



FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP201T

Course Title: Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
2	-	-	2	20/08	30/12	-	-	50/25

*J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Unit No.	Topics	Hours
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	6



	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	
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
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 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
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
5.	Statistical Analysis Using Python – Case based learning • Demonstration of descriptive statistics, correlation analysis and linear regression using Python libraries- SciPy / Stats models / Scikit-learn on pharmaceutical datasets	4
6.	Report Writing • Interpretation of the output summaries and p-values • Preparation of statistical reports	2



Reference Books:

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.

Open Education Resources

Sr. No.	Title of OER	Source URL
1.	National Library of Medicine	https://pmc.ncbi.nlm.nih.gov/articles/PMC9372427/
2.	Open Learning Initiative	https://oli.cmu.edu/courses/probability-statistics-open-free/
3.	Open Textbook Library	https://open.umn.edu/opentextbooks/textbooks/think-stats-probability-and-statistics-for-programmers
4.	National Library of Medicine	https://pmc.ncbi.nlm.nih.gov/articles/PMC3576830/
5.	Life Sciences	https://elifesciences.org/labs/f779833b/python-for-the-practicing-neuroscientist-an-online-educational-resource

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Pedagogy:

- Traditional teaching methodology (Blackboard)
- ICT Tools (PowerPoint presentation, video sharing on Projector)

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
30	30	25	15	5	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	% weightage
SLO1	Classify pharmaceutical data using appropriate descriptive statistics.	25
SLO2	Apply probability concepts and statistical distributions in clinical and pharmaceutical contexts.	25



SLO3	Perform sampling and hypothesis testing for decision-making in research.	20
SLO4	Analyze correlation and regression relationships in pharmaceutical datasets.	20
SLO5	Demonstrate statistical analysis using Python and interpret outputs appropriately.	10

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SLO1	2	1	2	3	1	2	3	1	3	2	2	1	2	4
SLO2	2	1	2	3	2	-	1	1	3	2	2	1	2	3,4
SLO3	3	1	1	3	2	-	2	1	3	2	2	1	-	3,9
SLO4	2	2	3	3	2	2	2	1	3	2	2	3	1	3,9
SLO5	2	1	2	-	2	-	2	1	3	2	2	1	1	4,9

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June- 2026
Last Reviewed on (Month-Year):	June-2026
Next Review on (Month-Year):	June-2031



FACULTY OF PHARMACEUTICAL SCIENCE

Effective from Academic Batch: 2026-27

Programme: BACHELOR OF PHARMACY (B.PHARM.)

Semester: II

Course Code: BP202T

Course Title: Biochemistry

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	-	-	3	30/12	45	-	-	75/38

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Unit No.	Topics	Hours
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.	10



	Clinical Chemistry: Liver function tests (routinely performed tests based on liver function). Renal function tests (routinely performed tests based on kidney function, ELISA test)	
2.	Introduction about biomolecules Introduction of carbohydrate, lipids, nucleic acids, amino acids and proteins. Bioenergetics Concept of free energy; relationship between free energy, enthalpy, and entropy; redox potential; energy-rich compounds (ATP, GTP, etc.) and their biological significance.	3
3.	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. - Biological Oxidation: Electron Transport Chain (ETC), oxidative phosphorylation, and mechanisms of ATP synthesis; regulation and clinical implications of mitochondrial dysfunction and oxidative stress.	7
4.	Lipid metabolism - Classification, functions, and properties of lipids and lipoproteins (HDL, LDL, VLDL, chylomicrons). β-oxidation and de-novo synthesis of fatty acids: Ketone bodies: synthesis, utilization, and clinical significance. - Biological-significance of cholesterol, lipid profile, and its clinical significance. - Disorders associated with lipid metabolism: Hyperlipidaemias and hypercholesterolemia, lipid storage diseases, atherosclerosis, fatty liver disease, and obesity.	7
5.	Amino acids and protein metabolism - Classification and Biological Functions: Classification and physiological roles of amino acids. Structure and functions of proteins and plasma proteins. - 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). - 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. - Biochemical significance of neurotransmitters and hormones derived from amino acids: 5-HT (serotonin), melatonin, dopamine, noradrenaline, adrenaline. - Catabolism of heme and related disorders (jaundice).	10
6.	Nucleic acid metabolism and genetic information transfer	8



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

1.	Nelson, D.L., Cox, M.M. and Hoskins, A., Lehninger Principles of Biochemistry. New York: W.H. Freeman.
2.	Kennelly, P.J., Rodwell, V.W., Bender, D.A., Botham, K.M. and Weil, P.A., Illustrated Biochemistry. New York: McGraw-Hill Education.
3.	Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Weil, P.A., Harper's Biochemistry. New York: McGraw-Hill.
4.	Voet, D. and Voet, J.G., Biochemistry. New York: John Wiley & Sons.
5.	Devlin, T.M., Textbook of Biochemistry with Clinical Correlations. New York: Wiley-Liss.
6.	Satyanarayana, U. and Chakrapani, U., Biochemistry. Kolkata: Books and Allied (P) Ltd.
7.	Stryer, L., Biochemistry. New York: W.H. Freeman.
8.	Textbook of Biochemistry by Rama Rao.
9.	Textbook of Biochemistry by Deb.
10.	Outlines of Biochemistry by Conn and Stumpf.
11.	Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition).
12.	Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
13.	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2
14.	https://youtu.be/NoLD2MVjpII
15.	https://youtu.be/phdPb0NFoho

Open Educational Resource		
Sr. No.	Title of OER	Source URL
1.	Enzymes- NCBI	https://www.ncbi.nlm.nih.gov/books/NBK22436/
2.	Biological Molecules- Khan Academy	https://www.khanacademy.org/science/biology/macromolecules
3.	Carbohydrate Metabolism & Biological Oxidation- e-PG Pathshala	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2
4.	Lipid Metabolism	https://youtu.be/NoLD2MVjpII
5.	Amino Acids and Proteins- OpenStax Biology 2e	https://openstax.org/details/books/biology-2e

6.	Nucleic Acid Metabolism & Genetic Info- Molecular Biology Open Resources	https://youtu.be/phdPb0NFoho
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Pedagogy:

1. ICT tools (LCD projector, Laptop, Smart Board)
2. Traditional method (Black board)

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
25	25	15	10	20	05	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%Weightage
SL01	Explain the principles of enzymology and various tests in clinical chemistry.	10
SL02	Describe the classification, the classification, structure, and functions of major biomolecules such as carbohydrates, lipids, proteins, nucleic acids, enzymes, and vitamins.	15
SL03	Apply the principles of bioenergetics, biological oxidation, and the overview of metabolic pathways of biomolecules, along with their clinical significance.	15
SL04	Evaluate metabolism of carbohydrates, lipids and its significance.	30
SL05	Understand metabolism of proteins, nucleic acid metabolism, genetic information transfer and its significance.	30

PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	3	2	3	2	2	2	3	3	3	3	3	3	3	3, 4, 9
SL02	2	2	-	2	2	2	2	2	2	2	2	2	2	2, 3, 4
SL03	3	3	2	2	2	3	2	2	2	3	2	3	2	3, 4, 9
SL04	3	3	2	2	2	3	3	3	3	3	3	3	3	2, 3, 8
SL05	3	3	2	2	3	3	3	3	3	3	3	3	3	3, 4, 8



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June 2026
Last Reviewed on (Month-Year):	June 2026
Next Review on (Month-Year):	June 2031



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP203T

Course Title: Human Anatomy, Physiology and Pathophysiology II (Theory)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	-	-	4	40/16	60/24	-	-	100/50

*J: Jury; V: Viva; P: Practical

**Detailed Syllabus:**

Unit No.	Topics	Hours
1.	Nervous System • 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). • Pathophysiology of epilepsy, Parkinson's disease, stroke, migraine, depression, schizophrenia, Alzheimer's disease and meningitis.	14
2.	Gastrointestinal System • Anatomy of GI tract with special reference to anatomy and functions of stomach acid production in the stomach and its regulation through parasympathetic nervous system; role of pepsin in protein digestion). • 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. • Pathophysiology of inflammatory bowel diseases, peptic ulcer, jaundice, hepatitis, typhoid and alcoholic and non-alcoholic fatty liver disease	12
3.	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.	6
4.	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.	6
5.	Endocrine System • 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. • Pathophysiology of diabetes, hypothyroidism, hyperthyroidism, goitre and polycystic ovary syndrome.	10
6.	Reproductive System and Cancer	12



CVM UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

	- 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. - Pathophysiology of sexually transmitted diseases: AIDS, syphilis and gonorrhoea. - Etiology and pathogenesis of cancer.	
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Reference Books:

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., <i>Textbook of Medical Physiology</i> . Elsevier.
4.	Chatterjee, C.C., <i>Human Physiology (Vol. I & II)</i> . Academic Publishers, Kolkata.
5.	Mohan, H., <i>Textbook of Pathology</i> . Jaypee Publishers.
6.	Porth, C.M., <i>Pathophysiology: Concepts of Altered Health States</i> . Lippincott Williams & Wilkins.
7.	Kumar, V., Abbas, A.K., Aster, J.C. and Deyrup, A.T., <i>Robbins and Kumar Basic Pathology</i> . Elsevier.

Open Education Resources

Sr. No.	Title of OER	Source URL
1.	Nervous System anatomy and physiology	https://www.ncbi.nlm.nih.gov/books/NBK542179/
2.	Pathophysiology of Nervous System	https://www.slideshare.net/slideshow/pathophysiology-of-nervous-system-pptx/267937486
3.	Gastrointestinal System anatomy and physiology	https://www.scribd.com/presentation/76241283/Gastrointestinal-System-Ppt-new
4.	Pathophysiology of gastrointestinal System	https://pmc.ncbi.nlm.nih.gov/articles/PMC12305151/
5.	respiratory system anatomy and physiology	https://my.clevelandclinic.org/health/body/21205-respiratory-system
6.	Nervous System anatomy and physiology	https://www.ncbi.nlm.nih.gov/books/NBK542179/

Pedagogy:

1. LCD projector, laptop
2. Traditional method (Black Board)
3. Project-based Learning (PBL)
4. Experiential Learning
5. Case-Based Learning (CBL)
6. Simulation-Based Learning
7. Audio-Visual Pedagogy



Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
30	30	15	15	10	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%Weightage
SL01	Explain the structural organization and functions of the central nervous system, and discuss the pathophysiology of related diseases.	25
SL02	Describe the structural organization and functions of the gastrointestinal system, and analyse the pathophysiology of gastrointestinal diseases.	20
SL03	Explain the anatomy and physiology of the respiratory and urinary systems, and illustrate common diseases affecting them.	25
SL04	Describe the structural organization and functions of the endocrine system, and analyse pathophysiological alterations associated with endocrine gland disorders.	15
SL05	Describe the structural organization and functions of the reproductive system, and interpret pathophysiological alterations associated with sexually transmitted diseases and cancers.	15

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL0 1	3	3	3	3	3	3	3	3	3	2	3	3	3	3,4,
SL0 2	3	3	3	-	3	2	3	3	3	3	2	3	3	3,4
SL0 3	3	3	3	3	3	2	3	3	3	3	2	3	3	3,4
SL04	3	3	-	3	3	2	2	3	3	3	3	3	3	3,4,
SL05	3	3	3	3	3	2	2	3	3	2	2	3	3	4,16

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
Version:	2
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Next Review on (Month-Year):	June 2031



FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP204T

Course Title: Pharmaceutical Organic Chemistry (Theory)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	-	-	4	40/16	60/24	-	-	100/50

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Unit No.	Topics	Hours
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	8



2.	Aliphatic Saturated Hydrocarbons – Cycloalkanes - Baeyer's strain theory and its limitations - Coulson–Moffitt modification - Sachse–Mohr theory	4
3.	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
4.	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
5.	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



6.	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
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Reference Books:

1.	Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., <i>Organic Chemistry</i> . Pearson Education India.
2.	Finar, I.L., <i>Organic Chemistry, Vol. I</i> . Pearson Books
3.	Bahl, B.S. and Bahl, A., <i>Textbook of Organic Chemistry</i> . S. Chand & Company.
4.	Pavia, D. L., Lampman, G. M., Kriz, G. S. and Engel, R. Introduction to Organic Laboratory Techniques. Cengage Learning.
5.	Organic Chemistry by P. L. Soni.
6.	Mann, F. G. and Saunders, B. C. Practical Organic Chemistry. Pearson Education.
7.	Vogel's textbook of Practical Organic Chemistry.
8.	Advanced Practical organic chemistry by N.K.Vishnoi.
9.	Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
10.	Reaction and reaction mechanism by Ahluwalia/Chatwal.
11.	Organic Chemistry, 2nd Edition by Bhupinder Mehta and Manju Mehta
12.	https://chem.libretexts.org/Bookshelves/Organic_Chemistry
13.	https://www.carewellpharma.in/bpharmacy/notes/2nd-sem/pharmaceutical-organic-chemistry-1/
14.	https://imperfectpharmacy.shop/pharmaceutical-organic-chemistry-1-b-pharmacy-2nd-semester-imperfect-pharmacy-notes/
15.	https://www.youtube.com/watch?v=f0hzRRI2PtM&list=PLkfv4yq2FBxWqTKSbDomKbSo2JnlsopJj

Open Educational Resource

Sr. No.	Topic Covered	Open Educational Resource (OER)
1.	ChemLibreTexts – Organic Chemistry: Alkanes and Cycloalkanes	https://chem.libretexts.org/Bookshelves/Organic_Chemistry
2.	MIT Open Courseware – Organic Chemistry I	https://ocw.mit.edu/courses/5-12-organic-chemistry-i-fall-2005/
3.	ChemLibreTexts – Aldehydes and Ketones	https://chem.libretexts.org/Bookshelves/Organic_Chemistry
4.	Master Organic Chemistry – Organic Reaction Mechanisms	https://www.masterorganicchemistry.com



5.	NPTEL – Organic Chemistry (IIT Lectures)	https://nptel.ac.in/courses
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Pedagogy:

1. Using chalk and blackboard
2. ICT tools (PowerPoint, smart board, projector)

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
30	20	20	15	10	05	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%Weightage
SL01	Describe the chemical reactions and mechanisms of aliphatic saturated hydrocarbons.	30
SL02	Explain the reactions and mechanisms of aliphatic unsaturated hydrocarbons.	20
SL03	Understand nucleophilic substitution and elimination reactions of alkyl halides.	20
SL04	Evaluate electrophilic aromatic substitution reactions and the effect of substituents benzene and its derivatives.	10
SL05	Apply knowledge of carbonyl compounds and reaction mechanisms in pharmaceutical chemistry.	20

PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	2	2	3	2	-	-	3	3	3	2	3	2	2	3, 4,
SL02	3	2	3	2	-	-	3	3	3	3	3	2	2	3,4
SL03	2	2	3	3	-	-	3	3	3	3	3	3	2	9,12
SL04	2	2	3	2	-	-	3	3	3	3	3	3	2	9,12
SL05	3	3	3	3	3	-	3	2	3	2	2	3	2	4,9

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June 2026
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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP205T

Course Title: Pharmacognosy and Phytochemistry (Theory)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
4	-	-	4	40/16	60/24	-	-	100/50

* J: Jury; V: Viva; P: Practical



Detailed Syllabus:

Unit No.	Topics	Hours
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
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 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
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	12



	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	
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
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).	7



6.	Screening and analysis of major metabolites: • Alkaloids • Glycosides • Saponins • Tannins • Resins • Flavonoids • Phenolics • Steroids	7
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Reference Books:

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 Blatt, 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.

Open Education Resources

Sr. No.	Title of OER	Source URL
1.	Tracer technique	https://www.youtube.com/watch?v=ZzgJHDQyKZc
2.	Carbohydrates Acacia Agar Tragacanth Honey Pharmacognosy unit 5 #pharmacognosy	https://www.youtube.com/watch?v=gNg7wBBCWJU
3.	Glycosides Containing Drug (Part 01) = Senna and Bitter Almond (Sourec, Description, Chemical & Use)	https://www.youtube.com/watch?v=n-DqP4esUPk
4.	modern method of extraction Pharmacognosy modern method of extraction in phytochemistry	https://www.youtube.com/watch?v=X7W5U9V6kx6k
5.	Basics of chromatography Chemical processes MCAT Khan Academy	https://www.youtube.com/watch?v=SnbXQTTHGs4&t=539s
6.	Caffeine Isolation Method	https://www.youtube.com/watch?v=X3yrEOLr6M4

Pedagogy:

1. ICT tools (Powerpoint and projector)



2. Group discussion
3. Quiz based learning
4. Case based learning
5. Peer learning
6. Experiential learning

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20	30	20	10	10	10	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%Weightage
SL01	Describe biosynthetic pathways and genetic tools involved in phytoconstituent production.	20
SL02	Classify and explain drugs containing primary and secondary metabolites.	40
SL03	Apply traditional and modern extraction and isolation methods.	20
SL04	Explain qualitative and quantitative analysis of plant metabolites.	10
SL05	Evaluate identity, purity, and quality of herbal raw materials.	10

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	-	-	-	3	-	3	3	2	3	-	3	3	3	4, 9
SL02	-	-	-	-	1	2	3	3	-	-	-	1	2	3, 4
SL03	-	3	3	3	2	3	3	3	2	1	2	2	3	9, 12
SL04	2	3	3	3	2	3	3	3	3	2	2	2	3	3
SL05	2	2	3	3	3	3	3	3	3	3	3	3	3	3, 12

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:

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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP206T

Course Title: Physical Pharmaceutics (Theory)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	-	-	3	30/12	45/18	-	-	75/38

* J: Jury; V: Viva; P: Practical

**Detailed Syllabus:**

Unit No.	Topics	Hours
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
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
3.	Colloidal 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.	6
4.	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).	6
5.	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, psychorheology. Applications of rheology in pharmacy	8
6.	Micromeritics Particle size and size distribution, Particle Shape and Surface area: Methods for determination and significance. Flow properties of powders:	8



	determination, significance and methods of enhancement. Advanced flow properties of powders (Powder flow tester).	
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Reference Books:

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
6.	Mendham, J., Denney, R.C., Barnes, J.D. and Thomas, M.J.K., Vogel's Textbook of Quantitative Chemical Analysis.
7.	Myers, D., Surfaces, Interfaces, and Colloids: Principles and Applications. Ladisch, M.R., Rheology of Fluid and Semisolid Foods. Springer.

