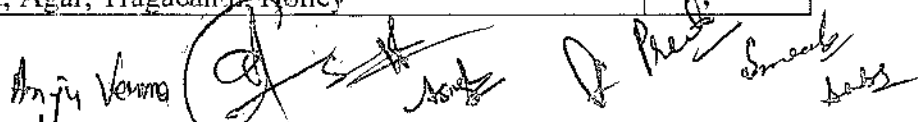
CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	-	-	-	-	1	1	3	-	2
CO2	3	2	1	-	1	-	-	-	1	1	1	3	1	2
CO3	3	3	3	-	2	-	-	-	-	1	1	3	-	3
CO4	3	3	3	-	2	-	-	-	-	-	1	3	-	3
CO5	3	3	3	-	2	-	-	-	1	2	1	3	1	3
Average	3.0	2.6	2.2	0.2	1.8	0.0	0.0	0.0	0.4	1.0	1.0	3.0	0.4	2.6

3 = High, 2 = Moderate, 1 = Low

Course Content

Unit No	Topic	No. of Lectures
1	Metabolic Pathways and Biogenetic Studies Brief study of basic metabolic pathways and biosynthesis of secondary metabolites including: • Shikimic acid pathway • Acetate pathway • Amino acid pathways Utilization of radioactive isotopes in biogenetic studies. Introduction to pathway prediction tools and modern genetic tools such as CRISPR/Cas9.	10 Hours
2	Primary Metabolites – General classification and identification tests, Pharmacognostic study (biological source, distribution, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: Carbohydrates: Acacia, Agar, Tragacanth, Honey	12 Hours



	Proteins and Enzymes: Gelatin, Casein, Proteolytic enzymes: Papain, Bromelain, Serratiopeptidase, Urokinase, Streptokinase, Pepsin Lipids (Waxes, Fats, Fixed Oils): Castor oil, Olive oil, Cocoa butter, Wool fat, Beeswax	
3	Secondary Metabolites – General classification and identification tests Pharmacognostic study (biological source, distribution, cultivation of underlined drugs, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: Alkaloids: Vinca, Rauwolfia, Opium Volatile Oils: Lemongrass, Clove, Cinnamon, Fennel Tannins: Myrobalans, Catechu, Pomegranate Resins: Guggul, Asafoetida Glycosides: Senna, Liquorice, Digitalis Phenylpropanoids and Flavonoids: Green Tea, Ginkgo, Flax seed Iridoids, Other Terpenoids and Naphthoquinones: Gentian, Artemisia	12 Hours
4	Extraction Methods for Medicinal Plants Conventional Methods of Extraction: Infusion, Decoction, Digestion, Maceration, Percolation, Reflux, Distillation, Soxhlet extraction, Successive solvent extraction Modern Methods of Extraction: Supercritical fluid extraction, Microwave-assisted extraction, Ultrasonic-assisted extraction, Enzyme-assisted extraction, Pressurized liquid extraction	12 Hours
5	Overview of Isolation, Identification and Characterization Techniques Separation and Isolation Techniques: Planar chromatography, Column chromatography, Preparative TLC, Flash chromatography Identification Techniques: Phytochemical tests, Chromatographic techniques, Spectroscopic techniques Fingerprinting of medicinal plants using TLC/HPTLC. Types and significance of markers (phytochemical reference standards). Screening and analysis of major metabolites: Alkaloids, Glycosides, Saponins, Tannins, Resins, Flavonoids, Phenolics, Steroids	14 Hours

Recommended References (Preferably latest editions):

1. Dewick, P.M., Medicinal Natural Products: A Biosynthetic Approach. John Wiley & Sons.
2. Evans, W.C., Trease and Evans' Pharmacognosy. W.B. Saunders & Co., London.
3. Wagner, H., and Bladt, S., Plant Drug Analysis: A Thin Layer Chromatography Atlas. Springer-Verlag.
4. Harborne, J.B., Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Chapman & Hall.

