



TAKSHASHILA UNIVERSITY

(Tamil Nadu State Private University)
ONGUR, TINDIVANAM TK, VILLUPURAM DT

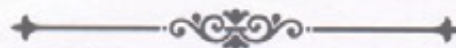
FACULTY OF HEALTH SCIENCES SCHOOL OF PHARMACY

The Regulation for the B. Pharm. Degree Programme Choice Based Credit System (CBCS) as per National Education Policy 2020 of the Pharmacy Council of India, New Delhi

R26

**CURRICULUM & SYLLABI
BACHELOR OF PHARMACY (B. Pharm)**

II SEMESTER



VISION AND MISSION OF UNIVERSITY

VISION :

To inspire, develop and create change makers and world leaders of tomorrow through knowledge similar to the ancient Takshashila University

MISSION :

Nurturing and developing the leaders of tomorrow with the brightest minds and best resources, fostering lifelong learning and ethical excellence.

VISION AND MISSION OF PROGRAMME

VISION :

Our vision is to be a leading institution in pharmacy education, contributing to the advancement of healthcare by training the next generation of pharmacists who are committed to excellence and innovation.

MISSION :

Our mission is to provide world-class pharmacy education that prepares students to become responsible, ethical, and competent pharmacy professionals capable of improving patient health through effective medication management.

PROGRAMME EDUCATIONAL OBJECTIVES

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

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

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

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

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

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

PROGRAMME OUTCOMES (POs)
Bachelor of Pharmacy (B. Pharm)

PO1. Pharmacy Knowledge

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

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

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

PO3. Pharmaceutical Skills & Practice

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

PO4. Modern Tools, AI & Digital Competence

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

PO5. Research & Innovation

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

PO6. Professional Ethics & Human Values

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

PO7. Communication & Interpersonal Skills

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

PO8. Leadership, Management & Entrepreneurship

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

PO9. Pharmacist & Society

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

PO10. Environment and sustainability:

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

PO11. Life-Long Learning & Professional Development

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



**TAKSHASHILA
UNIVERSITY**

(Established under Tamil Nadu State Private Universities Act 2019 &
Recognized by UGC (w 20) of the UGC Act 1956)

Ongur (PO), Tindivanam Taluk, Villupuram District,
Tamil Nadu - 604 305, India.
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CURRICULUM

School : School of Pharmacy
Program : B. Pharm

Batch : 2026 - 2030
Regulation : R26

Sl. No	SEMESTER-II									
	Course			Hr/ Week			Cre -dits	Max. Marks		
	Code	Title	Type							
				L	T	P		IM	ESM	Total
THEORY										
1	BP201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences	Core	2	-	-	2	20	30	50
2	BP202T	Biochemistry	Core	3	-	-	3	30	45	75
3	BP203T	Human Anatomy, Physiology and Pathophysiology II	Core	4	-	-	4	40	60	100
4	BP204T	Pharmaceutical Organic Chemistry	Core	4	-	-	4	40	60	100
5	BP205T	Pharmacognosy and Phytochemistry	Core	4	-	-	4	40	60	100
6	BP206T	Physical Pharmaceutics	Core	3	-	-	3	30	45	75
PRACTICAL										
7	BP207P	Biochemistry	Core	-	-	3	1	20	30	50
8	BP208P	Human Anatomy, Physiology and Pathophysiology II	Core	-	-	3	1	20	30	50
9	BP209P	Pharmaceutical Organic Chemistry	Core	-	-	3	1	20	30	50
10	BP210P	Pharmacognosy and Phytochemistry	Core	-	-	3	1	20	30	50
11	BP211P	Physical Pharmaceutics	Core	-	-	3	1	20	30	50
12	BP212P SEC1	Communication Skills	Elective	-	-	2	1	20	30	50
	BP212P SEC2	Mental Well-Being, Stress & Conflict Management	Elective							
	BP212P SEC3	Fundamentals of Computer Operations	Elective							
Total				37			26	320	480	800

BoS Members

BoS Chairman

BP201T Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)

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

COURSE OBJECTIVES:

The objectives of this course are to:

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

COURSE OUTCOMES (CO):

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

Detailed Syllabus:

Unit No.	Topics	No. of Lectures
I	Descriptive Statistics • Types of data in pharmaceutical sciences (nominal, ordinal, interval, ratio) • Sources of data in pharmacy: clinical trials, pharmacovigilance, quality control, PK studies • Measures of central tendency: mean, median, mode, their calculation and interpretation	6 hours

