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Amrutvahini Sheti & Shikshan Vikas Sanstha's

Amrutvahini College of Pharmacy, Sangamner

(An Autonomous College)

(As per UGC letter Ref.no. No.F. 2-10/2023(AC-Policy) dated 27th May 2025 and SPPU letter no. CA/ 716 dated 09/06/2025)

SYLLABUS FOR BACHELOR OF PHARMACY (B. Pharm) (2026) as per NEP 2020

[Framed under PCI NOTIFICATION, New Delhi, the 9th June, 2026 No. 14-154/2025-PCI.—In exercise of the powers conferred by Regulation 8. of the Bachelor of Pharmacy (B. Pharm) Course Regulations, 2014, the Pharmacy Council of India.]

With Effect from Academic Year
2026-27
[Revision 0.0]

Amrutvahini Sheti & Shikshan Vikas Sanstha's

Amrutvahini College of Pharmacy, Sangamner

Nashik-Pune Highway, Ghulewadi, Amrutnagar,
Tal. Sangamner, Dist.-Ahilynagar, Pin Code:- 422608

Vision

Our College will be recognized as socially cautious centre of excellence in innovative education through its contribution in training, scholarly research in pharmacy profession and services to society

Mission

For translation of our vision into reality college is striving to:

M1: Provide value based student centric and sustained quality pharmaceutical education

M2: Foster advanced and innovative research that benefits pharmaceutical industry and community.

M3: Encourage and strengthen leadership, competitiveness, ethical reasoning and intellectual curiosity

Amrutvahini Sheti & Shikshan Vikas Sanstha's
AMRUTVAHINI COLLEGE OF PHARMACY, SANGAMNER
• Approved by Pharmacy Council of India (PCI), New Delhi • Approved by D.T.E., Mumbai & Govt. of Maharashtra
• Permanently Affiliated to Savitribai Phule Pune University • Recognised under section 2(f) and 12B UGC Act 1956
• University ID : PU/AN/Pharm/83, 2004; Puncode : CPHA016760 • DTE CODE : 5194 • A.I.S.H.E. Code : C-42026 • NAAC "A" Grade
An Autonomous College

Ref. AVCOP/317/2026-27 Date: 01/10/2026

Curricular Structure and Syllabus for B.Pharm (2026) as per NEP 2020 -2026-27:B.Pharm

The Bachelor of Pharmacy (B.Pharm) program syllabus of **First Year B.Pharm Semester-I and Semester–II** of academic year 2026-27 being offered at **Amrutvahini College of Pharmacy, Sangamner (An Autonomous College)** has been duly approved by the Academic Council of Amrutvahini Sheti & Shikshan Vikas Sanstha's, Amrutvahini College of Pharmacy, Sangamner (An Autonomous College).

Dr.M.J.Chavan
Chairman Academic Council & Principal
Chairman, Academic Council
Amrutvahini College of Pharmacy
(Autonomous), Sangamner-422608

SYLLABUS

SEMESTER I

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

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP101T	**Basics of Python Programming for Pharmaceutical Sciences (Theory)**			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	T	P	
2	**2**	**--**	**--**	**30**
Maximum Marks	**ISE**			ESE
50	**20**			**30**

COURSE OBJECTIVES:

The objectives of this course are to:

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

COURSE OUTCOMES (CO):

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

COURSE CONTENT:

Unit	Topic	Hours
I	**Introduction to Python programming** • Installing Python and an Integrated Development Environment (IDE) [Jupyter Notebook, PyCharm, VS Code etc.], Advantages of IDEs over text editors. • Python variables and data types (integers, floats, strings, booleans), Type casting and basic operators (arithmetic, comparison, logical), Input and output operations.	**6**
II	• Basic string operations and manipulation techniques. Introduction to standard libraries and third-party libraries, installing and uninstalling libraries. **Control Structures & Functions** • Conditional statements (if, if-else, if-elif-else), nested conditions • Loops (for loop, while loop). • Break and continue statements. • Defining and calling functions, passing arguments and returning values. • Writing modular programs for simple pharmaceutical applications- dosage	**6**

	calculation and BMI calculation.	
III	**Data Structures & File Handling** • Lists, tuples, and dictionaries. • Indexing and slicing lists, basic operations on lists and dictionaries, string manipulation techniques. • Introduction to NumPy arrays, basic operations using NumPy (array creation, arithmetic operations). • Reading and writing CSV files. • Understanding structured healthcare datasets. • Importing small pharmaceutical datasets and performing basic data access and manipulation tasks.	**6**
IV	**Data Handling with Pandas** • Introduction to Pandas library. • Pandas Series and DataFrame structures. • Reading CSV and Excel files-PK study datasets and ADR reports • Inspecting datasets using functions such as head (), tail (), info (), and describe (). • Data cleaning techniques and handling missing values. • Filtering and selecting data based on conditions. • Grouping data and performing aggregation functions.	**6**
V	**Data Visualization with Matplotlib** • Introduction to Matplotlib. • Creating line plots, histograms, scatter plots, and box plots. • Labeling axes, titles, and legends. • Create plots and visualize pharmaceutical datasets - concentration-time curves for oral and IV administration, ADR reporting rates across drugs, dissolution profiles. • Scientific interpretation of plots.	**6**

Recommended References (Preferably latest editions):

1. McKinney, W. 2022, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter, 3rd Edition, O'Reilly Media, Sebastopol.

2. Lutz, M. 2013, Learning Python, 5th Edition, O'Reilly Media, Sebastopol.

3. Matthes, E. 2023, Python Crash Course: A Hands-On, Project-Based Introduction to Programming, 3rd Edition, No Starch Press, San Francisco.

4. VanderPlas, J. 2016, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media, Sebastopol.

5. Wes McKinney. 2018, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition, O'Reilly Media, Sebastopol.

Program : B. Pharmacy	Class : First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP102T	General Pharmacy (Theory)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
3	3	-	-	45
Maximum Marks	**ISE**			**ESE**
75	30			45

Course Objectives:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT

Unit	Topic	Hours
I	**Introduction to the Profession of Pharmacy** • History of the Profession of Pharmacy in India: In relation to pharmacy education, pharmaceutical industries and organizations – evolution, development and milestones. • Scope of the Pharmacy Profession: Role and responsibilities of pharmacists in retail/community pharmacy, hospital and clinical pharmacy, and industrial pharmacy including research and development. • Pharmacopoeias: Introduction to IP, BP, USP, BPC, International Pharmacopoeia, other pharmacopoeias and the National Formulary of India; structure and content of the Indian Pharmacopoeia; study of one model IP monograph. • Introduction to Prescription: Structure and format/parts of prescription, handling of prescriptions, Latin terminology related to prescriptions. • Introduction of incompatibility and their types	**9**
II	**Introduction to Pharmaceutical Calculations and Dosage Forms** • Metric system of weights and measures; calculations based on allegation, proof spirit, isotonic solutions, dilute solutions (percentage and ratio) and geometric dilution; scientific notation of units and measures. • Posology: Definition and dose calculation based on age, body weight and body surface area. • Introduction to Dosage Forms: Routes of administration and classification of dosage forms. • Introduction to Active Pharmaceutical Ingredients and Excipients: Definition, ideal characteristics and importance.	**9**
III	**Solid Dosage Forms** • Powders: Classification, advantages and disadvantages; dusting powders, effervescent powders, efflorescent powders, hygroscopic powders and eutectic mixtures; introduction to excipients and methods of preparation. • Tablets: Definition, types of tablets including molded tablets and pills with examples; advantages and disadvantages; introduction to excipients and methods of preparation. • Capsules: Definition, types of capsules, advantages and disadvantages, capsule sizes; introduction to excipients and methods of preparation.	**9**
IV	**Monophasic and Biphasic Liquids** • For internal use – Solutions, aromatic waters, syrups, elixirs and linctus (definition and preparation). • For external use and body cavities – liniments, lotions, throat paints, applications, gargles, mouthwashes, enemas, eye drops, ear drops, nasal drops and tinctures with examples.	**9**

