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Course Outcomes Bachelor of Pharmacy

(First-Final Year)

Sem	Course code -Course Name	Course Name	CO	Course Outcomes (CO) Statement
I	17YBH101-Human anatomy & Physiology-I	C101	C101.1	Explain the basic concepts of human anatomy and physiology, including levels of structural organization, homeostasis, and anatomical terminology, and describe the structure and functions of cells, mechanisms of membrane transport, cell communication, and tissue organization.
			C101.2	Describe the structure and functions of the integumentary, skeletal, and muscular systems, and correlate bone types, joint classifications, and muscle contraction mechanisms with their functional significance in body movement and support.
			C101.3	Explain the composition and functions of body fluids and blood, mechanisms of hemopoiesis, coagulation, and blood grouping, and describe the structure and functions of the lymphatic system in immunity and fluid balance.
			C101.4	Differentiate between sympathetic and parasympathetic nervous systems, describe the origin and functions of spinal and cranial nerves, and explain the structure, functions, and common disorders of special sense organs.
			C101.5	Describe the anatomy and physiology of the cardiovascular system, and explain the mechanisms of cardiac conduction, cardiac cycle, regulation of blood pressure, electrocardiogram, and common cardiovascular disorders.
	17YBH102-Phamaceutical analysis-I	C102	C102.1	Explain the scope and importance of pharmaceutical analysis, describe different analytical techniques, methods of expressing concentration, preparation and standardization of solutions, and analyze sources and types of analytical errors, pharmacopoeial standards, and limit tests.
			C102.2	Explain the principles and theories of acid–base and non-aqueous titrations, interpret neutralization curves, and apply these principles to the estimation of pharmaceutical substances such as sodium benzoate and ephedrine hydrochloride.
			C102.3	Describe the principles and procedures of precipitation, complexometric, gravimetric, and diazotization titrations, and apply appropriate analytical methods for the quantitative estimation of inorganic and organic pharmaceutical compounds.
			C102.4	Explain oxidation–reduction concepts and differentiate between various redox titration methods, including cerimetry, iodimetry, iodometry, bromatometry, dichrometry, and potassium iodate titrations, with reference to their pharmaceutical applications.
			C102.5	Explain the principles, instrumentation, and applications of electrochemical analytical techniques such as conductometry, potentiometry, and polarography, and interpret their use in pharmaceutical analysis.
	17YBH103-Pharmaceutics-I	C103	C103.1	Explain the historical development of the profession of pharmacy and pharmacopoeias, describe various dosage forms, prescription components, and posology, and apply pediatric dose calculation methods based on age, body weight, and body surface area.
			C103.2	Apply pharmaceutical calculations related to weights and measures, percentage solutions, alligation, isotonicity, and proof spirit, and describe the formulation principles, advantages, disadvantages, and excipients of powders and liquid dosage forms, including solubility enhancement techniques.
			C103.3	Describe the formulation and preparation of monophasic and biphasic liquid dosage forms, including suspensions and emulsions, and analyze their stability problems with appropriate methods to overcome them.

			C103.4	Explain the principles of formulation and evaluation of suppositories, perform displacement value calculations, and differentiate various types of pharmaceutical incompatibilities with suitable examples.
			C103.5	Describe the formulation, excipients, evaluation, and factors affecting drug penetration in semisolid dosage forms such as ointments, creams, pastes, and gels.
	17YBH104- Pharmaceutical Inorganic Chemistry	C104	C104.1	Explain the history of pharmacopoeia, describe the sources and types of impurities in pharmaceutical substances, analyze the principles of limit tests for common impurities, and describe the preparation, assay, properties, and medicinal uses of selected inorganic pharmaceutical compounds.
			C104.2	Explain the principles of acids, bases, and buffers, apply buffer equations and isotonicity calculations, and describe the pharmaceutical and physiological importance of electrolytes, dental products, and electrolyte replacement therapies.