Open Education Resources

Sr. No.	Title of OER	Source URL
1.	What is Solubility?	https://www.youtube.com/watch?v=G0MSddE2UxI
2.	pH, buffers and Isotonic solutions Sorenson pH Scale	https://www.youtube.com/watch?v=VqCsQMwFb0s
3.	HLB	https://www.youtube.com/watch?v=waRrjZKEW5A
4.	Surface and Interfacial Tension Part 1	https://www.youtube.com/watch?v=hmp-QmUkB5E
5.	Disperse System/ Introduction/ Classification	https://www.youtube.com/watch?v=E8QX1iyftc
6.	Properties of Colloidal Solutions	https://www.youtube.com/watch?v=Y5eh1mbMLag

Pedagogy:

1. Using chalk and blackboard
2. ICT tools (Powerpoint and projector)
3. Quiz
4. Gamification



Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
10	25	25	20	20	0	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	% Weightage
SL01	Explain fundamental principles of solubility, partition coefficient, and buffer systems and their role in drug behavior and pharmaceutical formulation.	20
SL02	Analyze interfacial phenomena including surface tension, adsorption, wetting, and electric double layer properties and correlate them with the design and stability of pharmaceutical dosage forms.	20
SL03	Apply principles of colloidal and coarse dispersion systems to formulate, evaluate, and stabilize suspensions and emulsions as pharmaceutical dosage forms.	20
SL04	Evaluate rheological behavior of pharmaceutical systems by selecting appropriate flow models and measurement techniques to optimize formulation performance.	20
SL05	Apply principles of micromeritics including particle size, surface area, and powder flow to characterize and optimize solid pharmaceutical dosage forms.	20

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	2	2	2	3	2	3	2	2	2	2	3	3	2	3,4
SL02	3	3	3	3	3	3	3	2	3	2	3	3	3	3,9
SL03	3	3	3	3	3	3	3	3	3	3	3	3	3	3,9
SL04	3	3	3	3	3	3	3	3	3	3	3	3	3	3,9
SL05	3	3	3	3	3	3	3	3	3	3	3	3	3	3,9

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:

Version:	2
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FACULTY OF PHARMACEUTICAL SCIENCE

Effective from Academic Batch: 2026 – 27

Programme: BACHELOR OF PHARMACY (B.PHARM.)

Semester: II

Course Code: BP207P

Course Title: Biochemistry Practical

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	3	1	-	-	20/8	30	50/25

* J: Jury; V: Viva; P: Practical

List of Practicals:

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 haemoglobin 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.

Reference Books:

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 Chemistry. McGraw-Hill.
6.	Freifelder, D. Essential Molecular Biology: A Practical Approach. Oxford University Press.
7.	Textbook of Biochemistry by Rama Rao.
8.	Textbook of Biochemistry by Deb.
9.	Outlines of Biochemistry by Conn and Stumpf.
10.	Nelson, D.L., Cox, M.M. and Hoskins, A., Lehninger Principles of Biochemistry. New York: W.H. Freeman.
11.	Stryer, L., Biochemistry. New York: W.H. Freeman.
12.	Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition).
13.	Practical Biochemistry by R.C. Gupta and S. Bhargavan.
14.	Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
15.	Practical Biochemistry by Harold Varley.
16.	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=2
17.	https://youtu.be/NoLD2MVjpII
18.	https://youtu.be/phdPb0NFoho

Open Educational Resource		
Sr.No.	Title of OER	Source URL
1.	Protein Identification Tests	https://www.youtube.com/watch?v=YB8xk6YQkGI
2.	Carbohydrate Identification Tests	https://chem.libretexts.org
3.	Blood Glucose Estimation	https://www.ncbi.nlm.nih.gov/books
4.	Cholesterol Estimation	https://medlineplus.gov/cholesterollevelswhatyouneedtoknow.html
5.	Enzyme Activity Experiment	https://www.khanacademy.org/science/biology/energy-and-enzymes



6.	Liver Function Enzymes	https://labtestsonline.org.uk/tests/alt-and-ast
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Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%weightage
SL01	Identify proteins and carbohydrates using qualitative biochemical tests and explain their physiological relevance.	30
SL02	Detect normal and abnormal constituents in urine and interpret their diagnostic significance.	20
SL03	Estimate and interpret levels of glucose, cholesterol, urea, creatinine, uric acid, and serum proteins, and correlate results with clinical conditions.	20
SL04	Demonstrate enzyme substrate reactions and evaluate the effect of temperature and substrate concentration on enzymatic activity.	20
SL05	Analyze, record, and report biochemical results accurately and relate practical findings to theoretical knowledge and clinical application.	10

PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	3	2	2	2	3	3	3	3	2	3	3	3	3	2, 3, 4
SL02	3	2	2	2	3	3	3	3	2	3	3	3	3	3, 4
SL03	3	2	2	2	3	3	3	3	2	3	3	3	3	3, 8, 9
SL04	3	2	2	2	3	3	3	3	2	3	3	3	3	4, 9, 12
SL05	3	2	3	2	2	3	2	3	3	3	2	3	3	3, 4, 8

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP208P

Course Title: Human Anatomy, Physiology and Pathophysiology II (Practical)

Course Objectives: The objectives of this course are:

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	3	1	-	-	20/8	30/12	50/25

* J: Jury; V: Viva; P: Practical



List of Practicals:

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).