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

References (Preferably Latest Editions):

1. Ansel HC, Popovich NG. Pharmaceutical dosage forms and drug delivery systems. Lippincott Williams & Wilkins, New Delhi.
2. Gunn C, Carter SJ. Dispensing for Pharmaceutical students. CBS Publisher, New Delhi.
3. Indian Pharmacopoeia Commission, Indian Pharmacopoeia. Ghaziabad.
4. Indian Pharmacopoeia Commission, National Formulary of India. Ghaziabad, India.
5. British Pharmacopoeia Commission, British Pharmacopoeia. London.
6. United States Pharmacopeial Convention, United States Pharmacopeia (USP–NF). Rockville, Maryland, USA.
7. Lachman L, Lieberman HA, Kanig JL. The theory and practice of industrial pharmacy. Philadelphia: Lea & Febiger, University of Michigan.
8. Remington JP. Remington: the science and practice of pharmacy. Lippincott Williams & Wilkins, New Delhi
9. Jain SK. Bentley's Textbook of Pharmaceutics. Elsevier health sciences, USA.
10. Nieloud F, Marti-Mestres G, Pharmaceutical emulsions and suspensions. Marcel Dekker, Inc., New York.

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP103T	Healthcare Psychology and Communication Skills (Theory)			Core 3
Credits	**Hours Per Week (L-T-P)**			**Max Hours**
	L	**T**	**P**	
1	1	--	--	15
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT:

Unit	Topic	Hours
I	**Introduction to Psychology in Healthcare** Definition, scope, and relevance of psychology in health sciences. Branches of psychology with healthcare relevance: clinical, health, behavioural, and developmental psychology. Sensation, perception, and attention in clinical assessment. Learning and memory: reinforcement in health behavior change. Emotion and motivation: theories and implications in health contexts.	3
II	**Developmental and Behavioural Psychology** Human developmental stages and healthcare needs. Personality theories and patient interaction styles. Psychological factors affecting illness perception and recovery. Common psychological disorders in healthcare: anxiety, depression, and somatization. Coping strategies, resilience, and stress management techniques.	3
III	**Foundations of Health Communication** Elements and models of communication in healthcare. Types of communication: interpersonal, group, mass, and telehealth communication. Barriers to effective communication in clinical settings. Active listening, questioning techniques, and empathy. Culturally appropriate and inclusive communication.	3

IV	**Professional Communication in Healthcare Settings** Communication with patients, caregivers, and interdisciplinary teams. Delivering difficult news and handling emotionally charged situations. Legal and ethical issues in health communication (confidentiality, consent). Writing patient records, reports, and discharge summaries. Use of technology and digital communication tools in healthcare services	**3**
V	**Health Psychology and Behavioural Interventions** Health belief models and illness behaviour. Psychosomatic illnesses and the mind–body connection. Behaviour change theories (e.g., CBT, TTM) in treatment adherence. Psychological first aid and crisis communication. Mental health promotion and stigma reduction through communication.	**3**

Reference Books

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

Program : B. Pharmacy			Class: First Year	Semester : 1
Course Code	**Course Title**			**Course Type**
BP104T	**Human Anatomy, Physiology and Pathophysiology I (Theory)**			**Core 5**
Credits	**Hours Per Week (L-T-P)**			**Max Hours**
	L	**T**	**P**	
4	**4**	**--**	**--**	**60**
Maximum Marks	**ISE**			**ESE**
100	**40**			**60**

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT:

Unit	Topics	Hours
I	**Introduction to human body** Cellular and tissue level of organization. Definition and scope of anatomy, physiology and pathophysiology. Levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminologies. Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, forms of intracellular signalling a) Contact-dependent, b) Paracrine, c) Synaptic, d) Endocrine Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues. **Basic principles of cell injury and adaptation** Components and types of feedback systems, causes of cellular injury, pathogenesis(cell membrane damage, mitochondrial damage, ribosome damage and nuclear damage), morphology of cell injury – adaptive changes (atrophy, hypertrophy, hyperplasia, metaplasia, dysplasia), cell swelling, intra cellular accumulation and cell death. Definitions of commonly used relevant medical terminologies.	**12**

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

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., Textbook of Medical Physiology. Elsevier.
4. Chatterjee, C.C., Human Physiology (Vol. I & II). Academic Publishers, Kolkata.
5. Mohan, H., Textbook of Pathology. Jaypee Publishers.
6. Porth, C.M., Pathophysiology: Concepts of Altered Health States. Lippincott Williams & Wilkins.
7. Kumar, V., Abbas, A.K., Aster, J.C. and Deyrup, A.T., Robbins and Kumar Basic Pathology. Elsevie
8. Sembulingam, K. and Sembulingam, P., Essentials of Medical Physiology. Jaypee Brothers Medical Publishers, New Delhi.
9. Kumar, V., Cotran, R.S. and Robbins, S.L., Basic Pathology. W.B. Saunders Company, Philadelphia.

Program: B. Pharmacy	Class: First Year			Semester: I
Course Code	**Course Title**			**Core**
BP105T	**Introduction to Pharmacognosy (Theory)**			**7**
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
3	**3**	**-**	**-**	**45**
Maximum Marks	**ISE**			**ESE**
75	**30**			**45**

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENTS:

Unit	Topics	Hours
I	**Fundamentals of Pharmacognosy** **(a)** Definitions, history, present status, scope and development of pharmacognosy. **(b) Sources of drugs:** Plants, animals, microbial, marine, mineral and plant tissue culture. **(c) Historical milestones in drug discovery:** Morphine, quinine, aspirin, warfarin, penicillin, cephalosporin, taxol and artemisinin. **(d) Introduction to different herbal / traditional pharmacopoeias:** Indian Pharmacopoeia, British Herbal Pharmacopoeia, United States Pharmacopeia –Herbal Medicines and Dietary Supplements, Ayurvedic Pharmacopoeia of India, Unani Pharmacopoeia of India and American Herbal Pharmacopoeia. e) **Official and non-official; codified and non-codified drugs.** Classification of crude drugs: alphabetical, morphological, taxonomical, chemical, pharmacological and chemotaxonomic classification along with their merits and limitations.	**10**