BPT206T: Physical Pharmaceutics (Theory)		
Course Type	Core	
Pre-requisite Subject	Physics, Chemistry	
Contact hours/week	Lecture: 3	
No of Credits	3	
Course Assessment	Continuous assessment attendance, home assignments, quizzes and one	

Methods	minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Provide a comprehensive understanding of the theory and principles of pharmaceutical processes and unit operations involved in drug manufacturing. 2. Impart knowledge of physicochemical phenomena such as solubility, dissolution, interfacial phenomena, rheology, and micromeritics relevant to dosage form design. 3. Develop understanding of colloidal and coarse dispersions, including suspensions and emulsions, and their pharmaceutical applications. 4. Familiarize students with rheological and micromeritic properties of powders and dispersions and their role in formulation development and evaluation. 5. Build a strong foundation for formulation development, process optimization, and quality control of pharmaceutical dosage forms.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Explain and interpret the fundamental principles governing pharmaceutical manufacturing processes and unit operations. 2. Analyze physicochemical properties of drugs and excipients and correlate them with formulation stability, quality, and performance. 3. Apply concepts of interfacial phenomena, colloids, and dispersions in the design and evaluation of pharmaceutical dosage forms. 4. Evaluate and optimize pharmaceutical processes by controlling variables related to rheology, micromeritics, and dispersion systems. 5. Demonstrate foundational competency required for advanced studies in formulation development, industrial pharmacy, and pharmaceutical research.

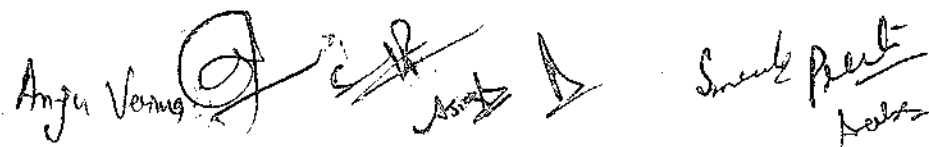
Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	15	15	
75	30		45

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	-	-	1	3	-	3
CO2	3	3	2	-	2	-	-	-	-	-	1	3	-	3
CO3	3	3	3	-	2	-	-	-	-	-	1	3	-	3
CO4	3	3	3	1	2	-	-	-	-	-	1	3	-	3
CO5	3	2	2	-	3	-	-	-	-	-	2	3	-	3
Average	3.0	2.6	2.4	0.2	2.0	0.0	0.0	0.0	0.0	0.0	1.2	3.0	0.0	3.0

3 = High, 2 = Moderate, 1 = Low



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Course Content

Unit No	Topic	No. of Lectures
1	Solubility distribution phenomenon & buffers Solubility expression, Solute solvent interactions, Solubility of liquid and liquids, Solubility of solids and liquids, Solubility of Gas in Liquids, Raoult's Law. Factors affecting solubility, Measurement of saturation Solubility, Effect of pH on solubility, Partition Coefficient – Measurement and significance, Critical Solution Temperature and Applications. Introduction to buffers, Buffers in pharmaceutical and biological system, pH determination methods (Electrometry and colorimetry). Buffer equation / Factor influencing the pH of buffer solutions, Factor influencing Buffer capacity, General procedure for preparing buffers, Indicators.	9 Hours
2	Interfacial phenomenon Liquid interface Surface and interfacial tension, surface free energy, Measurement of surface and interfacial tension, Spreading coefficient, surface active agent, HLB, detergency, types of monolayers at liquid surface. Adsorption at solid interface, Liquid Interface (contact angle, activated charcoal and Wetting). Adsorption of surface-active agents. Electric properties of interface / Electric double layer, Nernst and zeta potential effect of electrolytes	8 Hours
3	Colloidal and Coarse Dispersion Colloidal dispersions: Types of colloidal dispersions (Lyophobic, Lyophilic, Association colloids), Optical properties of colloids, Kinetic properties of colloids, Electrical properties of colloids, Size and shape of colloidal systems, Stability of colloidal system (peptization and protective action), Application of Colloidal System. Coarse Dispersions: Suspensions, Stokes law (Theory of sedimentation), Effect of Brownian movement / Sedimentation of flocculated particles, sedimentation parameters. Flocculation and controlled structure flocculation. Theories of emulsification and stabilization (DLVO Theory, Monomolecular adsorption, Multimolecular adsorption, Film formation, Solid particle adsorption). Physical instabilities of emulsions (creaming, coalescence and breaking, and phase inversion).	12 Hours
4	Rheological studies Newtonian systems and non-Newtonian systems. Thixotropy – measurement / Bulges and spurs. Negative thixotropy, Determination of rheological properties (Viscometers / single and multi-point). Viscoelasticity, psycho-rheology. Applications of rheology in pharm	8 Hours
5	Micromeritics Particle size and size distribution, Particle Shape and Surface area: Methods for determination and significance. Flow properties of powders: determination, significance and methods of enhancement. Advanced flow properties of powders (Powder flow tester).	8 Hours