Reference Books:

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

Open Education Resources		
Sr.No	Title of OER	Source URL
1.	Explain the gross morphology, structures, and functions of various organs and organ systems of the human body.	https://www.slideshare.net/slideshow/in
2.	Demonstrate basic emergency response procedures such as cardiopulmonary resuscitation (CPR).	https://www.mayoclinic.org
3.	Describe the etiology and pathogenesis of selected disease states.	https://pmc.ncbi.nlm.nih.gov/articles/PMC7150046/



4.	Identify signs and symptoms, risk factors, diagnostic methods, prevention, treatment strategies, and complications of diseases.	https://pmc.ncbi.nlm.nih.gov/articles/PMC4977932/
5.	Understand coordinated working patterns of different organs of each system and perform experiments related to special senses and nervous system.	https://my.clevelandclinic.org/health/body/21202-nervous-system
6.	Explain the gross morphology, structures, and functions of various organs and organ systems of the human body.	https://www.slideshare.net/slideshow

Pedagogy:

1. LCD projector, laptop
2. Traditional method (Black Board)
3. Project-based Learning (PBL)
4. Reflective Learning Journals
5. Simulation-Based Learning
6. Case-Based Learning (CBL)
7. Role Play Method
8. Peer Teaching Method

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%Weightage
SL01	Explain the gross morphology, structures, and functions of various organs and organ systems of the human body with the help of models.	30
SL02	Demonstrate competency in measuring physiological parameters (temperature, BMI, tidal volume, vital capacity) and applying emergency life-support skills through cardiopulmonary resuscitation (CPR).	30
SL03	Describe and analyze the etiology and pathogenesis of selected disease states, including nervous system disorders, respiratory diseases, gastrointestinal diseases, and reproductive disorders.	10
SL04	Identify signs and symptoms, risk factors, diagnostic methods, prevention, treatment strategies, and complications of IBD, peptic ulcer, jaundice, hepatitis, typhoid, asthma, tuberculosis, diabetes, and thyroid.	20
SL05	Perform and interpret neurological examinations, cranial nerve functions (olfactory, taste, vision), and reflex activity to understand coordinated patterns of the nervous system and special senses.	10

SLO-PO & SLO-PSO Mapping and SDG Alignment



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

SLOs	POs											PSOs		SDG Alignment
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	
SLO 1	3	3	3	3	3	3	2	3	2	3	3	3	3	3,9
SLO 2	3	3	3	3	3	2	3	3	2	2	2	3	3	3,9
SLO 3	3	3	3	2	-	3	3	2	3	2	2	3	3	3,9
SLO4	3	3	3	3	3	3	2	2	2	3	3	3	3	3,9
SLO5	3	3	3	2	-	-	3	3	3	2	2	3	3	4,16

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy
Semester: II
Course Code: BP209P
Course Title: Pharmaceutical Organic Chemistry (Practical)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	3	1	-	-	20/08	30/12	50/25

* J: Jury; V: Viva; P: Practical

**Detailed Syllabus:**

Unit No.	Topics
1	Systematic qualitative analysis of minimum of five water-insoluble or water immiscible unknown organic compounds from different chemical classes: • Preliminary tests: Color, odour, Solubility tests, test for aromaticity, test for saturation/unsaturation etc. • Detection of elements such as nitrogen, sulphur and halogens by Lassaigne's test • Determination of Functional group tests such as phenols, amides, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons and nitro compounds. • 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.

Reference Books:

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.
6.	Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., <i>Organic Chemistry</i> . Pearson Education India.
7.	Finar, I.L., <i>Organic Chemistry, Vol. I</i> . Pearson Books
8.	Organic Chemistry by P. L. Soni.
9.	Advanced Practical organic chemistry by N.K.Vishnoi.
10.	Reaction and reaction mechanism by Ahluwalia/Chatwal.
11.	https://drive.google.com/file/d/1jyKu8qQPMXJ4RI5F_2geP60XYOM2rf8U/view
12.	https://www.youtube.com/watch?v=ccnlBr6zaSc&list=PLx0aAgHiabZ-_aYBTDHdtCG70rvwlT1kM&index=1
13.	https://www.youtube.com/watch?v=6eP1VUegldc



Open Educational Resource

Sr. No.	OER Title	Source URL
1.	Systematic Qualitative Analysis of Organic Compounds	https://www.youtube.com/results?search_query=Systematic+Qualitative+Analysis+of+Organic+Compounds+NPTEL
2.	Functional Group Identification Tests in Organic Chemistry	https://www.youtube.com/results?search_query=Functional+Group+Identification+Tests+in+Organic+Chemistry+Dr.+Gajendra+Purohit
3.	Molecular Models and Chemical Bonding	https://www.khanacademy.org/science/chemistry
4.	Crystallization (Recrystallization) Technique in Organic Chemistry Laboratory	https://www.youtube.com/results?search_query=Crystallization+Technique+Organic+Chemistry+NPTEL
5.	Organic Chemistry Practical Laboratory Playlist	https://www.youtube.com/results?search_query=Organic+Chemistry+Practical+Laboratory+NPTEL

Student Learning Outcomes (SLOs):

SLOs	Sr. Student Learning Outcome Statements	%Weightage
SLO1	Recall and outline the preliminary qualitative tests used for identifying water insoluble and immiscible organic compounds.	15
SLO2	Understand the synthesis methods for preparing simple organic compounds and their derivatives.	15
SLO3	Apply crystallization techniques to purify organic compounds effectively.	10
SLO4	Analyze experimentally to detect elements and functional groups to identify unknown organic compounds.	30
SLO5	Interpret and analyze organic compounds through systematic qualitative analysis to confirm their chemical nature	30

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SLO1	3	2	2	2	–	–	3	2	3	1	2	2	3	3,4,9,12
SLO2	3	3	2	2	2	–	3	3	3	1	3	3	3	3,4,9,12
SLO3	3	2	2	2	2	–	3	2	3	1	2	2	3	3,4,9,12
SLO4	3	3	2	3	2	–	3	2	3	1	3	3	3	3,4,9,12
SLO5	3	3	2	3	3	–	3	2	3	1	3	3	3	3,4,9,12

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

Curriculum Revision:	
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CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP210P

Course Title: Pharmacognosy and Phytochemistry (Practical)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	3	1	-	-	20/8	30/12	50/25

* J: Jury; V: Viva; P: Practical

List of Practicals:

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.

Reference Books:

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.