II	**Cultivation, Collection, Processing and Storage of Drugs of Natural Origin** Methods of plant cultivation and Good Agricultural and Collection Practices (WHO/ GAP / GCP guidelines) for medicinal plants. Factors influencing cultivation, collection and storage of medicinal plants. Planthormonesandtheirapplicationsincultivationofmedicinalplants.Application of polyploidy, mutation and hybridization concepts with reference to secondary metabolites. Ex-situ and in-situ conservation and strategies for value addition of medicinal plants. Role of eco-pharmacognosy in sustainable conservation of endangered medicinal plants such as kutki and chirata.	**8**
III	**Quality Control of Drugs of Natural Origin (WHO Guidelines)** Adulterationofdrugsofnaturalorigin.Evaluationofdrugsusingorganoleptic, microscopic (qualitative and quantitative), physical, chemical and biological methods.Physicochemicalparameters:extractivevalues,moisturecontent,foreign organic matter, ash values, bitterness value, foaming index, haemolytic potential, swelling index, viscosity, optical rotation, refractive index, acid value and saponification value. DNA barcoding.	**8**
IV	**Introduction to Metabolites of Plant Origin:** Definition and general properties of plant metabolites. Primary and secondary metabolites such as carbohydrates, proteins, lipids, alkaloids, glycosides, flavonoids, tannins, terpenoids, volatile oils and resins. **Traditional Systems of Medicine** Basic principles of treatment of diseases in different systems of medicine including AYUSH and TCM. Types of dosage forms in AYUSH medicines. Role of pharmacognosy in allopathy and traditional systems of medicine such as AYUSH and TCM.	**12**
V	**Phyto-therapeutic Agents:** Biological source, major constituents and uses of the following classes of drugs: • Adaptogens and Immunomodulators: Ashwagandha, Tulsi, Amla • Hepatoprotectives: Milk thistle, Kutki • Cardiovascular drugs: Garlic, Arjuna • Antidiabetics: Gymnema, Fenugreek • Anti-inflammatory and analgesics: Turmeric, Boswellia • CNS drugs: Brahmi • Antimicrobial and antivirals: Giloy, Neem, Andrographis • Gastrointestinal drugs: Psyllium • Dermatological agents: Aloe • Drugs used in women's health: Chasteberry, Shatavari • Respiratory drugs: Vasaka	**7**

Recommended References (*Preferably latest editions*):

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

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP106T	Pharmaceutical Inorganic and Analytical Chemistry (Theory)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
3	3	--	--	45
Maximum Marks	**ISE**			**ESE**
75	30			45

COURSE OBJECTIVES:

The Understand the importance of errors, impurities in pharmaceuticals.

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

COURSE OUTCO MES (CO):

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

COURSE CONTENT:

Unit	Topic	Hours
I	**Introduction to pharmaceutical analysis** Different techniques of analysis, Methods of expressing strength of solutions, Primary and secondary standards with examples. **Errors** Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures. **Impurities** Definition, types, contents and regulatory importance. Sources and types of impurities in Pharmaceuticals, limit tests for chloride, sulphate, iron, arsenic, lead, heavy metals, and modified limit test for chloride and sulphate.	7
General methods of preparation and assay for compounds superscripted with an asterisk (*), Properties and Medicinal uses of Inorganic Compounds belonging to the following classes		

II	**Acid-Base Chemistry and Buffer Systems in Pharmacy** Definition of acids, bases, principles of acid-base titrations, buffers, pH Scale, measurement of pH and its significance, Buffer equation (Henderson-Hasselbalch equation), buffer solution. Isotonicity and its application in IV Fluids and Ophthalmic Solutions. **Major extra and intracellular electrolytes** Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium chloride and Oral Rehydration Salt (ORS), Physiological acid base balance.	**8**
III	**Acid base titrations** Theories of acid base indicators, classification of acid base titrations. Preparation and standardization of titrants viz. hydrochloric acid and sodium hydroxide. Theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves. Assay of Ammonium hydroxide. **Non-aqueous titrations** Types of solvents used, acidimetric and alkalimetric titration using non-aqueous solvents. Preparation and standardization of acidic and basic titrants. Estimation of weakly acidic and basic substances using non-aqueous titrants, estimation of Sodium benzoate. **Precipitation titrations and gravimetry** Principle and steps involved in gravimetric analysis, Mohr's method, Volhard's, Modified Volhard's, Fajans method. Estimation of barium sulphate by gravimetry. **Complexometric titrations** Classification, metal ion indicators, masking and demasking reagents, preparation and standardization of disodium EDTA. Estimation of Magnesium sulphate and Calcium gluconate*. **Redox titrations** Concepts of oxidation and reduction, Types of redox titrations viz. Permanganometry, Cerimetry, Iodimetry, Iodometry and titrations with potassium iodate.	**14**
IV	**Gastrointestinal agents** Acidifiers: Sodium acid phosphate and Dilute Hydrochloric acid. Antacids: Ideal properties of antacids, combinations of antacids, Sodium bicarbonate*, Aluminium hydroxide gel*. Agents promote bowel movements: Magnesium hydroxide, Sodium orthophosphate, Sodium Potassium tartrate and magnesium trisilicate. **Antimicrobials:** Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations. **Radiopharmaceuticals** Basics of radioactivity, applications of radioisotopes of Sodium Iodide I-131, Technetium-99 m, Cobalt-60, Phosphorus-32 including safe handling, storage, and disposal of radiopharmaceuticals adhering to regulatory guidelines for safety.	**10**

V	**Miscellaneous Compounds** **Expectorants:** Potassium iodide, Ammonium chloride*. **Emetics:** Copper sulphate*, Sodium potassium tartrate. **Haematinics:** Ferrous sulphate*, Ferrous gluconate. **Poisons and Antidotes:** Definition, classification of antidotes, Sodium Thiosulphate **Astringents:** Alum (Potash Alum), Zinc Sulfate ($ZnSO_4$) **Topical agents:** Zinc Oxide (ZnO), Titanium Dioxide (TiO_2) **Dental Products:** Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, Zinc eugenol cement	**06**

Recommended References (Preferably latest editions):

1. Block, J.H., Roche, E.B., Soine, T.O and Wilson, C.O. 1974, Inorganic Medicinal and Pharmaceutical Chemistry, Philadelphia
2. Bentley, R. and Driver, J., Bentley and Driver's Textbook of Pharmaceutical Chemistry. Oxford: Oxford University Press.
3. Vogel, A.I., Vogel's Textbook of Quantitative Chemical Analysis. Essex: Pearson Education Limited.
4. Beckett, A.H. and Stenlake, J.B., Practical Pharmaceutical Chemistry. Part I & II. London: The Athlone Press, University of London.
5. Schroff, M.L., Inorganic Pharmaceutical Chemistry. New Delhi: Oxford Book Company
6. Indian Pharmacopoeia Commission, Indian Pharmacopoeia. Ghaziabad, India.