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	- 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	
II	Probability & Statistical Distributions in Healthcare - Basic probability concepts and laws (addition and multiplication rules), conditional probability and its interpretation - Bayes' theorem and its application in clinical decision-making - Concept of random variables (discrete and continuous) - Normal distribution and its importance in biological and pharmaceutical measurements, - Binomial distribution demonstrating applications in clinical trial outcomes - Poisson distribution for modeling rare events such as adverse drug reactions - Graphical visualization of these probability distributions using Python	6 hours
III	Sampling & Statistical Inference - Population versus sample, sampling techniques used in clinical research, Sampling error and bias - Conceptual understanding of the Central Limit Theorem - Confidence intervals and their interpretation - Hypothesis testing framework (null and alternative hypotheses) - Type I and Type II errors, p-value and statistical significance - Demonstration, calculation and interpretation of these parameters using python with pharmaceutical data	6 hours
IV	Basics of Correlation & Regression Conceptual understanding of the following concepts with emphasis on their interpretation- - correlation and Pearson correlation coefficients - Interpretation of positive and negative correlations - Scatter plots and trend visualization using pharmaceutical data such as dose-response relationships - Simple linear regression concept, interpretation of regression coefficients - Introduction to odds ratio and its application in clinical risk analysis	6 hours
V	Statistical Analysis Using Python – Case based learning - Demonstration of descriptive statistics, correlation analysis and linear regression using Python libraries- SciPy / Statsmodels / Scikit-learn on pharmaceutical datasets - Interpretation of the output summaries and p-values - Preparation of statistical reports	6 hours

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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.

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BP202T Biochemistry (Theory)

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

COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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

Detailed Syllabus:

Unit No.	Topics	No. of Lectures
I	Enzymology a. Introduction, properties, nomenclature, and IUB classification of enzymes and coenzymes. Enzyme kinetics (Michaelis plot, Lineweaver–	10 hours

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	Burk plot). Enzyme inhibitors with examples. Regulation of enzymes: enzyme induction and repression, allosteric enzyme regulation. Therapeutic and diagnostic application of enzymes and isoenzymes. Factors affecting enzyme activity. Digestion, absorption function of dietary Macro and Micronutrients, including Vitamins and Minerals, Biochemical functions of vitamins and associated diseases. b. Clinical Chemistry: Liver function tests (routinely performed tests based on liver function). Renal function tests (routinely performed tests based on kidney function, ELISA test)	
II	a. Introduction about biomolecules – Introduction of carbohydrate, lipids, nucleic acids, amino acids and proteins. b. Bioenergetics: Concept of free energy; relationship between free energy, enthalpy, and entropy; redox potential; energy-rich compounds (ATP, GTP, etc.) and their biological significance. c. Carbohydrate Metabolism and their role in 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.	10 hours
III	Lipid metabolism a. Classification, functions, and properties of lipids and lipoproteins (HDL, LDL, VLDL, chylomicrons) b. β-oxidation and de-novo synthesis of fatty acids: Ketone bodies: synthesis, utilization, and clinical significance c. Biological significance of cholesterol, lipid profile, and its clinical significance d. Disorders associated with lipid metabolism: Hyperlipidaemias and hypercholesterolemia, lipid storage diseases, atherosclerosis, fatty liver disease, and obesity	7 hours
IV	Amino acids and protein metabolism a. Classification and Biological Functions: Classification and physiological roles of amino acids. Structure and functions of proteins and plasma proteins b. General Metabolism of Amino Acids: Transamination, oxidative and non-oxidative deamination, decarboxylation. Urea cycle – nitrogen disposal and detoxification. Fate of carbon skeletons of amino acids (glucogenic vs ketogenic). 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	10 hours

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	d. Biochemical significance of neurotransmitters and hormones derived from amino acids: 5-HT (serotonin), melatonin, dopamine, noradrenaline, adrenaline e. Catabolism of heme and related disorders (jaundice).	
V	Nucleic acid metabolism and genetic information transfer a. Nucleotide Metabolism and their related disorders: Biosynthesis of purine and pyrimidine nucleotides. Catabolism of purine nucleotides (uric acid formation). Clinical significance of Hyperuricemia and Gout. b. Genome Structure and Central Dogma: Organization of the mammalian genome. Introduction to DNA replication, Transcription, and Translation. c. Genetic Code and Regulation of Protein Synthesis: Properties of the genetic code: Inhibitors of transcription and translation (antibiotics, toxins) d. DNA Repair and Related Disorders: DNA damage types, Repair mechanisms. Overview of clinical disorders associated with faulty DNA repair.	8 hours
Recommended References (Preferably latest editions): 1. Nelson, D.L., Cox, M.M. and Hoskins, A., <i>Lehninger Principles of Biochemistry</i>. New York: W.H. Freeman. 2. Kennelly, P.J., Rodwell, V.W., Bender, D.A., Botham, K.M. and Weil, P.A., <i>Harper's Illustrated Biochemistry</i>. New York: McGraw-Hill Education. 3. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Weil, P.A., <i>Harper's Biochemistry</i>. New York: McGraw-Hill. 4. Voet, D. and Voet, J.G., <i>Biochemistry</i>. New York: John Wiley & Sons. 5. Devlin, T.M., <i>Textbook of Biochemistry with Clinical Correlations</i>. New York: Wiley-Liss. 6. Satyanarayana, U. and Chakrapani, U., <i>Biochemistry</i>. Kolkata: Books and Allied (P) Ltd. 7. Stryer, L., <i>Biochemistry</i>. New York: W.H. Freeman.		