Recommended References (Preferably latest editions):

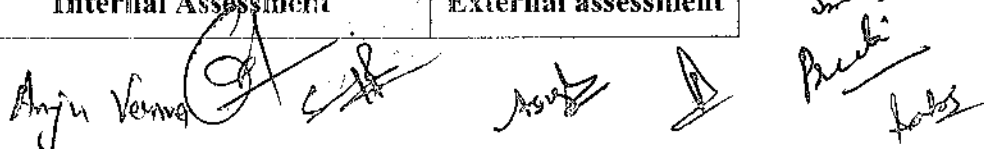
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1. Sinko, P.J., Martin's Physical Pharmacy and Pharmaceutical Sciences.
2. Allen, L.V. and McPherson, T.B., Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems.
3. Adejare, A., Remington: The Science and Practice of Pharmacy.
4. Aulton, M.E. and Taylor, K.M.G., Aulton Pharmaceutics: The Design and Manufacture of Medicines. Elsevier.
5. Lachman, L. and Libbermann, H.A., The Theory and Practice of Industrial Pharmacy. Mendham, J., Denney, R.C., Barnes, J.D. and Thomas, M.J.K., Vogel's Textbook of Quantitative Chemical Analysis.
6. Myers, D., Surfaces, Interfaces, and Colloids: Principles and Applications. Ladisch, M.R., Rheology of Fluid and Semisolid Foods. Springer.

BFT207P: Biochemistry (Practical)	
Course Type	Core
Pre-requisite Subject	Biology, Chemistry
Contact hours/week	Practical: 3
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. To develop skills to identify and differentiate carbohydrates and proteins through classical qualitative biochemical tests. 2. To apply biochemical techniques for analysis of pathological conditions using urine and blood samples. 3. To perform estimations of clinically important biomolecules such as glucose, cholesterol, urea, creatinine, uric acid, and proteins in biological fluids. 4. To demonstrate enzymatic activity and study factors affecting enzyme function, including substrate concentration and temperature. 5. To interpret biochemical results and correlate them with clinical conditions such as diabetes, renal dysfunction, and lipid disorders.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Identify proteins and carbohydrates using qualitative biochemical tests and explain their physiological relevance. 2. Detect normal and abnormal constituents in urine and interpret their diagnostic significance. 3. Estimate and interpret levels of glucose, cholesterol, urea, creatinine, uric acid, and serum proteins, and correlate results with clinical conditions. 4. Demonstrate enzyme-substrate reactions and evaluate the effect of temperature and substrate concentration on enzymatic activity. 5. Analyze, record, and report biochemical results accurately and relate practical findings to theoretical knowledge and clinical application.

Scheme of Assessment

Max Marks	Internal Assessment	External assessment
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	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	1	-	-	-	1	-	1	3	2	-
CO2	3	3	3	-	1	-	-	-	2	-	1	3	3	-
CO3	3	3	3	-	2	-	-	-	2	-	1	3	3	-
CO4	3	2	3	-	2	-	-	-	1	-	1	3	2	1
CO5	2	3	3	-	2	-	1	-	2	-	1	3	2	1
Average	2.8	2.6	3.0	0.0	1.6	0.0	0.2	0.0	1.6	0.0	1.0	3.0	2.4	0.4

3 = High, 2 = Moderate, 1 = Low

List of Practical's:

(Minimum 12 experiments must be performed)

1. Identification tests for proteins (Albumin and Casein).
2. Qualitative analysis of carbohydrates* (Glucose, Fructose, Lactose, Sucrose, and Starch).
3. Qualitative analysis of urine for normal and abnormal constituents.
4. 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. Study of the effect of substrate concentration on salivary amylase activity.
11. Estimation of hemoglobin in blood by Sahli's method / Cyanmethemoglobin method.
12. Estimation of serum bilirubin (total and direct bilirubin).
13. Estimation of glycogen content
14. Estimation of SGOT and SGPT

Recommended References (Preferably latest editions):

1. Plummer, D. T. An Introduction to Practical Biochemistry. McGraw-Hill, New York.
2. Wilson, K., and Walker, J. Principles and Techniques of Biochemistry and Molecular Biology. Cambridge University Press.
3. Varley, H., Gowenlock, A. H., Bell, M., and Bell, J. L. Varley's Practical Clinical Biochemistry. Heinemann Medical Books.
4. Burtis, C. A., Ashwood, E. R., and Bruns, D. E. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Elsevier.
5. Rodwell, V. W., Bender, D. A., Botham, K. M., Kennelly, P. J., and Weil, P. A. Harper's Illustrated Biochemistry. McGraw-Hill.
6. Freifelder, D. Essential Molecular Biology: A Practical Approach. Oxford University Press.