Program : B. Pharmacy	Class : First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP107P	General Pharmacy (Practical)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	T	P	
1	-	-	3	45
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT:

List of practicals
1. Pharmaceutical Calculations Solutions based on allegation and dilution methods **2. Powders & Granules** a) ORS powder – WHO b) Effervescent granules – IP c) Dusting powder – IP d) Divided powders – IP **3. Solutions** a) Strong solution of ammonium acetate – IP b) Cresol with soap solution – IP c) Lugol's solution – BPC **4. Gargles & Mouthwashes** a) Iodine gargle – BPC

b) Chlorhexidine mouthwash – IP

5. Syrups

a) Simple Syrup – IP

6. Suppositories

a) Glycerogelatin suppository – BPC
b) Cocoa butter suppository – IP
c) Zinc Oxide suppository – IP

7. Semisolids

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

Note:

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

References (Preferably Latest Editions):

1. Gunn C, Carter SJ. Dispensing for Pharmaceutical students. CBS Publishers, New Delhi.
2. Indian Pharmacopoeia Commission, Indian Pharmacopoeia, Ghaziabad.
3. United States Pharmacopeial Convention, United States Pharmacopeia–National Formulary (USP–NF). Rockville, MD, USA.
4. British Pharmacopoeia Commission, British Pharmacopoeia Codex. London: The Stationery Office.
5. World Health Organization, Oral Rehydration Salts (ORS) Formulation Guidelines. Geneva: WHO

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP108P	**Healthcare Psychology and Communication Skills (Practical)**			**Core 4**
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	T	P	
1	--	--	2	30
Maximum Marks	**ISE**			**ESE**
50	**20**			**30**

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

List of Practicals	
1	**Role Plays and Simulations** Counselling a patient with chronic illness Breaking bad news in a clinical setting Empathetic listening in crisis response
2	**Case Study Discussions** Mental health cases in primary care Impact of miscommunication in healthcare errors
3	**Peer-to-Peer Practice Sessions** Reflective listening and paraphrasing Effective team communication and decision-making
4	**Community Engagement Tasks** Designing IEC materials for public health awareness Conducting mock health education sessions
5	**Journaling & Self-Reflection Logs** Weekly reflection on emotional responses during care simulations Growth in communication skill development over the semester

Recommended References *(Preferably Latest Editions)*:

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

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP109P	Human Anatomy, Physiology & Pathophysiology- I (Practical)			Core 6
Credits	**Hours Per Week (L-T-P)**			**Max Hours**
	L	**T**	**P**	
1	--	--	3	45
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT:

Sr No.	List of Practical
	(Minimum of 12 experiments must be performed) Practical HAPP allows the verification of physiological processes discussed in theory classes through experiments on living tissues, simulated videos, models, and charts.
1.	Study of compound microscopes.
2..	Microscopic study of epithelial and connective tissue
3.	Microscopic study of muscular and nervous tissue.
4.	Identification of axial bones.
5.	Identification of appendicular bones.
6.	Introduction to hemocytometry
7.	Demonstration of total blood count by cell analyser.
8.	Enumeration and interpretation of white blood cell (WBC) count, differential count.
9.	Enumeration and interpretation of total red blood corpuscles (RBC) count.
10.	Determination of bleeding time and clotting time
11	Estimation and interpretation of hemoglobin content.
12	Determination of blood group

13	Determination and interpretation of erythrocyte sedimentation rate (ESR).
14	Determination of pulse rate, heart rate and blood pressure.
15	Recording and interpretation of ECG.
16	To study the cardiovascular system and integumentary system
17	Case studies/files of patients with anaemia, thalassemia, haemophilia, leprosy, gout, hypertension and ischemic heart disease.

Recommended References *(Preferably latest editions)*:

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

Program: B. Pharm.	Class: First Year			Semester: I
Course Code	**Course Title**			**Core**
BP110P	Introduction to Pharmacognosy (Practical)			8
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
1	L	T	P	45
	-	-	3	
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENTS:

List of Practicals

(Minimum 12 experiments must be performed)

1. Morphological study of medicinal plants (as mentioned in Unit V Theory) and Experiential learning-based experiments involving collection, identification of medicinal plant material, preparation of voucher specimens and excursion visits to medicinal plant garden.
2. Organoleptic evaluation and powder microscopical characters of the following drugs: Tulsi and Ashwagandha.
3. Organoleptic evaluation and powder microscopical characters of the following drugs: Amla and Arjuna.
4. Organoleptic evaluation and powder microscopical characters of the following drugs: Turmeric and Psyllium husk.
5. Organoleptic evaluation and powder microscopical characters of the following drugs: Brahmi and Fenugreek.
6. Determination of moisture content and foreign organic matter of crude drugs.
7. Determination of swelling index and foaming index of crude drugs.
8. Determination of stomatal number and stomatal index of leaf.
9. Determination of vein islet and vein termination number of leaf.
10. Determination of ash value and extractive values of crude drugs.
11. Determination of dimensions of calcium oxalate crystals and phloem fibers by eyepiece micrometry.

12. Determination of percentage purity of powder drug using lycopodium spore method.

Recommended References *(Preferably Latest Editions)*:

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

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP111P	**Pharmaceutical Inorganic and Analytical Chemistry (Practical)**			**Core**
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	**L**
1	**--**	**--**	**1**	**--**
Maximum Marks	**ISE**			**ESE**
50	**20**			**30**

COURSE OBJECTIVES:

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

COURSE OUTCOMES (CO):

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

COURSE CONTENT:

List of Practicals
1. Limit tests (Any 4 Experiments)
a. Limit test and modified limit test for Chloride as per Indian Pharmacopoeia
b. Limit test and modified limit test for sulphate as per Indian Pharmacopoeia
c. Limit test for Iron
d. Limit test for Lead
e. Limit test for arsenic
f. Limit tests for heavy metals
2. Preparation of inorganic pharmaceuticals (Any 3 Experiments)
a. Preparation of Aluminium hydroxide
b. Preparation of potash alum
c. Preparation of ferrous sulphate
d. Preparation of Magnesium sulphate from magnesium hydroxide or magnesium carbonate
3. Test for Purity (Any 2 Experiments)
a. Assessment of swelling power of bentonite as per Indian Pharmacopoeia

b. Evaluation of acid neutralizing capacity of aluminium hydroxide gel

c. Determination of potassium iodate and iodine in potassium Iodide

4. Assay of the following inorganic compounds including standardization of titrant (Any 5 Experiments)

a. Assay of ammonium chloride by acid base titration

b. Assay of Ferrous sulphate by Cerimetry

c. Assay of Copper sulphate by Iodometry

d. Assay of Calcium gluconate by Complexometry

e. Assay of Hydrogen peroxide by Permanganometry

f. Assay of Sodium benzoate by non-aqueous titration

g. Assay of Sodium Chloride by precipitation titration (Modified Volhard's method)

5. Calibration of pH meter and pH measurement techniques.

Recommended References (Preferably latest editions):