Open Education Resources

Sr.No	Title of OER	Source URL
1.	Morphology & Microscopy of Fennel: Dr Bhushan Pimple	https://www.youtube.com/watch?v=WCCQ7sHlbDA
2.	Extraction and Isolation of Caffeine from Tea Leaves Isolation of Caffeine Caffeine ENGLISH	https://www.youtube.com/watch?v=0YGRh8yjwvs
3.	Isolation Identification and Analysis of Glycyrrhiza (LIquorice)	https://www.youtube.com/watch?v=p0zwvzipcLA

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	%Weightage
SL01	Identify unorganized crude drugs using specific chemical tests.	20
SL02	Analyze organized crude drugs through microscopy and powder analysis.	40
SL03	Select and perform appropriate extraction methods for herbal drugs.	5
SL04	Isolate and characterize phytoconstituents using laboratory techniques and TLC.	30
SL05	Assess and compare the quality and purity of herbal raw materials with official standards.	5



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SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	3	1	2	2	2	2	2	3	2	1	2	2	3	3, 4
SL02	3	1	3	2	3	2	3	3	2	-	2	2	2	3
SL03	-	2	3	3	3	2	3	3	2	3	2	3	3	9, 12
SL04	3	2	3	3	3	2	3	3	2	1	2	3	3	3, 9
SL05	3	3	3	3	3	3	3	3	3	1	3	3	3	3, 12

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP211P

Course Title: Physical Pharmaceutics (Practical)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	3	1	-	-	20/08	30/12	50/25

* J: Jury; V: Viva; P: Practical

List of Practicals:

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.
16.	Determination sedimentation volume with effect of different suspending agent

Reference Books:

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.

Open Education Resources

Sr. No	Title of OER	Source URL
1.	Surface tension by drop count & drop weight method	https://www.youtube.com/results?search_query=surface+tension+drop+count+drop+weight+method+pharmacy
2.	Critical micelle concentration determination	https://www.youtube.com/results?search_query=critical+micelle+concentration+experiment
3.	Viscosity determination using Ostwald viscometer	https://www.youtube.com/results?search_query=oswald+viscometer+experiment+viscosity
4.	HLB number determination by	https://www.youtube.com/results?search_query=H



	saponification method	LB+number+determination+saponification+method
5.	Particle size analysis by sieving method	https://www.youtube.com/results?search_query=particle+size+analysis+sieving+method+pharmaceutics
6.	Particle size determination by microscopy	https://www.youtube.com/results?search_query=particle+size+microscopy+method+pharmacy

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcomes	% weightage
SL01	Demonstrate practical knowledge of principles and procedures involved in measuring surface tension, viscosity; density, surfactant-related parameters such as CMC and HLB and related physical properties using standard laboratory apparatus.	20
SL02	Determine and interpret pH, pKa, buffer capacity, isotonicity and adsorption studies, and explain their significance in formulation stability and performance.	15
SL03	Conduct experiments and analyse results related to sedimentation volume and evaluate the influence of type of suspending agents on dispersion stability.	10
SL04	Evaluate micromeritic and flow properties of powders by determining particle size distribution, bulk density, tapped density, Hausner ratio, Car's index, angle of repose, true density, and porosity, and interpret the effect of glidants.	30
SL05	Perform and assess experiments on solubility, partition coefficient and critical solution temperature, and apply findings to formulation decisions.	25

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SL01	3	3	3	3	3	3	3	3	3	3	3	3	3	4,9
SL02	3	3	3	3	3	3	3	3	3	3	3	3	3	3,4
SL03	3	3	3	3	3	3	3	3	3	3	3	3	3	3,9
SL04	3	3	3	3	3	3	3	3	3	3	3	3	3	3,9
SL05	3	3	3	3	3	3	3	3	3	3	3	3	3	3,9

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:

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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy
Semester: II
Course Code: BP212P SEC1
Course Title: Communication Skills (Practical)

Course Objective: 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 conversations.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	2	1	-	-	20 /08	30/12	50/25

* J: Jury; V: Viva; P: Practical

List of Practicals:

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

Reference books:

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

Open Education Resources

Sr.No.	Title of OER	Source URL
1.	Communication Skills in Healthcare	https://youtu.be/tShavGuo0_E?si=-MeX790k23N06daJ
2.	Active Listening Skills	https://www.skillsyouneed.com/ips/listening-skills.html
3.	Patient Counselling in Pharmacy Practice	https://youtu.be/RNR1jXjvP_E?si=vtrcv3ui_K5zCauE
4.	De-escalation Techniques in Healthcare	https://youtu.be/6B9Kqg6jFeI?si=cp6VZl5_xpL_MFZS-
5.	Professional Email Writing Guide	https://owl.purdue.edu/owl/general_writing/academic_writing/email_etiquette.html
6.	FDA Drug Labeling Information	https://www.fda.gov/drugs/drug-safety-and-availability/drug-labeling

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	% weightage
SL01	Demonstrate effective verbal and non-verbal communication in clinical, retail, and academic pharmacy contexts	20
SL02	Perform patient counselling and handle real-world pharmacy interactions using role play and case scenarios.	30
SL03	Draft professional emails, prepare patient information leaflets, and create drug labels with clarity and accuracy.	20
SL04	Deliver confident oral presentations and communicate complex medical information in a simplified, patient-friendly manner.	20
SL05	Apply principles of ethical and culturally sensitive communication in handling patients and professional peers.	10



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	
SL01	2	2	3	3	1	3	3	2	3	2	3	3	3	3,4
SL02	3	3	3	3	2	3	3	2	3	2	3	3	3	3
SL03	2	2	3	3	3	3	3	2	3	2	3	3	3	3,4
SL04	2	3	2	3	3	3	3	3	3	2	3	3	3	3,4
SL05	2	3	3	3	2	3	3	2	3	2	3	3	3	3,16

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy

Semester: II

Course Code: BP212P SEC2

Course Title: Mental Well-Being, Stress and Conflict Management (Practical)

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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	2	1	-	-	20/08	30/12	50/25

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Unit No.	Topics
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

Reference Books:

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

Open Educational Resource

Sr. No.	OER Title	Source URL
1.	Mindfulness breathing exercise and reflection	https://www.youtube.com/watch?v=wfdTp2GogaQ
2.	Cognitive restructuring worksheet for negative thoughts	https://www.youtube.com/watch?v=sR_CK2mlW18
3.	Conflict styles self-test (Thomas-Kilmann Conflict Mode Instrument)	https://www.youtube.com/watch?v=Pex1ChYoVRQ
4.	Reflection report after practicing gratitude for 5 days	https://www.facebook.com/groups/habuild/posts/1842403366587637/
5.	Case study analysis: Conflict scenario in a healthcare/pharma setup	https://www.youtube.com/watch?v=awj509VfhBE



Student Learning Outcomes (SLOs):