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BP203T Human Anatomy, Physiology and Pathophysiology II (Theory)

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

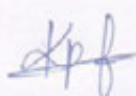
COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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



Detailed Syllabus:

Unit No.	Topics	No. of Lectures
I	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
II	Gastrointestinal System a) Anatomy of GI tract with special reference to anatomy and functions of stomach (acid production in the stomach and its regulation through parasympathetic nervous system; role of pepsin in protein digestion). Anatomy and functions of small intestine and large intestine. Anatomy and functions of salivary glands, pancreas and liver. Movements of GIT, digestion and absorption of nutrients. b) Pathophysiology of inflammatory bowel diseases, peptic ulcer, jaundice, hepatitis, typhoid and alcoholic and non alcoholic fatty liver disease	12 hours
III	a) Respiratory System Anatomy of respiratory system with special reference to anatomy of lungs. Mechanism of respiration and regulation of respiration. Lung volumes and capacities, transport of respiratory gases, artificial respiration and resuscitation methods. Pathophysiology of asthma, chronic obstructive pulmonary diseases and tuberculosis. c) Urinary System Anatomy of urinary tract with special reference to anatomy of kidney and nephrons. Functions of kidney and urinary tract. Physiology of urine formation, micturition reflex and role of kidneys in acid-base balance. Role of Renin Angiotensin Aldosterone System in kidney. Pathophysiology of acute and chronic renal failure and urinary tract infections.	12 hours

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IV	Endocrine System a) Classification of hormones and mechanism of hormone action. Structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland and thymus. b) Pathophysiology of diabetes, hypothyroidism, hyperthyroidism, goitre and polycystic ovary syndrome.	10 hours
V	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.

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BP204T Pharmaceutical Organic Chemistry (Theory)

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

COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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

Detailed Syllabus:

Unit No.	Topics	No. of Lectures
	Aliphatic Saturated Hydrocarbons – Alkanes • Methods of preparation: Wurtz reaction, Kolbe's reaction, Clemmensen reduction, Wolff-Kishner reduction	

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I	- Chemical reactions of alkanes - Mechanism of free radical substitution (halogenation) - Pharmaceutical applications of alkanes: Liquid paraffin, soft paraffin, hard paraffin Cycloalkanes - Baeyer's strain theory and its limitations - Coulson-Moffitt modification - Sachse-Mohr theory	12 hours
II	Aliphatic Unsaturated Hydrocarbons -- Alkenes - Methods of preparation: - 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 Conjugated Dienes - Stability of conjugated dienes - Mechanism of Diels-Alder reaction Electrophilic and free radical addition reactions 1,2- and 1,4-addition reactions	12 hours
III	Alkyl Halides - Nucleophilic substitution reactions: SN1 and SN2 - Mechanism, kinetics, substrate structure, solvent effect, stereochemistry - Elimination reactions: E1 and E2 - Mechanism, kinetics, substrate structure, solvent effect, stereochemistry - Zaitsev's (Saytzeff's) rule with examples - Comparison of substitution vs elimination reactions	12 hours

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IV	Benzene and Its Derivatives – – • IUPAC nomenclature of mono- and di-substituted benzene derivatives • Structure of benzene • Molecular orbital picture and resonance • Aromaticity and Hückel's rule • Electrophilic aromatic substitution reactions: ◦ Nitration ◦ Halogenation ◦ Friedel–Crafts alkylation and its limitations ◦ Friedel–Crafts acylation ◦ Sulphonation and desulphonation • Effect of substituents on reactivity and orientation	12 hours
V	Carbonyl Compounds - Aldehydes and Ketones • Preparation and properties of carbonyl compounds • Nucleophilic addition reactions • Aldol condensation and crossed aldol condensation • Cannizzaro and crossed Cannizzaro reactions • Benzoin and Perkin condensation • Oxidation and reduction reactions • Pharmaceutical applications of carbonyl compounds: Chloral, Paraldehyde, Ketoprofen	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.	