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BPT208P: Human Anatomy, Physiology and Pathophysiology II (Practical)	
Course Type	Core
Pre-requisite Subject	Biology
Contact hours/week	Practical: 3
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Provide foundational knowledge of the structure and functions of major organ systems of the human body. 2. Develop understanding of physiological mechanisms responsible for maintenance of homeostasis. 3. Explain the pathophysiology of diseases affecting different organ systems. 4. Explore causes of diseases and the body's responses to pathological conditions. 5. Build a strong base for clinical learning through the study of functional and structural changes in disease states.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Explain the gross morphology, structures, and functions of various organs and organ systems of the human body. 2. Demonstrate basic emergency response procedures such as cardiopulmonary resuscitation (CPR). 3. Describe the etiology and pathogenesis of selected disease states. 4. Identify signs and symptoms, risk factors, diagnostic methods, prevention, treatment strategies, and complications of diseases. 5. Understand coordinated working patterns of different organs of each system and perform experiments related to special senses and nervous system.

Scheme of Evaluation

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	1	-	1	3	1	-
CO2	2	2	3	-	-	1	1	-	3	-	1	2	3	-
CO3	3	3	2	-	1	-	-	-	2	-	1	3	2	-
CO4	3	3	2	-	1	-	1	-	3	-	1	3	3	-
CO5	3	2	3	-	1	-	-	-	1	-	1	3	2	-
Average	2.8	2.4	2.4	0.0	0.6	0.2	0.4	0.0	2.0	0.0	1.0	2.8	2.2	0.0

3 = High, 2 = Moderate, 1 = Low

List of Practical's:

(Minimum 12experiments must be performed)

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Practical HAPP allows the verification of physiological processes discussed in theory classes through experiments on living tissues, simulated videos, models, and charts.

1. Study of nervous system using specimens and models.
2. Study of respiratory system using models.
3. Study of gastrointestinal system using models.
4. Study of reproductive system using models.
5. Demonstration of general neurological examination.
6. Demonstration of function of olfactory nerve.
7. Examination of different types of taste.
8. Demonstration of visual acuity.
9. Demonstration of reflex activity.
10. Recording of body temperature.
11. Determination of tidal volume and vital capacity.
12. Recording of body mass index (BMI).
13. Study of family planning devices and pregnancy diagnosis tests.
14. Understanding pathophysiology of IBD, peptic ulcer, jaundice, hepatitis, typhoid, asthma, tuberculosis, diabetes, and thyroid disorders through case files / case reports.
15. Hands-on training in cardiopulmonary resuscitation (CPR).

Recommended References (Preferably latest editions):

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

BPT209P: Pharmaceutical Organic Chemistry (Practical)	
Course Type	Core
Pre-requisite Subject	Chemistry
Contact hours/week	Practical: 3
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Understand and follow essential laboratory safety protocols for handling chemicals, glassware, and equipment. 2. Identify and analyze organic compounds through their physical properties and functional group reactivity. 3. Apply ball-and-stick molecular models to visualize and interpret the structure of organic compounds. 4. Perform purification techniques such as crystallization to isolate and refine organic substances.

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	5. Synthesize simple organic compounds and their derivatives using standard laboratory methods.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Recall and outline the preliminary qualitative tests used for identifying waterinsoluble and immiscible organic compounds. 2. Understand the synthesis methods for preparing simple organic compounds and their derivatives. 3. Apply crystallization techniques to purify organic compounds effectively. 4. Analyze experimentally to detect elements and functional groups to identify unknown organic compounds. 5. Interpret and analyze organic compounds through systematic qualitative analysis to confirm their chemical nature.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	1	3	-	1
CO2	3	2	3	-	1	-	-	-	-	-	1	3	-	2
CO3	2	3	3	-	1	-	-	-	-	-	1	3	-	2
CO4	3	3	3	-	2	-	-	-	-	-	1	3	-	3
CO5	3	3	3	-	2	-	-	-	-	-	1	3	-	3
Avg.	2.8	2.6	2.8	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.0	3.0	0.0	2.2

3 = High, 2 = Moderate, 1 = Low

List of Practical's:

(Minimum 12 experiments must be performed)

- Systematic qualitative analysis of minimum of five water-insoluble or waterimmiscible unknown organic compounds from different chemical classes:**
 - a. Preliminary tests: Color, odour, Solubility tests, test for aromaticity, test for saturation/unsaturation etc.
 - b. Detection of elements such as nitrogen, sulphur and halogens by Lassaigne's test
 - c. Determination of Functional group tests such as phenols, amides, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons and nitro compounds.
 - d. Preparation of the derivatives and confirmation of the unknown organic compound by melting point / boiling point.
- Building Molecular Models:** Students will use ball-and-stick models to create structures of molecules and understand their shapes and bonding.
- Crystallization Method** Students will learn how to purify three organic compounds using the crystallization technique.