			C104.3	Describe the classification, preparation, properties, and medicinal uses of gastrointestinal agents, antacids, cathartics, and antimicrobial inorganic compounds, and explain their mechanisms of action in pharmaceutical practice.
			C104.4	Explain the pharmaceutical importance, preparation, properties, and therapeutic uses of miscellaneous inorganic compounds such as expectorants, emetics, haematinics, astringents, poisons, and antidotes.
			C104.5	Explain the principles of radioactivity, describe the properties and measurement of α, β, and γ radiations, and discuss the storage, precautions, and pharmaceutical applications of radiopharmaceuticals.
	17YBH105- Communication skills - Theory	C105	C105.1	Explain the fundamentals, process, and importance of communication, identify various barriers to effective communication, and analyze different perspectives influencing interpersonal communication in professional settings.
			C105.2	Describe the elements of verbal and non-verbal communication, and differentiate between various communication styles to enhance effective interaction in healthcare and professional environments.
			C105.3	Demonstrate effective listening skills and apply principles of structured written communication to convey information clearly and appropriately in formal and professional contexts.
			C105.4	Explain the principles of interview skills and presentation techniques, and apply appropriate strategies to plan, structure, and deliver effective interviews and presentations.
			C105.5	Describe the principles of group discussion and apply effective communication strategies to participate constructively and collaboratively as a team member.
	17YBH106- Remedial Biology	C106	C106.1	Explain and classify the living world based on five-kingdom classification, describe the salient features of each kingdom, and illustrate the morphology and internal anatomy of monocotyledonous and dicotyledonous flowering plants, including root, stem, and leaf structures.
			C106.2	Describe and analyze the composition and functions of blood, lymph, and the human circulatory system, and explain the physiological processes of digestion, absorption, breathing, and respiration along with their regulatory mechanisms.
			C106.3	Explain and differentiate the mechanisms of excretion, neural control, endocrine regulation, and human reproduction, and analyze the structure–function relationships of excretory organs, nervous system components, endocrine glands, and reproductive systems.
			C106.4	Explain the importance of essential minerals in plant nutrition, describe nitrogen metabolism and biological nitrogen fixation, and analyze the process of photosynthesis, photosynthetic pigments, and factors affecting photosynthetic efficiency.

	17YBH107-Remedial Mathematics	C107	C107.1	Describe and explain the processes of plant respiration, growth, and development, illustrate the structure and functions of cells and tissues, and explain the significance of cell division and plant growth regulators in living organisms.
			C107.2	Explain and apply the concepts of partial fractions, logarithms, functions, limits, and continuity, and solve basic mathematical problems related to chemical kinetics and pharmacokinetics in pharmacy.
			C107.3	Describe and apply matrix algebra and determinants to solve systems of linear equations, and analyze their applications in solving pharmacokinetic equations.
			C107.4	Explain and apply the principles of differentiation and calculus to solve problems involving rates of change, maxima and minima, and interpret their applications in pharmaceutical sciences.
			C107.5	Explain and apply concepts of analytical geometry and integration techniques to solve mathematical and pharmaceutical problems involving straight lines, areas, and definite integrals.
	17YBH111-Human anatomy & physiology-I	C108	C108.1	Explain and apply differential equations and Laplace transforms to solve and analyze chemical kinetics and pharmacokinetic models relevant to pharmacy practice.
			C108.2	Demonstrate and apply proper handling and use of a compound microscope, and identify the microscopic features of epithelial, connective, muscular, and nervous tissues.
			C108.3	Identify and differentiate the axial and appendicular bones, and correlate their structural features with their anatomical functions.
			C108.4	Demonstrate and perform hematological experiments using hemocytometry, including enumeration of RBC and WBC counts, following standard laboratory procedures.
			C108.5	Determine and interpret physiological parameters related to blood, including bleeding time, clotting time, hemoglobin content, blood group, and erythrocyte sedimentation rate (ESR).