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BP205T Pharmacognosy and Phytochemistry (Theory)

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

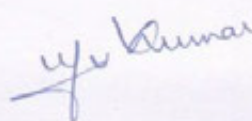
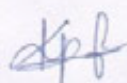
COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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



Detailed Syllabus:

Unit No.	Topics	No. of Lectures
I	Metabolic Pathways and Biogenetic Studies – Brief study of basic metabolic pathways and biosynthesis of secondary metabolites including: • Shikimic acid pathway • Acetate pathway • Amino acid pathways Utilization of radioactive isotopes in biogenetic studies. Introduction to pathway prediction tools and modern genetic tools such as CRISPR/Cas9.	10 hours
II	Primary Metabolites – General classification and identification tests Pharmacognostic study (biological source, distribution, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: Carbohydrates: • Acacia, • Agar • Tragacanth • Honey Proteins and Enzymes: • Gelatin • Casein • Proteolytic enzymes: Papain, Bromelain, Serratiopeptidase, Urokinase, Streptokinase, Pepsin Lipids (Waxes, Fats, Fixed Oils): • Castor oil • Olive oil • Cocoa butter • Wool fat • Beeswax	12 hours

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III	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
IV	Extraction Methods for Medicinal Plants – Conventional Methods of Extraction: • Infusion • Decoction • Digestion • Maceration • Percolation • Reflux • Distillation	12 hours

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	• Soxhlet extraction • Successive solvent extraction Modern Methods of Extraction: • Supercritical fluid extraction • Microwave-assisted extraction • Ultrasonic-assisted extraction • Enzyme-assisted extraction • Pressurized liquid extraction	
V	Overview of Isolation, Identification and Characterization Techniques– Separation and Isolation Techniques: • Planar chromatography • Column chromatography • Preparative TLC • Flash chromatography Identification Techniques: • Phytochemical tests • Chromatographic techniques • Spectroscopic techniques 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.		

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BP206T Physical Pharmaceutics (Theory)

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

COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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

Detailed Syllabus:

Unit No.	Topics	No. of Lectures
I	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
II	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
III	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

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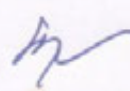
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IV	Rheological studies Newtonian systems and non-Newtonian systems. Thixotropy – measurement / Bulges and spurs. Negative thixotropy, Determination of rheological properties (Viscometers / single and multi-point). Viscoelasticity, psycho-rheology. Applications of rheology in pharmacy	8 hours
V	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 powers (Powder flow tester).	8 hours
Recommended References (Preferably latest editions): 1. Sinko, P.J., <i>Martin's Physical Pharmacy and Pharmaceutical Sciences.</i> 2. Allen, L.V. and McPherson, T.B., <i>Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems.</i> 3. Adejare, A., <i>Remington: The Science and Practice of Pharmacy.</i> 4. Aulton, M.E. and Taylor, K.M.G., <i>Aulton Pharmaceutics: The Design and Manufacture of Medicines.</i> Elsevier. 5. Lachman, L. and Libbermann, H.A., <i>The Theory and Practice of Industrial Pharmacy.</i> Mendham, J., Denney, R.C., Barnes, J.D. and Thomas, M.J.K., <i>Vogel's Textbook of</i> 6. <i>Quantitative Chemical Analysis.</i> Myers, D., <i>Surfaces, Interfaces, and Colloids: Principles and Applications.</i> Ladisch, M.R., <i>Rheology of Fluid and Semisolid Foods.</i> Springer.		



BP207P Biochemistry (Practical)

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

COURSE OBJECTIVES

The objectives of this course are:

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

Course Outcomes (CO):

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

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Detailed Syllabus:

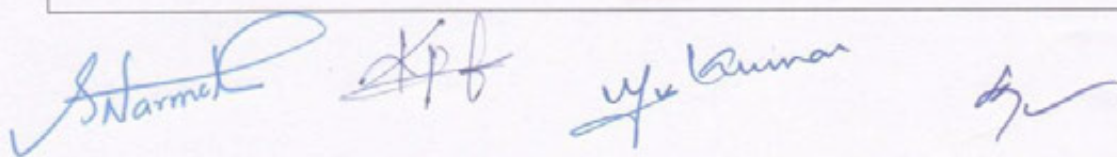
List of practical

(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.