 Anju Verma, Anshu, Anshu, Anshu, Anshu, Anshu

Recommended References (Preferably latest editions):

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

BPT210P: Pharmacognosy and Phytochemistry (Practical)	
Course Type	Core
Pre-requisite Subject	Biology
Contact hours/week	Practical: 3
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major theory and practical test.
Course Objectives	The objectives of this course are to: 1. Perform chemical tests for the identification of gums, resins, oils, fats, waxes, and unorganized drugs. 2. Examine crude drugs using transverse section and powder microscopy for correct identification. 3. Apply suitable extraction techniques and study their effect on yield of crude extracts. 4. Isolate and identify important phytoconstituents and volatile oils using standard procedures. 5. Evaluate herbal raw materials collected from field/market sources as per Pharmacopoeial standards.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Recall and outline the preliminary qualitative tests used for identifying waterinsoluble and immiscible organic compounds. 2. Analyze organized crude drugs through microscopy and powder analysis. 3. Select and perform appropriate extraction methods for herbal drugs. 4. Isolate and characterize phytoconstituents using laboratory techniques and TLC. 5. Assess and compare the quality and purity of herbal raw materials with official standards.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

50	20
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CO-PO/PSO mapping (1 to 3 scale)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	1	3	-	1
CO2	3	3	3	-	1	-	-	-	-	-	1	3	-	2
CO3	3	2	3	-	1	-	-	-	-	1	1	3	-	3
CO4	3	3	3	1	2	-	-	-	-	-	1	3	-	3
CO5	3	3	3	-	2	-	-	-	1	2	1	3	1	3
Avg.	2.8	2.6	2.8	0.2	1.2	0.0	0.0	0.0	0.2	0.6	1.0	3.0	0.2	2.4

3 = High, 2 = Moderate, 1 = Low

List of Practical's:

(Minimum 12 experiments must be performed)

1. Chemical tests for identification of Agar, Acacia, Tragacanth, Honey.
2. Chemical tests for identification of Castor oil, Olive oil, Wool fat, Beeswax.
3. Chemical tests for identification of Asafoetida, Catechu, Aloe.
4. Transverse section and powder microscopy of a vinca leaf.
5. Transverse section and powder microscopy of a cinnamon bark.
6. Transverse section and powder microscopy of a fennel fruit.
7. Transverse section and powder microscopy of a clove flower bud.
8. Transverse section and powder microscopy of a Tulsi stem.
9. Transverse section and powder microscopy of a Liquorice roots.
10. Study of effect on different extraction techniques on yield of crude extract (maceration, decoction, soxhlation).
11. Isolation of volatile oil and it's TLC.
12. Isolation of caffeine from tea.
13. Isolation of Hesperidin from lemon peel.
14. Isolation of Glycyrrhizin from liquorice roots.
15. Isolation of Pectin from orange peel.
16. Experiential learning-based experiment involving evaluation and comparison of field/market collected herbal raw materials with Pharmacopoeial standards.

Recommended References (Preferably latest editions):

1. Trease, G. E. and Evans, W. C. Pharmacognosy. Elsevier.
2. Harborne, J. B. Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Springer.
3. Wallis, T. E. Textbook of Pharmacognosy. CBS Publishers & Distributors, New Delhi.
4. Tyler, V. E., Brady, L. R. and Robbers, J. E. Pharmacognosy. Lea & Febiger.