	17YBH112-Pharmaceutical Analysis-I	C109	C109.1	Measure, record, and analyze vital physiological parameters such as heart rate, pulse rate, and blood pressure in normal human subjects, and interpret the results in relation to normal physiology.
			C109.2	Perform limit tests for chloride, sulphate, iron, and arsenic, and analyze their compliance with pharmacopeial standards in pharmaceutical preparations.
			C109.3	Prepare and standardize common volumetric solutions such as sodium hydroxide, sulphuric acid, sodium thiosulfate, potassium permanganate, and ceric ammonium sulphate, and evaluate their accuracy for analytical use.
			C109.4	Conduct quantitative assays of pharmaceutical compounds including ammonium chloride, ferrous sulphate, copper sulphate, calcium gluconate, hydrogen peroxide, sodium benzoate, and sodium chloride, and interpret the results.
			C109.5	Apply electro-analytical techniques, including conductometric and potentiometric titrations, to determine normality and understand the principles underlying these analytical methods.
	17YBH113 - Pharmaceutics I	C110	C110.1	Demonstrate overall analytical competence by integrating titrimetric and electro-analytical methods, and ensure accuracy, precision, and quality control in pharmaceutical analysis
			C110.2	Prepare pharmaceutical syrups and elixirs, and evaluate their composition, taste, stability, and suitability for patient use according to pharmacopeial standards.
			C110.3	Formulate linctus and pharmaceutical solutions, and demonstrate proper solubilization, dosing accuracy, and stability in different medicinal applications.
			C110.4	Prepare pharmaceutical suspensions and emulsions, and analyze their homogeneity, particle size distribution, type of emulsion, and physical stability.

			C110.5	Formulate powders, granules, and suppositories, and assess their flow properties, uniformity, melting point, drug content, and release characteristics.
	17YBH114-Pharmaceutical Inorganic Chemistry	C111	C111.1	Prepare semisolids, gargles, and mouthwashes, and evaluate their spreadability, consistency, microbial stability, palatability, and therapeutic suitability for patient use.
			C111.2	Perform limit tests for various inorganic ions, and analyze their compliance with pharmacopeial standards to ensure safety and quality of pharmaceutical preparations.
			C111.3	Identify common inorganic pharmaceutical compounds, and demonstrate appropriate qualitative tests to confirm their identity and composition.
			C111.4	Evaluate the purity of inorganic pharmaceutical compounds by performing standard tests, and interpret the results to ensure compliance with quality standards.
			C111.5	Prepare selected inorganic pharmaceutical compounds, and assess their quality, composition, and suitability for medicinal use according to pharmacopeial guidelines.
	17YBH115 - Communication skills	C112	C112.1	Integrate analytical, identification, and preparation techniques to demonstrate overall competence in pharmaceutical inorganic chemistry, and ensure accuracy, safety, and quality of preparations.
			C112.2	Demonstrate basic communication skills, including interpersonal interactions, questioning techniques, and social etiquette to enhance everyday professional and personal communication.
			C112.3	Apply correct pronunciation of consonants, vowels, and nouns to improve clarity, fluency, and comprehensibility in verbal communication.
			C112.4	Develop effective listening and comprehension skills, and interpret direct and indirect speech and figures of speech for accurate understanding and professional communication.
			C112.5	Demonstrate effective verbal and written communication, including formal writing, email etiquette, and structured information delivery for professional contexts.
	17YBH116-Remedial Biology – Practical	C113	C113.1	Apply appropriate strategies for interviews and presentations, and analyze personal performance to enhance confidence, clarity, and professional effectiveness in real-world settings.
			C113.2	Demonstrate basic laboratory techniques, including microscopy, sectioning, mounting, staining, and preparation of permanent slides to effectively observe biological specimens.
			C113.3	Examine cellular structures and plant organs, and analyze their morphological features and modifications to understand structure-function relationships in plants.
			C113.4	Identify and differentiate plant tissues microscopically, and interpret their structural and functional significance.
			C113.5	Demonstrate vertebrate anatomy using models, and analyze skeletal structures to correlate anatomical features with physiological functions.