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

SYLLABUS

SEMESTER II

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

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

Program : B. Pharmacy	Class: First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP201T	Applied Biostatistics and Data Analytics for Pharmaceutical Sciences (Theory)			Core 11
Credits	**Hours Per Week (L-T-P)**			**Max Hours**
	L	**T**	**P**	**L**
2	2	--	2	2
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

Unit	Topic	Hours
I	**Descriptive Statistics** • Types of data in pharmaceutical sciences (nominal, ordinal, interval, ratio) • Sources of data in pharmacy: clinical trials, pharmacovigilance, quality control, PK studies • Measures of central tendency: mean, median, mode, their calculation and interpretation • Measures of dispersion (range, variance, standard deviation) and their interpretation using pharmaceutical data • Skewness and understanding distribution shape in biological measurements • Perform descriptive statistical analysis using Python libraries such as NumPy and Pandas, with focus on Interpretation of results	6
II	**Probability & Statistical Distributions in Healthcare** • Basic probability concepts and laws (addition and multiplication rules), conditional probability and its interpretation • Bayes' theorem and its application in clinical decision-making • Concept of random variables (discrete and continuous) • Normal distribution and its importance in biological and pharmaceutical measurements, • Binomial distribution demonstrating applications in clinical trial	6

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

Recommended References *(Preferably Latest Editions)*:

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

Program : B. Pharmacy	Class: First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP202T	**Biochemistry (Theory)**			**Core**
Credit	**Hours Per Week (L-T-P)**			**Max. Hours L**
	L	T	P	
3	**3**	**--**	**3**	**3**
Maximum Marks	**ISE**			**ESE**
75	**30**			**45**

COURSE OBJECTIVES:

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

COURSE OUTCOMES (CO):

CO NO.	Upon completion of course student will able to
1	Explain the classification, properties, kinetics, regulation and therapeutic and diagnostic applications of enzymes, coenzymes, vitamins and minerals, and the commonly performed liver and renal function tests.
2	Explain the structure and biological functions of major biomolecules, bioenergetics, carbohydrate metabolism and biological oxidation, with their relevance to diabetes mellitus and oxidative stress.
3	Explain major classes of lipids and lipoproteins, and their role in lipid and cholesterol metabolism.
4	Understand amino acid and protein metabolism, urea cycle, neurotransmitter and hormone biosynthesis, and heme degradation, along with their associated metabolic disorders.
5	Understand nucleotide metabolism and the processes involved in DNA replication, transcription, translation and DNA repair, along with their clinical significance.

COURSE CONTENT:

Unit	Topic	Hours
I	**Enzymology** a. Introduction, properties, nomenclature, and IUB classification of enzymes and coenzymes. Enzyme kinetics (Michaelis plot, Lineweaver-Burk plot). Enzyme inhibitors with examples. Regulation of enzymes: enzyme induction and repression, allosteric enzyme regulation. Therapeutic and diagnostic application of enzymes and isoenzymes. Factors affecting enzyme activity. Digestion, absorption function of dietary Macro and Micronutrients, including Vitamins and Minerals, Biochemical functions of vitamins and associated diseases. b. Clinical Chemistry: Liver function tests (routinely performed tests based on liver function). Renal function tests (routinely performed tests based on kidney function,	**10**

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

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

Recommended References (Preferably latest editions):

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

Program : B. Pharmacy			Class: First Year	Semester : 2
Course Code	**Course Title**			**Course Type**
BP203T	**Human Anatomy, Physiology & Pathophysiology- II (Theory)**			**Core 3**
Credits	**Hours Per Week (L-T-P)**			**Max Hours**
	L	**T**	**P**	
4	**4**	**--**	**--**	**60**
Maximum Marks	**ISE**			**ESE**
100	**40**			**60**

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT

Unit	Topics	Hours
I	**Nervous System** a) Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse and neurotransmitters. Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem and cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity). b) Pathophysiology of epilepsy, Parkinson's disease, stroke, migraine, depression, schizophrenia, Alzheimer's disease and meningitis.	**14**
II	**Gastrointestinal System** a) Anatomy of GI tract with special reference to anatomy and functions of stomach (acid production in the stomach and its regulation through parasympathetic nervous system; role of pepsin in protein digestion). Anatomy and functions of small intestine and large intestine. Anatomy and functions of salivary glands, pancreas and liver. Movements of GIT, digestion and absorption of nutrients. b) Pathophysiology of inflammatory bowel diseases, peptic ulcer, jaundice, hepatitis, typhoid and alcoholic and non alcoholic fatty liver disease	**12**

III	a) **Respiratory System** Anatomy of respiratory system with special reference to anatomy of lungs. Mechanism of respiration and regulation of respiration. Lung volumes and capacities, transport of respiratory gases, artificial respiration and resuscitation methods. b) Pathophysiology of asthma, chronic obstructive pulmonary diseases and tuberculosis. c) **Urinary System** Anatomy of urinary tract with special reference to anatomy of kidney and nephrons. Functions of kidney and urinary tract. Physiology of urine formation, micturition reflex and role of kidneys in acid–base balance. Role of Renin Angitensin Aldosterone System in kidney. d) Pathophysiology of acute and chronic renal failure and urinary tract infections.	**12**
IV	**Endocrine System** a) Classification of hormones and mechanism of hormone action. Structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland and thymus. b) Pathophysiology of diabetes, hypothyroidism, hyperthyroidism, goitre and polycystic ovary syndrome.	**10**
V	**Reproductive System and Cancer** a) Anatomy of male and female reproductive system. Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition. b) Pathophysiology of sexually transmitted diseases: AIDS, syphilis and gonorrhea. c) Etiology and pathogenesis of cancer.	**12**

Recommended References (Preferably latest editions):

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

Program : B. Pharmacy	Class: First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP204T	Pharmaceutical Organic Chemistry (Theory)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	**L**
4	4	--	4	4
Maximum Marks	**ISE**			**ESE**
100	40			60

COURSE OBJECTIVES:

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

COURSE OUTCOMES (CO):

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

COURSE CONTENT:

Unit	Topic	Hours
I	**Basics of Organic chemistry:** Hybridization, Types of Bonds, Bond Fission, Concepts of Homolytic and Heterolytic bond fission/cleavage in reaction mechanisms. Factors affecting reaction Mechanism **Aliphatic Saturated Hydrocarbons** **Alkanes** • Methods of preparation: Wurtz reaction, Kolbe's reaction, Clemmensen reduction, Wolff- Kishner reduction • Chemical reactions of alkanes • Mechanism of free radical substitution (halogenation) • Pharmaceutical applications of alkanes: Liquid paraffin, soft paraffin, hard paraffin **Cycloalkanes** • Baeyer's strain theory and its limitations • Coulson- Moffitt modification • Sachse- Mohr theory	12
	Aliphatic Unsaturated Hydrocarbons **Alkenes** Methods of preparation: • Dehydration of alcohols • Dehydrohalogenation of alkyl halides • Dehalogenation of vicinal dihalides • Wittig reaction	12