BPT211P: Physical Pharmaceutics (Practical)	
Course Type	Core
Pre-requisite Subject	Physics, Chemistry
Contact hours/week	Practical: 3
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major practical test.
Course Objectives	The objectives of this course are to: 1. Introduce basic laboratory techniques for determining physicochemical properties such as surface tension, viscosity,

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	and density in pharmaceutical systems. 2. Develop understanding of interfacial phenomena and surfactant behavior, including micelles, critical micellar concentration (CMC), and HLB in formulation design. 3. Train students in evaluating disperse systems through sedimentation studies and the effect of suspending agents. 4. Provide practical experience in powder characterization, including particle size distribution, density, flow properties, porosity, and the role of glidants. 5. Develop skills in determining solubility, partition coefficient, buffer capacity, and related equilibria relevant to drug formulation.
Course Outcome	Upon successful completion of this course, the students will be able to: 1. Demonstrate practical knowledge of principles and procedures involved in measuring surface tension, viscosity, density, and related physical properties using standard laboratory apparatus. 2. Determine and interpret surfactant-related parameters such as CMC and HLB and explain their significance in formulation stability and performance. 3. Conduct experiments and analyze results related to sedimentation volume and evaluate the influence of type and concentration of suspending agents on dispersion stability. 4. Evaluate micromeritic and flow properties of powders by determining particle size distribution, bulk density, tapped density, Hausner ratio, Carr's index, angle of repose, true density, and porosity, and interpret the effect of glidants. 5. Perform and assess experiments on solubility, partition coefficient, critical solution temperature, adsorption studies, and buffer capacity, and apply findings to formulation decisions.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	1	1	-	-	-	-	-	1	3	-	3
CO2	3	3	3	1	2	-	-	-	-	-	1	3	-	3
CO3	3	3	3	-	2	-	-	-	-	-	1	3	-	3
CO4	3	3	3	1	2	-	-	-	-	-	1	3	-	3
CO5	3	3	3	1	3	-	-	-	-	-	1	3	-	3
Avg.	3.0	2.8	3.0	0.8	2.0	0.0	0.0	0.0	0.0	0.0	1.0	3.0	0.0	3.0

3 = High, 2 = Moderate, 1 = Low

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List of Practical's:

(Minimum 12 experiments must be performed)

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

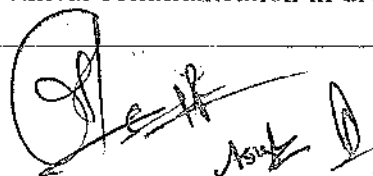
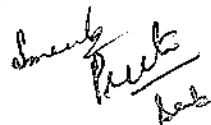
Note: Compare the values of various physicochemical properties with marketed formulations wherever possible.

Recommended References (Preferably latest editions):

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.

BPT212P SEC1: Communication Skill (Practical)	
Course Type	Elective
Pre-requisite Subject	English
Contact hours/week	Practical: 2
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major practical test.
Course Objectives	The objectives of this course are to: 1. Enhance verbal and non-verbal communication skills in academic, clinical, and professional pharmacy settings. 2. Develop competence in patient counselling, prescription communication, and interprofessional dialogue. 3. Promote empathetic and ethical communication in diverse cultural and patient contexts.

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	4. Use digital tools and professional formats (e.g., email, reports, posters) for effective communication. 5. Foster confidence, active listening, and clarity in pharmacy-related presentations and conversations.
Course Outcome	Upon successful completion of this course, the students will be able to 1. Demonstrate effective verbal and non-verbal communication in clinical, retail, and academic pharmacy contexts. 2. Perform patient counselling and handle real-world pharmacy interactions using role play and case scenarios. 3. Draft professional emails, prepare patient information leaflets, and create drug labels with clarity and accuracy. 4. Deliver confident oral presentations and communicate complex medical information in a simplified, patient-friendly manner. 5. Apply principles of ethical and culturally sensitive communication in handling patients and professional peers.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	—	—	3	3	—	2	2	3	2
CO2	2	3	2	1	2	—	—	3	3	—	2	2	3	2
CO3	2	2	2	1	2	—	—	3	3	—	2	2	3	2
CO4	2	2	2	1	2	—	—	3	3	—	2	2	3	2
CO5	1	2	1	2	2	—	—	3	3	—	3	2	3	2
Avg.	1.8	2.2	1.6	1.2	1.8	0.0	0.0	3.0	3.0	0.0	2.2	2.0	3.0	2.0

3 = High, 2 = Moderate, 1 = Low

List of practical

(Perform any 12 Experiments)