SLOs	Sr. Student Learning Outcome Statements	%Weightage
SLO1	Identify sources and effects of stress in personal and professional life.	20
SLO2	Apply stress management techniques such as mindfulness, journaling, and relaxation exercises.	30
SLO3	Utilize conflict management strategies to resolve interpersonal and workplace conflicts.	20
SLO4	Demonstrate improved emotional intelligence and resilience.	15
SLO5	Develop effective communication skills for personal and professional growth.	15

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2	
SLO1	2	2	3	1	2	3	2	2	2	-	2	2	1	3,4,9,12
SLO2	2	3	3	2	3	3	2	2	2	-	2	3	2	3,4,8,9,12
SLO3	2	2	3	1	3	3	3	3	2	-	2	2	3	3,4,9,11,12
SLO4	1	2	2	-	3	3	3	3	2	-	3	3	2	4,9,12,13
SLO5	1	2	2	-	3	3	3	3	2	-	3	2	3	4,8,9,12,17

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

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FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy
Semester: II
Course Code: BP212P SEC3
Course Title: Fundamentals of Computer Operations (Practical)

Course Objective: 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.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
-	-	2	1	-	-	20/08	30/12	50/25

*J: Jury; V: Viva; P: Practical

List of Practicals:

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.

References Books:

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

Open Education Resources

Sr. No.	Title of OER	Source URL
1.	Computer Operating System Basics and File Explorer Navigation	https://youtu.be/fkGCLIQx1MI?si=5oeJmt0muYrB2jU
2.	File and Folder Creation, Organization, and Management	https://youtu.be/n1g9GWWRTFw?si=iZ6TOzw5al40yGfR
3.	Academic Report Formatting Using MS Word	https://youtu.be/4n6Le0-1i2o?si=V29VCONuXcOXQDy-
4.	Spreadsheet Formulas and Functions in MS Excel	https://youtu.be/Pt9iS-OyWk4?si=DLyIt2t4XzfNYqpl
5.	Creating Charts and Graphs from Pharmaceutical Data	https://youtu.be/eHtZrIb0oWY?si=fL-5Ub095880hUCh
6.	Preparing Academic Presentations Using PowerPoint	https://youtu.be/yPhUz6xjhGY?si=y7CxZsCemNPYn3n

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statements	% weightage
SLO1	Demonstrate the ability to operate computer systems and perform basic system and file management functions.	12
SLO2	Prepare and format digital documents and spreadsheets for academic and pharmaceutical applications.	28
SLO3	Develop presentations and use digital communication tools for effective professional communication.	18
SLO4	Access and retrieve scientific information using online databases and academic search platforms.	12
SLO5	Apply basic computer skills for organizing, analyzing, and managing pharmaceutical data and documentation.	30

SLO-PO & SLO-PSO Mapping and SDG Alignment

SLOs	POs											PSOs		SDG Alignment
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	
SLO1	2	3	2	3	2	3	2	2	2	2	3	3	2	4
SLO2	3	3	3	3	3	3	3	3	3	3	3	3	3	4,9
SLO3	2	3	3	3	3	3	3	3	3	2	3	3	3	4
SLO4	3	3	2	3	3	3	3	3	3	3	3	3	3	4,9
SLO5	3	3	3	3	3	3	3	3	3	3	3	3	3	4,9

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Curriculum Revision:	
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CVM
UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF PHARMACEUTICAL SCIENCES

Effective from Academic Batch: 2026-27

Programme: Bachelor of Pharmacy
Semester: II
Course Code: 1UCN12001
Course Title: Artificial Intelligence for Everyone

Course Objectives: The objectives of this course are to:

1. Introduces students from diverse disciplines to the fundamentals of Artificial Intelligence (AI) and its real-world applications.
2. It enables students to effectively use modern AI tools and technologies for academic, creative, and domain-specific tasks.
3. The course also develops prompt engineering skills, critical evaluation of AI-generated outputs, and awareness of ethical, responsible, and secure use of AI technologies.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorials	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
01	00	02	02	25/09	25/09	50/18	-	100/36

* J: Jury; V: Viva; P: Practical



Detailed Syllabus:

Unit No.	Topics	Hours
1.	Introduction to Artificial Intelligence: Definition and brief history of Artificial Intelligence, Types of AI (Artificial Narrow Intelligence, Artificial General Intelligence, Artificial Super Intelligence), Strong AI vs. Weak AI, Applications of AI in different domains, Overview of AI systems and their impact on society, Difference between Artificial Intelligence, Machine Learning, and Deep Learning.	2
2.	Basics of Machine Learning and Deep Learning: Concept of learning from data, Types of Machine Learning (Supervised, Semi- Supervised, Unsupervised, and Reinforcement learning), Introduction to Deep Learning, Basic concept of Neural Networks, Applications of ML/DL in real-world problems.	3
3.	Modern Artificial Intelligence: Introduction to Generative AI, Basic concepts of Large Language Models (LLMs) and Transformers, Basic working principle of AI systems (input-processing-output), Concepts: tokens, context window, prompt-response mechanism, Overview AI tools (for use cases such as Text generation, Search & Research, Image & Design, Audio/Video, Automation & Platforms, etc.)	2
4.	Prompt Engineering: Concept and importance of prompts in AI systems, Components of an effective prompt (role, task, context, and output format), Types of prompts (direct, role-based, step-by-step, example-based, and constraint-based), Techniques for improving prompts (such as adding clarity, specificity, and examples), Generating structured outputs (tables, bullet points, step-wise answers), Context engineering and Harness engineering - How prompt design affects AI responses.	3
5.	Applications of AI for Productivity and Creativity: Use of AI for academics (Note making, summarization, presentation generation, translation and explanation), Use of AI for professional purposes (resume building, email drafting, data interpretation), Domain specific use (Engineering – coding/debugging, design Ideas; Commerce – marketing contents, analytics; Pharmacy – drug information summarization; Management – case analysis; etc.), Creative use (image-video creation, poster design)	2
6.	Ethics, Limitations and Future of AI: Limitations of AI systems (hallucination, bias, outdated knowledge), Risks of over-dependence on AI, Academic integrity and plagiarism, Privacy and data security concerns, AI-generated misinformation and deepfakes, Responsible AI usage guidelines, Future trends and career opportunities	2



in Artificial Intelligence – Agentic AI.