II	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 **Alkynes** Characterization reactions, addition reaction mechanisms	
III	**Alkyl Halides** Nucleophilic substitution reactions: **SN1 and SN2** • Mechanism, kinetics, substrate structure, solvent effect, stereochemistry Elimination reactions: **E1 and E2** • Mechanism, kinetics, substrate structure, solvent effect, stereochemistry • Zaitsev's (Saytzeff's) rule with examples • Comparison of substitution vs elimination reactions	**12**
IV	**Benzene and Its Derivatives** • IUPAC nomenclature of mono- and di-substituted benzene derivatives • Structure of benzene • Molecular orbital picture and resonance • Aromaticity and Hückel's rule • Electrophilic aromatic substitution reactions: • Nitration • Halogenation • Friedel- Crafts alkylation and its limitations • Friedel- Crafts acylation • Sulphonation and desulphonation • Effect of substituents on reactivity and orientation	**12**
V	**Carbonyl compounds Aldehydes and Ketones** • Preparation and properties of carbonyl compounds • Nucleophilic addition reactions • Aldol condensation and crossed aldol condensation • Cannizzaro and crossed Cannizzaro reactions • Benzoin and Perkin condensation • Oxidation and reduction reactions • Pharmaceutical applications of carbonyl compounds: Chloral, Paraldehyde, Ketoprofen	**12**

Recommended References (Preferably latest editions):

1. Morrison, R.T., Boyd, R.N. and Bhattacharjee, S.K., Organic Chemistry. Pearson Education India.

2. Finar, I.L., Organic Chemistry, Vol. I. Pearson Books.

3. Bahl, B.S. and Bahl, A., Textbook of Organic Chemistry. S. Chand & Company.

4. Furniss, B.S., Vogel's Textbook of Practical Organic Chemistry.

Program: B. Pharm.	Class: First Year			Semester: II
Course Code	**Course Title**			**Core**
BP205T	**Pharmacognosy and Photochemistry (Theory)**			**7**
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
4	**4**	**-**	**-**	**60**
Maximum Marks	**ISE**			**ESE**
100	**40**			**60**

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT:

Unit.	Topics	Hours
I	**Metabolic Pathways and Biogenetic Studies–** Brief study of basic metabolic pathways and biosynthesis of secondary metabolites including: • Shikimic acid pathway • Acetate pathway • Amino acid pathways Utilization of radioactive isotopes in biogenetic studies. Introduction to pathway prediction tools and modern genetic tools such as CRISPR/Cas9.	**10**

II	**Primary Metabolites:** **General classification and identification tests** **Pharmacognostic study** (biological source, distribution, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: **Carbohydrates:** Acacia, Agar, Tragacanth, Honey **Proteins and Enzymes:** Gelatin, Casein, Proteolytic enzymes: Papain, Bromelain, Serratiopeptidase, Urokinase, Streptokinase, Pepsin **Lipids (Waxes, Fats, Fixed Oils):** Castor oil, Olive oil, Cocoa butter Wool fat, Beeswax	**12**
III	**Secondary Metabolites–** **General classification and identification tests Pharmacognostic study** (biological source, distribution, cultivation of underlined drugs, identifying characters, chemical constituents, specific tests, therapeutic uses, and commercial applications) of: **Alkaloids:** Vinca, Rauwolfia, Opium **Volatile Oils:** Lemongrass, Clove, Cinnamon, Fennel **Tannins:** Myrobalans, Catechu. Pomegranate **Resins:** Guggul, Asafoetida **Glycosides:** Senna, Liquorice, Digitalis **Phenyl propanoids and Flavonoids:** Green Tea, Ginkgo, Flaxseed **Iridoids, Other Terpenoids and Naphthoquinones:** Gentian, Artemisia	**12**
IV	**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**
V	**Overview of Isolation, Identification and Characterization Techniques–** **Separation and Isolation Techniques:** Planar chromatography, Column chromatography, Preparative TLC, Flash chromatography **Identification Techniques:** Phyto chemical tests, Chromatographic techniques, Spectroscopic techniques, Finger printing of medicinal plants using **TLC/HPTLC**. Types and significance of **markers (phytochemical reference standards)**. **Screening and analysis of major metabolites:** Alkaloids, Glycosides, Saponins, Tannins, Resins, Flavonoids, Phenolics. Steroids	**14**

Recommended References (*Preferably latest editions*):

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

Program : B. Pharmacy	Class : First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP206T	Physical Pharmaceutics (Theory)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
3	3	-	-	45
Maximum Marks	**ISE**			**ESE**
75	**30**			**45**

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

CO No.	Upon completion of this course, the students will able to:
1	Apply the principles of solubility, partitioning, phase rule, and buffer systems and interpret their significance in pharmaceutical and biological systems.
2	Illustrate the principles of surface and interfacial tension, adsorption, surface-active agents, wetting, and electrical properties of interfaces.
3	Explain the properties and stability of colloidal and coarse dispersions and analyze their sedimentation, flocculation, emulsification, and physical instability.
4	Differentiate Newtonian and non-Newtonian systems and evaluate thixotropy, viscoelasticity, and rheological properties of pharmaceutical systems.
5	Determine particle size, size distribution, surface area, and flow properties of powders and assess their significance.

COURSE CONTENT

Unit	Topic	Hours
I	**Solubility distribution phenomenon & buffers** Solubility expression, Solute solvent interactions, Solubility of liquid and liquids, Solubility of solids and liquids, Solubility of Gas in Liquids, Raoult's Law and its deviations. Factors affecting solubility, Measurement of saturation Solubility, Effect of pH on solubility, Phase rule and solubility. Applications of 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 / Factors influencing the pH of buffer solutions, Factor influencing Buffer capacity, General procedure for preparing buffers, Indicators.	9
	Interfacial phenomenon	8

II	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	
III	**Colloidal and Coarse Dispersion** Colloidal dispersions: Types of colloidal dispersions (Lyophobic, Lyophilic, Association colloids), Optical properties of colloids, Kinetic properties of colloids, Electrical properties of colloids, Size and shape of colloidal systems, Stability of colloidal system (peptization and protective action), Application of Colloidal System. Coarse Dispersions: Suspensions, stokes law (Theory of sedimentation), Effect of Brownian movement / Sedimentation of flocculated particles, sedimentation parameters. Flocculation and controlled structure flocculation. Theories of emulsification and stabilizaition (DLVO Theory, Monomolecular adsorption, Multimolecular adsorption, Film formation, Solid particle adsorption). Physical instabilities of emulsions (creaming, coalescence and breaking, and phase inversion).	**12**
IV	**Rheological studies** Newtonian systems and non-Newtonian systems. Thixotropy –measurement / Bulges and spurs. Negative thixotropy, Determination of rheological properties (Viscometers / single and multi-point) Viscoelasticity, psycho-rheology. Applications of rheology in pharmacy.	**8**
V	**Micromeritics** Particle size and size distribution, Particle Shape and Surface area: Methods for determination and significance. Flow properties of powders: determination, significance and methods of enhancement. Advanced flow properties of powers (Powder flow tester).	**8**

References (Preferably Latest Editions):

1. Sinko PJ. Martin's physical pharmacy and pharmaceutical sciences. Lippincott Williams & Wilkins.
2. Allen LV, Popovich NG. Ansel's pharmaceutical dosage forms and drug delivery systems. Philadelphia, PA, USA: Wolters Kluwer Health.
3. Remington JP. Remington: the science and practice of pharmacy. Lippincott Williams & Wilkins.
4. Aulton ME, Taylor K, editors. Aulton's pharmaceutics: the design and manufacture of medicines. Elsevier Health Sciences.
5. Lachman L, Lieberman HA, Kanig JL. The theory and practice of industrial pharmacy. Philadelphia: Lea & Febiger.
6. Mendham J, Denney RC, Barnes JD. 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.