- Introduction to Communication in Pharmacy
 - Types of communication: verbal, non-verbal, written
 - Importance in clinical, academic, and retail pharmacy
- Listening and Observation Skills Workshop
 - Active listening techniques, barriers to listening
 - Observation of cues: patient posture, tone, compliance
- Role-play: Communicating with a Patient for Dispensing a Prescription
 - Explanation of dosage, frequency, side effects, and precautions
- Role-play: Handling Difficult Conversations (e.g., Angry Patient or Confused Elderly)
 - Empathy, patience, tone modulation, de-escalation techniques
- Written Communication I: Professional Email Writing & Documentation
 - Writing emails to doctors, suppliers, institutions
 - Structure, etiquette, and clarity in pharmacy communications
- Written Communication II: Preparing Patient Information Leaflets and Drug Labels

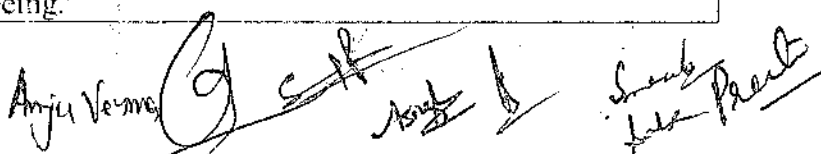
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- Use of simple language, drug facts, precautions, icons
- Creating flyers for common conditions (e.g., diabetes, asthma)
- 7. Non-verbal Communication Skills
 - Body language, eye contact, gestures, tone of voice
 - Cross-cultural sensitivity in pharmacy communication
- 8. Presentation Skills I – Basic Techniques
 - Voice projection, clarity, use of visuals
 - Individual practice with simple pharmacy topics
- 9. Presentation Skills II – Group Presentations
 - Topics: health awareness campaigns, drug education, OTC safety
 - Peer and faculty feedback
- 10. Patient Counseling Practice (Case-Based)
 - Counseling for chronic illness (e.g., hypertension, diabetes)
 - Role-playing real-life counseling situations
- 11. Communicating with Healthcare Professionals
 - Case handoff, drug information request, referral writing
 - Using SBAR (Situation, Background, Assessment, Recommendation) format
- 12. Mock Interview / Group Discussion Practice
 - Industry/clinical job interview scenarios
 - GD on topics like “Generic vs Branded Medicines”
- 13. Digital Communication Skills for Pharmacists
 - Creating a simple health blog, social media awareness post
 - Basics of teleconsultation and ePharmacy chat support
- 14. Ethics and Professionalism in Communication
 - Confidentiality, patient rights, informed consent
 - Role-play ethical dilemmas in pharmacy
- 15. Assessment & Reflection
 - Final presentation or counseling demo
 - Feedback, self-evaluation, and faculty observation

Recommended References (Preferably latest edition):

1. Communication Skills in Pharmacy Practice – E. M. Kelly & S. L. Svarstad, Lippincott Williams & Wilkins
2. Developing Communication Skills for Pharmacy – Catherine Langford, Pharmaceutical Press
3. Patient Counselling Guidelines for Pharmacists – WHO India, World Health Organization

BPT212P SEC2: Mental Well-Being, Stress and Conflict Management (Practical)	
Course Type	Elective
Pre-requisite Subject	--
Contact hours/week	Practical: 2
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major practical test.
Course Objectives	The objectives of this course are to: 1. Introduce students to the concepts of mental well-being and stress. 2. Equip students with techniques to manage stress, anxiety, and emotional well-being.



	3. Develop conflict resolution skills for personal and professional life. 4. Encourage emotional intelligence and interpersonal communication. 5. Promote resilience and positive mindset development.
Course Outcome	Upon successful completion of this course, the students will be able to 1. Identify sources and effects of stress in personal and professional life. 2. Apply stress management techniques such as mindfulness, journaling, and relaxation exercises. 3. Utilize conflict management strategies to resolve interpersonal and workplace conflicts. 4. Demonstrate improved emotional intelligence and resilience. 5. Develop effective communication skills for personal and professional growth.

Scheme of Assessment

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	2	-	-	-	2	2	1	1	-	3	-	2	-
CO2	-	2	1	-	-	2	2	1	1	-	3	-	2	-
CO3	-	3	1	-	-	2	3	3	1	-	2	-	2	1
CO4	-	2	1	-	-	3	2	2	1	-	3	-	2	-
CO5	-	2	1	-	-	2	3	2	1	-	3	-	2	1
Avg.	0.0	2.2	0.8	0.0	0.0	2.2	2.4	1.8	1.0	0.0	2.8	0.0	2.0	0.4

List of practical

(Perform any 12 Experiments)