List of Practicals:

1.	AI-based research and summarization. Tools: ChatGPT or Gemini, Perplexity AI - Open Perplexity AI and search the a topic (Climate Change / Digital Payments / Online Education / Social Media Impact / Any other) - Generate a summary of the topic in 150-200 words. Refine/improve the summary using ChatGPT by adding clarity and structure. - Add 3 key insights.
2..	Content generation using Multiple Tools. Tools: ChatGPT, Gemini, Microsoft Copilot - Generate notes using ChatGPT (minimum 5 points) on any one topic (Blockchain Basics, Human Brain, Marketing Strategies, Renewable Energy, etc.). - Expand using Google Gemini. - Use Microsoft Copilot to generate 3–5 questions. - Combine all outputs into a structured document.
3.	Compare responses from different AI systems. Tools: Claude, Perplexity AI Question (choose one): - What is Artificial Intelligence? / Benefits of Online Learning / Role of Data in Business / Any other. - Generate responses using Claude and Perplexity AI. - Compare responses on Accuracy, completeness, clarity/readability. - Write conclusion – Which is better and why?
4.	Use of Prompt Engineering for better AI output. Tool: ChatGPT Topic (choose one): - Internet / Machine Learning / Stock Market / Health Awareness / Any other Awareness / Any other - Write a simple prompt in ChatGPT (e.g., “Explain Internet”). - Improve the prompt by adding role (e.g. teacher), context (e.g. for beginners), and output format (e.g. bullet points). - Compare outputs. - Iterate for getting improved versions.
5.	Generate structured outputs from AI systems. Tools: Gemini, ChatGPT Topic (choose one): - Advantages of AI / Study Techniques / Business Models / Any other - Generate explanation using Google Gemini or ChatGPT.



	• Convert the same content into bullet points, table and any other suitable structured output. • Add heading and formatting.
6.	Use AI for visual content creation. Tools: Canva / Microsoft Designer / Leonardo AI Topic (choose one): • Save Environment / Cyber Security / Digital India / Healthy Lifestyle / Any other • Generate a poster on any topic. • Customize layout. • Modify prompt to add text and improve visuals. • Export/download final design.
7.	Create a structured and visually appealing presentation using AI tools. Tools: ChatGPT or Gemini, Gamma.app or Microsoft Copilot or Canva AI • Generate a presentation on any topic of your interest domain (title, introduction, 4-6 key points, conclusion) • Create Presentation using AI tools (select appropriate template, theme) • Enhance ppt for 1 visual (image/icons/charts), key message, slide transition, etc. • Export in ppt/pdf format.
8.	Convert speech into text and improve it using AI. Tools: Otter.ai + ChatGPT Topic (choose one): • Self Introduction / Importance of Education / Technology in Daily Life • Record speech (1-2 minutes) using Otter.ai. • Convert speech into text. • Improve grammar and clarity using ChatGPT.
9.	Create audio / video content using AI tools. Tools: ChatGPT, RunwayML / ElevenLabs Topic (choose one): • Product Advertisement / Awareness Message / Educational Concept • Generate a script using ChatGPT. • Convert script into voice or video using RunwayML or ElevenLabs.(Approximately 30-60 seconds.) • Ensure clarity and quality.
10.	To understand basic automation using AI tools. Tools: Zapier or FlowiseAI Task: • Automate a simple workflow. • Create a workflow (e.g., email alert or reminder) using Zapier or FlowiseAI. • Execute and test the workflow. • Document steps.
11.	Build and test a simple AI model. Tools: Google Teachable Machine + Hugging Face



	• Build/train a simple AI model for two classes (Use Google Teachable Machine). • Test the model with sample inputs. • Observe accuracy. • Explore one demo on Hugging Face Spaces.
12.	Understand and evaluate AI responses for bias or variation. Tools: ChatGPT, Gemini, LMSYS ArenaTopic (choose one): • News / Health Advice / Career Guidance / Technology Trend. • Enter the same question related to the selected topic in at least two AI tools such as ChatGPT, Google Gemini, or Microsoft Copilot. • Observe and compare the responses in terms of accuracy, completeness, and tone. • Identify any differences such as missing information, possible bias, or variation in explanation. • Use LMSYS Chatbot Arena to compare responses of different AI models for the same query. • Write observations.
13.	Mini Project: Apply AI tools to solve a real world problem. Examples: • AI Chatbot for College FAQs • AI Marketing Campaign, Product Advertisement Generator • Drug Information Summarizer, Patient Medicine Guide • Patient Education Assistant • Legal Document Summarizer, Consumer Rights Guide Tasks: • Identify good problem • Use different AI tools • Generate outputs • (iv) Present results

Reference Books:

1.	Sarkar, S., Artificial Intelligence for Everyone, 1st Edition, Khanna Publishing House, 2025.
2.	Hunter, N., The Art of Prompt Engineering with ChatGPT: A Hands-On Guide, 2nd Edition, Independent/TechPress, 2024.
3.	Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.
4.	Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
5.	John Misak, "AI for Everyone: A Practical Guide to Using Artificial Intelligence (AI Unplugged)", Atlantic Publishers and Distributors (P) Ltd, New Delhi, 2025.
6.	Elements of AI – https://www.elementsofai.com



7.	Learn Prompting (Open-Source Guide) – https://learnprompting.org
8.	Ethics in AI – Google Responsible AI Practices https://ai.google/responsibilities/responsible-ai-practices/
9.	Google Teachable Machine (Train AI models visually without code) https://teachablemachine.withgoogle.com

Pedagogy:

- Direct classroom teaching
- Practical based learning
- Project based learning
- Flipped classroom

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
5%	15%	25%	20%	10%	25%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Student Learning Outcomes (SLOs):

SLOs	Student Learning Outcome Statement	% Weightage
SL01	Explain basic concepts of AI and identify its applications in daily life and across disciplines.	20
SL02	Describe fundamental ideas of Machine Learning and Deep Learning with real-world examples.	10
SL03	Use modern AI tools for content generation and comparison.	20
SL04	Design effective prompts to obtain meaningful and structured responses from AI systems.	20
SL05	Apply AI tools to create content such as documents, presentations, images, and media.	20
SL06	Evaluate AI outputs for accuracy & bias and use AI responsibly.	10

Curriculum Revision:



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

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