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP207P	Biochemistry (Practical)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	**L**
1	--	--	1	--
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOMES (CO):

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

COURSE CONTENT:

List of practical
(Minimum 12 experiments must be performed)
1. Identification tests for proteins (Albumin and Casein).
2. Qualitative analysis of carbohydrates* (Glucose, Fructose, Lactose, Sucrose, and Starch).
3. Qualitative analysis of urine for normal and abnormal constituents.
4. Estimation of blood glucose.
5. Estimation of total cholesterol and HDL cholesterol.
6. Estimation of urea, creatinine, and uric acid in serum.
7. Estimation of serum total protein and albumin.
8. Study of enzymatic hydrolysis of starch.
9. Study of the effect of temperature on salivary amylase activity.
10. Study of the effect of substrate concentration on salivary amylase activity.
11. Estimation of hemoglobin in blood by Sahli's method / Cyanmethemoglobin method.
12. Estimation of serum bilirubin (total and direct bilirubin).

13. Estimation of glycogen content
14. Estimation of SGOT and SGPT

Recommended References (Preferably latest editions):

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

Harper's Illustrated Biochemistry. McGraw-Hill.

6. Freifelder, D. Essential Molecular Biology: A Practical Approach. Oxford University Press.

Program : B. Pharmacy	Class: First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP208P	Human Anatomy, Physiology & Pathophysiology- II (Practical)			Core 4
Credits	**Hours Per Week (L-T-P)**			**Max Hours**
	L	**T**	**P**	
1	--	--	3	45
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

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

COURSE CONTENT

Sr. No.	List of Practical
	(Minimum of 12 experiments must be performed) Practical HAPP allows the verification of physiological processes discussed in theory classes through experiments on living tissues, simulated videos, models, and charts.
1.	Study of nervous system using specimens and models.
2..	Study of respiratory system using models.
3.	Study of gastrointestinal system using models.
4.	Study of reproductive system using models.
5.	Demonstration of general neurological examination.
6.	Demonstration of function of olfactory nerve.
7.	Examination of different types of taste.
8.	Demonstration of visual acuity.

9.	Demonstration of reflex activity.
10.	Recording of body temperature
11	Determination of tidal volume and vital capacity.
12	Recording of body mass index (BMI).
13	Study of family planning devices and pregnancy diagnosis tests
14	Understanding pathophysiology of IBD, peptic ulcer, jaundice, hepatitis, typhoid, asthma, tuberculosis, diabetes, and thyroid disorders through case files / case reports.
15	Hands-on training in cardiopulmonary resuscitation (CPR).

Reference Books

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

Program : B. Pharmacy	Class: First Year			Semester : 1
Course Code	**Course Title**			**Course Type**
BP209P	Pharmaceutical Organic Chemistry (Practical)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours L**
	L	**T**	**P**	
1	--	--	1	--
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOMES (CO):

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

COURSE CONTENT:

List of practicals

(Minimum 12 experiments to be performed)

1.Systematic qualitative analysis of minimum of five water-insoluble or water-immiscible unknown organic compounds from different chemical classes/ functional groups :

a. Preliminary tests: Color, odour, Solubility tests, test for aromaticity, test for saturation/unsaturation etc.

b. Detection of elements such as nitrogen, sulphur and halogens by Lassaigne's test

c. Determination of Functional group tests such as phenols, amides, amines, carboxylic acids, aldehydes and ketones, alcohols, esters, aromatic and halogenated hydrocarbons and nitro compounds.

d. Preparation of the derivatives and confirmation of the unknown organic compound by melting point / boiling point.

2. Synthesis, purification and TLC characterization of Acetanilide / Benzophenone

3. Building Molecular Models:

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

4. Demonstration on chemistry structure software like Chemsketch/ Chem-draw

5. Crystallization Method

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

Recommended References (Preferably latest editions):

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

Harper's Illustrated Biochemistry. McGraw-Hill.

6. Freifelder, D. Essential Molecular Biology: A Practical Approach. Oxford University Press.

Program : B. Pharmacy	Class: First Year			Semester: II
Course Code	**Course Title**			**Core**
BP210P	Pharmacognosy and Phytochemistry (Practical)			8
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
1	-	-	3	45
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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 Phyto-constituents and volatile oils using standard procedures.
5. Evaluate herbal raw materials collected from field/market sources as per Pharmacopeial standards.

COURSE OUTCOME (CO):

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

COURSE CONTENT:

List of practicals

(Minimum 12 experiments must be performed)

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

Recommended References *(Preferably Latest Editions)*:

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

Program : B. Pharmacy	Class : First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP211P	Physical Pharmaceutics (Practical)			Core
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
1	-	-	3	45
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

CO No.	Upon completion of this course, the students will able to:
1	Evaluate solubility, partition coefficient, critical solution temperature, buffer capacity, pKa, and isotonicity of pharmaceutical systems.
2	Determine surface tension, CMC, HLB value, and specific surface area of pharmaceutical systems.
3	Assess the viscosity of pharmaceutical liquids using Ostwald's and Brookfield viscometers.
4	Evaluate particle size, size distribution, density, porosity, and flow properties of pharmaceutical powders.

List of practicals

(Minimum 12 experiments must be performed)

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

14. Determination of densities and derived properties of powders (bulk density, tapped density, Hausner ratio, Carr's compressibility index), true density, and porosity.
15. Determination of angle of repose and influence of glidants on angle of repose.

Note: Wherever applicable, compare the experimental values of physicochemical and micromeritic properties with standard/literature values or values reported for marketed pharmaceutical formulations.

Program : B. Pharmacy	Class : First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP212PSEC1	Communication Skills (Practical)			Elective
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
1	-	-	2	30
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

CO No.	Upon completion of this course, the students will able to:
BP212PSEC1.1	Demonstrate effective verbal, non-verbal, listening, and observation skills in pharmacy-related communication.
BP212PSEC1.2	Apply appropriate communication techniques to counsel patients and manage different patient interactions in pharmacy practice.
BP212PSEC1.3	Prepare and demonstrate clear and appropriate written and digital communication for professional pharmacy practice.
BP212PSEC1.4	Demonstrate effective presentation, group discussion, interview, and professional communication skills in pharmacy-related situations.
BP212PSEC1.5	Apply professional, ethical, and structured communication practices while interacting with patients and healthcare professionals.