1. Self-assessment of stress levels using Perceived Stress Scale (PSS)
2. Journaling activity: Maintain a 7-day emotional diary
3. Mindfulness breathing exercise and reflection
4. Guided meditation session and feedback form
5. Time management activity using Eisenhower Matrix
6. Role-play exercise on workplace conflict resolution
7. SWOT analysis of personal behavior and coping mechanisms
8. Cognitive restructuring worksheet for negative thoughts
9. Group discussion: "How do you respond to stress?"
10. Conflict styles self-test (Thomas-Kilmann Conflict Mode Instrument)
11. Visualization technique to reduce anxiety
12. Progressive muscle relaxation practice
13. Team activity: Building trust through icebreakers and communication
14. Reflection report after practicing gratitude for 5 days
15. Case study analysis: Conflict scenario in a healthcare/pharma setup

Recommended References (Preferably latest edition):

1. The Relaxation and Stress Reduction Workbook – Martha Davis, Elizabeth Robbins Eshelman & Matthew McKay, New Harbinger Publications
2. Managing Stress: Principles and Strategies for Health and Well-Being – Brian Luke Seaward, Jones & Bartlett Learning
3. Emotional Intelligence – Daniel Goleman, Bantam Books
4. The 7 Habits of Highly Effective People – Stephen R. Covey, Simon & Schuster
5. Conflict Management: A Practical Guide to Developing Negotiation Strategies – Barbara A. Budjac Corvette, Pearson Education
6. Mindfulness: An Eight-Week Plan for Finding Peace in a Frantic World – Mark Williams & Danny Penman, Rodale Books
7. Stress Management for Life: A Research-Based Experiential Approach – Michael Olpin & Margie Hesson, Cengage Learning
8. Crucial Conversations: Tools for Talking When Stakes Are High – Kerry Patterson, Joseph Grenny, Ron McMillan & Al Switzler, McGraw-Hill Education

BPT212P SEC3: Fundamentals of Computer Operations (Practical)	
Course Type	Elective
Pre-requisite Subject	--
Contact hours/week	Practical: 2
No of Credits	1
Course Assessment Methods	Continuous assessment attendance, home assignments, quizzes and one minor test, one major practical test.
Course Objectives	The objectives of this course are to: 1. Provide foundational knowledge of computer systems, operating environments, and digital tools used in academic and professional settings. 2. Develop practical skills in digital documentation, data handling, and presentation using commonly available office productivity tools. 3. Familiarize students with file management practices and digital communication methods used in professional environments. 4. Enhance the ability to access, search, and retrieve scientific and academic information from online resources. 5. Prepare students to utilize computer-based tools for managing pharmaceutical data, documentation, and basic professional tasks.
Course Outcome	Upon successful completion of this course, the students will be able to 1. Demonstrate the ability to operate computer systems and perform basic system and file management functions. 2. Prepare and format digital documents and spreadsheets for academic and pharmaceutical applications. 3. Develop presentations and use digital communication tools for effective professional communication. 4. Access and retrieve scientific information using online databases and academic search platforms. 5. Apply basic computer skills for organizing, analyzing, and managing pharmaceutical data and documentation.

Scheme of Assessment



 Anju Verma, [Signature], [Signature], [Signature]

Max Marks	Internal Assessment		External assessment
	Continuous mode	Minor Exam	
	10	10	
50	20		30

CO-PO/PSO mapping (1 to 3 scale)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1	1	2	3	-	-	1	-	-	-	1	1	-	2
CO2	1	2	2	3	1	-	1	-	-	-	1	1	-	2
CO3	1	1	2	3	1	-	3	1	-	-	1	1	1	2
CO4	2	2	1	3	2	-	1	-	-	-	2	1	-	3
CO5	2	2	2	3	2	-	1	-	-	-	2	1	-	3
Avg.	1.4	1.6	1.8	3.0	1.2	0.0	1.4	0.2	0.0	0.0	1.4	1.0	0.2	2.4

3 = High, 2 = Moderate, 1 = Low

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.

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12. Using cloud-based storage platforms for saving, organizing, and sharing academic or pharmacy-related files and data.
13. Exploring digital health technologies such as pharmacy-related mobile applications or electronic health tools used in healthcare practice.
14. Accessing and utilizing online learning platforms for professional education and course materials.
15. Preparing and submitting digital assignments using word-processing, spreadsheet, or presentation tools.

Recommended References (Preferably latest edition):

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

A collection of handwritten signatures and initials in blue ink, located in the bottom right corner of the page. The signatures are written in a cursive, stylized manner. One signature appears to be 'Anju Verma', another 'Sneha', and others are less legible but include 'Ashu' and 'Kashu'.