II	17YBH201 -Human Anatomy and Physiology II	C114	C114.1	Perform physiological experiments to determine blood group, blood pressure, and tidal volume, and interpret the results to understand basic human physiological parameters.
			C114.2	Explain the organization, structure, and functional mechanisms of the nervous system, including electrophysiology, nerve impulse transmission, synaptic activity, and the functional roles of the brain and spinal cord.
			C114.3	Describe the anatomy, physiological functions, movements, and regulatory mechanisms of the digestive system, and analyze the processes of digestion, absorption, and energy metabolism including ATP formation and basal metabolic rate.
			C114.4	Explain the anatomical and physiological aspects of the respiratory and urinary systems, including mechanisms of respiration, gas transport, urine formation, acid–base balance, and the regulatory role of kidneys in homeostasis.

	C114	C114.5	Describe the classification, mechanisms of action, and physiological functions of endocrine hormones, and analyze the role of major endocrine glands in maintaining metabolic and hormonal balance.
17YBH202 - Pharmaceutical Organic Chemistry I	C115	C115.1	Explain the structure and functions of the male and female reproductive systems, reproductive physiology, and fundamental genetic principles governing inheritance and protein synthesis.
		C115.2	Classify organic compounds and apply IUPAC nomenclature rules to write structures and identify different types of structural isomerism.
		C115.3	Explain the preparation, reactions, stability, and reaction mechanisms of alkanes, alkenes, and conjugated dienes, including orientation and rearrangement principles.
		C115.4	Analyze substitution reactions of alkyl halides and alcohols using SN1 and SN2 mechanisms and identify important pharmaceutical organic compounds based on structure and properties.
		C115.5	Explain reaction mechanisms of aldehydes and ketones and apply qualitative tests to identify carbonyl compounds relevant to pharmaceutical use.
17YBH203 - Biochemistry	C116	C116.1	Analyze acidity and basicity of carboxylic acids and amines, apply qualitative tests, and relate structure–property relationships to pharmaceutical applications.
		C116.2	Explain the chemical nature, biological roles of biomolecules, and principles of bioenergetics including free energy changes and the role of energy-rich compounds in living systems.
		C116.3	Explain carbohydrate metabolism pathways, biological oxidation, and their regulation, and analyze metabolic alterations occurring in physiological and pathological conditions such as diabetes mellitus.
		C116.4	Analyze lipid and amino acid metabolism pathways, associated metabolic disorders, and the biochemical basis of synthesis and degradation of biologically important molecules.
		C116.5	Explain nucleic acid metabolism, organization of the mammalian genome, and mechanisms of genetic information transfer including replication, transcription, and translation.
17YBH204- Pathophysiology	C117	C117.1	Explain enzyme properties, kinetics, regulation, and inhibitors, and relate their therapeutic and diagnostic applications to pharmaceutical practice.
		C117.2	Explain the basic principles of cell injury, adaptation, inflammation, repair, and fluid–electrolyte imbalance, and relate these mechanisms to disease development.
		C117.3	Describe the etiology, pathogenesis, signs, symptoms, and complications of major cardiovascular, respiratory, and renal disorders.
		C117.4	Explain the pathophysiology, clinical manifestations, and complications of hematological, endocrine, nervous system, and gastrointestinal disorders.
		C117.5	Describe the pathogenesis and complications of inflammatory, hepatic, bone, joint disorders, and explain the basic principles of cancer development.
17YBH205- Computer Applications in Pharmacy	C118	C118.1	Explain the etiology, pathogenesis, signs, symptoms, and complications of infectious and sexually transmitted diseases relevant to pharmaceutical care.
		C118.2	Explain number systems, basic computer operations, and concepts of information systems, and apply system development principles for project planning and management.
		C118.3	Describe web technologies, programming concepts, and database systems, and explain their applications in pharmaceutical data management.