List of practical's

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. **Non-verbal Communication Skills**
   - Body language, eye contact, gestures, tone of voice
   - Cross-cultural sensitivity in pharmacy communication
4. **Role-play: Communicating with a Patient for Dispensing a Prescription**
   - Explanation of dosage, frequency, side effects, and precautions
5. **Role-play: Handling Difficult Conversations (e.g., Angry Patient or Confused Elderly)**
   - Empathy, patience, tone modulation, de-escalation techniques
6. **Patient Counseling Practice (Case-Based)**
   - Counseling for chronic illness (e.g., hypertension, diabetes)
   - Role-playing real-life counseling situations
7. **Written Communication I: Professional Email Writing & Documentation**
   - Writing emails to doctors, suppliers, institutions

- Structure, etiquette, and clarity in pharmacy communications

8. **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)
9. **Digital Communication Skills for Pharmacists**
   - Creating a simple health blog, social media awareness post
   - Basics of tele consultation and e Pharmacy chat support
10. **Presentation Skills I–Basic Techniques**
    - Voice projection, clarity, use of visuals
    - Individual practice with simple pharmacy topics
11. **Presentation Skills II–Group Presentations**
    - Topics: health awareness campaigns, drug education, OTC safety
    - Peer and faculty feedback
12. **Mock Interview/Group Discussion Practice**
    - Industry/clinical job interview scenarios
    - GD on topics like "Generic vs Branded Medicines"
13. **Communicating with Healthcare Professionals**
    - Case hand off, drug information request, referral writing
    - Using SBAR (Situation, Background, Assessment, Recommendation) format
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

References (Preferably Latest Edition):

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

Program: B. Pharmacy	Class: First Year			Semester: II
Course Code	**Course Title**			**Course Type**
BP212P SEC2	Mental Well-Being, Stress and Conflict Management (Practical)			Elective-1
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
1	-	-	2	30
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

CO No.	Upon successful completion of this course, the students will be able to:
BP212P SEC2.1	Identify sources and effects of stress in personal and professional life.
BP212P SEC2.2	Apply stress management techniques such as mindfulness, journaling, and relaxation exercises.
BP212P SEC2.3	Utilize conflict management strategies to resolve interpersonal and workplace conflicts.
BP212P SEC2.4	Demonstrate improved emotional intelligence and resilience.
BP212P SEC2.5	Develop effective communication skills for personal and professional growth.

COURSE CONTENT:

List of practical's

(Minimum 12 experiments must be performed)

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

Recommended References *(Preferably Latest Editions)*:

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

Program : B. Pharmacy	Class : First Year			Semester : 2
Course Code	**Course Title**			**Course Type**
BP212PSEC3	Fundamentals of Computer Operations (Practical)			Elective
Credit	**Hours Per Week (L-T-P)**			**Max. Hours**
	L	**T**	**P**	
1	-	-	2	30
Maximum Marks	**ISE**			**ESE**
50	20			30

COURSE OBJECTIVES:

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

COURSE OUTCOME (CO):

CO No.	Upon completion of this course, the students will able to:
BP212PSEC3.1	Demonstrate basic computer operations and manage files and folders using an operating system
BP212PSEC3.2	Prepare well-formatted digital documents using word-processing and document-editing tools.
BP212PSEC3.2	Apply spreadsheet tools, formulas, functions, and data visualization techniques for data management and analysis.
BP212PSEC3.2	Demonstrate effective use of digital tools for academic communication, information retrieval, and presentation.
BP212PSEC3.2	Explore and utilize digital technologies and platforms used for learning and pharmacy practice.

List of practical

(Perform any 12 Experiments)

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

References (Preferably Latest Edition):

1. Norton P. Introduction to computers. McGraw-Hill Education, New Delhi.
2. Miller M. Computer basics: Absolute beginner's guide. Que Publishing.

General Instruction on Digital Tools

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

Appendix I

List of Recommended Electives (AEC/SEC/VAC courses to be prescribed by HEI)

Semester	Elective	Course Code	Course Title	Type	Category
II	Elective 1	BP212P SEC1	Communication Skills	Practical	SEC
		BP212P SEC2	Mental Well-Being, Stress & Conflict Management	Practical	SEC
		BP212P SEC3	Fundamentals of Computer Operations	Practical	SEC
III	Elective 2	BP312P AEC1	Nutraceuticals and Functional Foods	Practical	AEC
		BP312P AEC2	Food Analysis	Practical	AEC
		BP312P AEC3	Yoga and Life Sciences	Practical	AEC
VI	Elective 3	BP607T AEC1	Green Chemistry	Theory	AEC
		BP607T AEC2	Materiovigilance and Hemovigilance	Theory	AEC
		BP607T AEC3	Scientific Writing	Theory	AEC
		BP607T AEC4	Drug Store and Business Management	Theory	AEC
		BP607T AEC5	Career Building in Cultivation of Medicinal Plants	Theory	AEC
		BP607T AEC6	Active Pharmaceutical Ingredients and Excipient Sciences	Theory	AEC
	Elective 4	BP610P SEC1	Computer Aided Drug Design	Practical	SEC
		BP610P SEC2	Analytical Method Development and Validation	Practical	SEC
		BP610P SEC3	Principles of Preclinical Studies	Practical	SEC

	Elective 5	BP611P VAC1	Professional Skills	Practical	**VAC**
		BP611P VAC2	Process Analytical Technology (PAT) and QbD in Formulation Science	Practical	**VAC**
VII	**Elective 6**	BP708T AEC1	Current Good Manufacturing Practices (cGMP)	Theory	**AEC**
		BP708T AEC2	Pharmaceutical Automation	Theory	**AEC**
		BP708T AEC3	Modern Techniques in Cellular Biology	Theory	**AEC**
		BP708T AEC4	Medical Devices	Theory	**AEC**
		BP708T AEC5	Transformation of Food Waste into Medicinal Products	Theory	**AEC**
		BP708T AEC6	Biosimilars, Vaccines & Macromolecules	Theory	**AEC**
		BP708T AEC7	Precision Medicine	Theory	**AEC**
VIII	**Elective 7**	BP806T AEC1	Pharmaceutical Packaging	Theory	**AEC**
		BP806T AEC2	Supply Chain Management	Theory	**AEC**
		BP806T AEC3	Industrial Safety and Waste Management	Theory	**AEC**
		BP806T AEC4	Traditional Healing Practices of India	Theory	**AEC**
		BP806T AEC5	Futuristic Pharma through AR/VR: Pharma 4.0	Theory	**AEC**
		BP806T AEC6	Herbal Cosmetics for Industry Perspective	Theory	**AEC**
	Elective 8	BP809P VAC1	Cleaning Validation	Practical	**VAC**
		BP809P VAC2	Basic Training in Aseptic Handling Techniques	Practical	**VAC**
		BP809P VAC3	Impurity Profiling	Practical	**VAC**
	SEC – Skill Enhancement Course AEC – Ability Enhancement Course VAC –Value Added Course				