BP208P Human Anatomy, Physiology and Pathophysiology II (Practical)

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

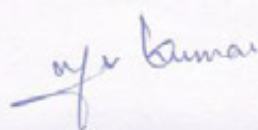
COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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



Detailed Syllabus:

List of practical

(Minimum of 12 experiments must be performed)

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.

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BP209P Pharmaceutical Organic Chemistry (Practical)

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

COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Recall and outline the preliminary qualitative tests used for identifying water-insoluble and immiscible organic compounds.
2	Understand the synthesis methods for preparing simple organic compounds and their derivatives.
3	Apply crystallization techniques to purify organic compounds effectively.
4	Analyze experimentally to detect elements and functional groups to identify unknown organic compounds.
5	Interpret and analyze organic compounds through systematic qualitative analysis to confirm their chemical nature.

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Detailed Syllabus:

List of practical

(Minimum 12 experiments to be performed)

1. **Systematic qualitative analysis of minimum of five water-insoluble or water-immiscible unknown organic compounds from different chemical classes:**
 - a. Preliminary tests: Color, odour, Solubility tests, test for aromaticity, test for saturation/unsaturation etc.
 - b. Detection of elements such as nitrogen, sulphur and halogens by Lassaigne's test
 - c. Determination of Functional group tests such as phenols, amides, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons and nitro compounds.
 - d. Preparation of the derivatives and confirmation of the unknown organic compound by melting point / boiling point.
2. **Building Molecular Models:**

Students will use ball-and-stick models to create structures of molecules and understand their shapes and bonding.
3. **Crystallization Method**

Students will learn how to purify three organic compounds using the crystallization technique.

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.

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BP210P Pharmacognosy and Phytochemistry (Practical)

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

COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

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

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Detailed Syllabus:

List of practical

(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.

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BP211P Physical Pharmaceutics (Practical)

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

COURSE OBJECTIVES

The objectives of this course are to:

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

Course Outcomes (CO):

CO No.	Upon successful completion of this course, the students will be able to:
1	Demonstrate practical knowledge of principles and procedures involved in measuring surface tension, viscosity, density, and related physical properties using standard laboratory apparatus.
2	Determine and interpret surfactant-related parameters such as CMC and 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.

Detailed Syllabus:

List of practical	
<i>(Minimum 12 experiments must be performed)</i>	
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.	

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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.

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Course Code*	Course Title*			Course Type
BP212P SEC1	Communication Skills			Elective
BP212P SEC2	Mental Well-Being, Stress & Conflict Management			
BP212P SEC3	Fundamentals of Computer Operations			
Credit	Hours Per Week (L-T-P)			Max. Hours
	L	T	P	
1	--	--	2	30
Maximum Marks	SE		ESE	
50	20		30	

* Only 1 elective course shall be selected

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BP212P SEC1 Communication Skills (Practical)

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

COURSE OBJECTIVES:

The objectives of this course are to:

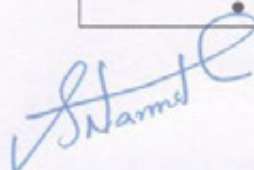
1. Enhance verbal and non-verbal communication skills in academic, clinical, and professional pharmacy settings.
2. Develop competence in patient counselling, prescription communication, and interprofessional dialogue.
3. Promote empathetic and ethical communication in diverse cultural and patient contexts.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

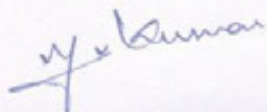
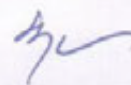
COURSE OUTCOMES (CO):

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

Detailed Syllabus

List of practical
<i>(Perform any 12 Experiments)</i> 1. Introduction to Communication in Pharmacy • Types of communication: verbal, non-verbal, written



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

Recommended References (Preferably latest edition):

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

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BP212P SEC2 Mental Well-Being, Stress and Conflict Management (Practical)

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

COURSE OBJECTIVES:

The objectives of this course are to:

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

COURSE OUTCOMES (CO):

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

Detailed Syllabus**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

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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

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BP212P SEC3 Fundamentals of Computer Operations (Practical)

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

COURSE OBJECTIVES:

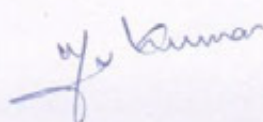
The objectives of this course are to:

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

COURSE OUTCOMES (CO):

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

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



Detailed Syllabus

List of practical

(Perform any 12 Experiments)

General Instruction on Digital Tools

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

Practical Components

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

Recommended References (Preferably latest edition):

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

✓ S. Narmadha

✓ K. P. S.

✓ M. Kumar

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