		C118.4	Explain the applications of computers in pharmacy practice, including drug information systems, pharmacokinetics, hospital and clinical pharmacy, and electronic healthcare systems.
		C118.5	Explain the basic concepts of bioinformatics and analyze the role of bioinformatics databases in drug and vaccine discovery.

	17YBH206-Environmental sciences	C119	C119.1	Explain the use of computers for data analysis in preclinical development, including chromatographic data systems and laboratory information management systems.
			C119.2	Explain the multidisciplinary nature of environmental sciences and analyze human–environment interactions influencing ecological balance.
			C119.3	Describe various natural resources, analyze resource-related environmental problems, and assess the role of individuals in conservation and sustainable use.
			C119.4	Explain the structure and functions of different ecosystems and analyze energy flow and interdependence among ecosystem components.
			C119.5	Analyze the causes, effects, and control measures of air, water, and soil pollution impacting environmental and human health.
	17YBH211- Human Anatomy & Physiology-II	C120	C120.1	Apply environmental knowledge to identify environmental problems and demonstrate responsible participation in environmental protection and sustainable practices.
			C120.2	Demonstrate and identify the structural organization of integumentary, nervous, special sensory, and endocrine systems using models and specimens.
			C120.3	Perform basic neurological examinations and interpret sensory and reflex responses in normal human subjects.
			C120.4	Record, demonstrate, and interpret physiological parameters and regulatory mechanisms related to thermoregulation, respiration, and homeostasis.
			C120.5	Identify and correlate the anatomical structures of major organ systems with their physiological functions using laboratory models and charts.
	17YBH212-Pharmaceutical Organic Chemistry I	C121	C121.1	Perform basic clinical and hematological assessments and interpret laboratory findings relevant to normal human physiology.
			C121.2	Perform preliminary and solubility tests to classify unknown organic compounds based on their physical and chemical properties.
			C121.3	Analyze organic compounds for elemental composition using Lassaigne's test and interpret the results systematically.
			C121.4	Identify functional groups present in unknown organic compounds by performing appropriate qualitative chemical tests.
			C121.5	Determine melting/boiling points, prepare suitable derivatives, and confirm the identity of organic compounds using standard reference data.
	17YBH213-Biochemistry	C122	C122.1	Systematically analyze unknown organic compounds and construct molecular models to correlate structure with chemical behavior.
			C122.2	Perform qualitative biochemical tests to identify carbohydrates and proteins and interpret the test results based on standard reactions.
			C122.3	Estimate concentrations of sugars and proteins using standard quantitative biochemical methods and analyze experimental data accurately.
			C122.4	Analyze biological samples using biochemical assays and correlate the results with normal and abnormal physiological conditions.
			C122.5	Prepare buffer solutions of desired pH and evaluate their importance in maintaining optimal biochemical reaction conditions.
	17YBH214-Computer Applications in Pharmacy – Practical	C123	C123.1	Evaluate enzyme activity experimentally and interpret the effects of temperature and substrate concentration on enzyme kinetics.
			C123.2	Design professional documents such as questionnaires and mailing labels using word processing tools for pharmaceutical and healthcare applications.
			C123.3	Create basic web pages and retrieve validated drug-related information using online and web-based resources relevant to pharmacy practice.
			C123.4	Develop and manage patient information databases using MS Access and apply database forms for efficient data entry and record maintenance.
			C123.5	Generate reports, invoices, and perform data retrieval using queries to analyze pharmaceutical and patient-related information effectively.

III	17YBH301-Pharmaceutical Organic Chemistry II – Theory	C201	C201.1	Export database components into web and XML formats and evaluate their use in digital documentation and data sharing systems.
			C201.2	Analyze the structure, reactivity, and substitution patterns of benzene derivatives and apply electrophilic substitution reactions to synthesize target compounds.
			C201.3	Evaluate the chemical properties of phenols, aromatic amines, and acids and predict their reactivity in different reactions.
			C201.4	Perform and interpret reactions of fats and oils and determine their analytical constants for quality assessment.
			C201.5	Analyze the structure, reactivity, and medicinal applications of polynuclear hydrocarbons.
	17YBH302-Physical Pharmaceutics I – Theory	C202	C202.1	Evaluate the stability and reactivity of cycloalkanes using theoretical models and predict their chemical behavior.
			C202.2	Apply principles of solubility, diffusion, and distribution to analyze drug behavior and optimize formulation design.
			C202.3	Evaluate physical states and physicochemical properties of drug molecules and predict their impact on formulation and stability.
			C202.4	Analyze surface and interfacial phenomena, including adsorption, surface tension, and HLB, to design and optimize dosage forms.
			C202.5	Apply concepts of complexation and protein binding to evaluate drug action, stability, and formulation strategies.
	17YBH303-Pharmaceutical Microbiology – Theory	C203	C203.1	Demonstrate preparation and application of buffers and isotonic solutions in pharmaceutical systems and predict their effects on drug stability and efficacy.
			C203.2	Demonstrate knowledge of microbial classification, growth requirements, cultivation, and preservation of microorganisms for pharmaceutical applications.
			C203.3	Apply microbiological staining techniques, biochemical tests, and sterilization methods to identify microorganisms and ensure sterile processing.
			C203.4	Analyze microbial growth, evaluate disinfectants, and perform sterility testing of pharmaceutical products according to standard protocols.
			C203.5	Design aseptic environments, perform microbiological assays, and standardize antibiotics, vitamins, and amino acids for quality assurance.
	17YBH304-Pharmaceutical Engineering – Theory	C204	C204.1	Evaluate microbial spoilage of pharmaceutical products, apply antimicrobial preservation strategies, and demonstrate cell culture techniques for pharmaceutical research.
			C204.2	Apply principles of fluid flow, particle size reduction, and size separation to design and optimize pharmaceutical manufacturing processes.
			C204.3	Evaluate heat transfer, evaporation, and distillation processes and apply them to pharmaceutical unit operations for formulation and production.
			C204.4	Analyze the principles of drying and mixing and select appropriate equipment to optimize pharmaceutical formulation and production.
			C204.5	Apply filtration and centrifugation techniques to ensure purity, separation, and quality of pharmaceutical products.
	17YBH311-Pharmaceutical Organic Chemistry –II (Practical)	C205	C205.1	Evaluate materials for pharmaceutical plant construction, understand corrosion mechanisms, and apply preventive strategies for sustainable manufacturing.
			C205.2	Demonstrate standard laboratory techniques to purify and isolate organic compounds efficiently.
			C205.3	Apply analytical methods to determine the physicochemical properties of oils and standardize reagents accurately.
			C205.4	Synthesize and characterize organic compounds using acylation reactions and confirm product identity.
			C205.5	Execute halogenation, nitration, oxidation, and hydrolysis reactions to prepare and analyze organic compounds systematically.

	17YBH312- Physical Pharmaceutics I – Practical	C206	C206.1	Perform diazotization, coupling, and condensation reactions to synthesize and verify complex organic compounds.
			C206.2	Analyze and determine solubility and pKa of drugs using quantitative methods.
			C206.3	Evaluate partition coefficients to understand drug distribution in biphasic systems.
			C206.4	Apply physicochemical principles to measure solution composition, surface tension, and surfactant properties.
			C206.5	Determine adsorption parameters and analyze surface interactions of drugs with adsorbents.
	17YBH313 - Pharmaceutical Microbiology – Practical	C207	C207.1	Investigate drug complexation and quantify stability constants using solubility and pH titration methods.
			C207.2	Demonstrate proper handling, operation, and maintenance of microbiological laboratory equipment.
			C207.3	Apply sterilization techniques to prepare sterile media and maintain aseptic conditions.
			C207.4	Cultivate, sub-culture, and differentiate microorganisms using appropriate staining and maintenance techniques.
			C207.5	Isolate pure cultures, assess motility, and perform microbiological assay of pharmaceutical products.
	17YBH314- Pharmaceutical Engineering (Practical)	C208	C208.1	Evaluate microbial quality of pharmaceutical products and water samples using standard microbiological tests.
			C208.2	Apply heat transfer and distillation principles to calculate efficiency and thermal parameters in pharmaceutical processes.
			C208.3	Analyze drying behavior, moisture content, and air humidity to optimize pharmaceutical processing conditions.
			C208.4	Demonstrate the operation of pharmaceutical machinery and evaluate particle size distribution for formulation quality control.
			C208.5	Apply size reduction principles, determine relevant coefficients, and understand the operation of processing equipment.
IV	17YBH401- Pharmaceutical Organic Chemistry- III Theory	C209	C209.1	Evaluate process parameters affecting filtration, crystallization, and mixing uniformity in pharmaceutical formulations.
			C209.2	Explain the principles of optical isomerism and apply asymmetric synthesis to understand stereochemistry of organic compounds.
			C209.3	Analyze geometrical and conformational isomers and predict stereospecific/stereoselective reaction outcomes.
			C209.4	Apply knowledge of five-membered heterocycles to synthesize, characterize, and discuss their medicinal applications.
			C209.5	Illustrate the synthesis, reactions, and medicinal applications of six-membered and fused heterocyclic compounds.
	17YBH402- Medicinal Chemistry-I(Theory)	C210	C210.1	Apply named organic reactions for synthesis and transformation of pharmaceutical intermediates.
			C210.2	Analyze physicochemical properties and stereochemical aspects to explain drug metabolism and therapeutic activity.
			C210.3	Explain structure-activity relationships (SAR) and apply knowledge to adrenergic and cholinergic drug classes for therapeutic use.
			C210.4	Apply SAR principles to design, predict, and rationalize activity of cholinergic drugs and inhibitors.
			C210.5	Evaluate the SAR and mechanisms of CNS drugs and their chemical synthesis for therapeutic applications.
		C211	C211.1	Illustrate the chemical structure, SAR, and synthesis of anesthetics, analgesics, and anti-inflammatory drugs to optimize pharmacological activity.

	17YBH403- Physical Pharmaceutics II – Theory		C211.2	Analyze colloidal systems and their properties to optimize stability and formulation performance.
			C211.3	Apply rheological and solid deformation principles to evaluate flow and mechanical properties of pharmaceutical systems.
			C211.4	Demonstrate formulation and stabilization techniques for coarse dispersions and emulsions using physicochemical principles.
			C211.5	Evaluate micromeritic parameters to optimize particle-based formulations and predict their behavior in dosage forms.
	17YBH404- Pharmacology-I(Theory)	C212	C212.1	Apply chemical kinetics and stability principles to design and evaluate stable pharmaceutical formulations.
			C212.2	Describe pharmacokinetic principles and drug action concepts for predicting therapeutic and toxic responses.
			C212.3	Explain mechanisms of drug action at molecular and cellular levels and evaluate drug safety and efficacy.
			C212.4	Apply knowledge of peripheral nervous system pharmacology to predict therapeutic outcomes and guide drug selection.
			C212.5	Analyze CNS drug actions to optimize therapy and minimize adverse effects.
	17YBH405- Pharmacognosy and Phytochemistry –I Theory	C213	C213.1	Evaluate pharmacotherapy of CNS disorders and interpret drug dependence and abuse potential.
			C213.2	Describe and classify drugs of natural origin and evaluate their quality using microscopic and organoleptic techniques.
			C213.3	Apply cultivation, collection, and processing techniques to optimize quality and yield of medicinal plants.
			C213.4	Demonstrate plant tissue culture techniques and evaluate their applications in pharmacognosy and novel drug production.
			C213.5	Analyze and interpret the properties and tests of secondary metabolites for medicinal use in various healthcare systems.
	17YBH411- Medicinal Chemistry I – Practical	C214	C214.1	Evaluate the chemical nature, therapeutic uses, and commercial applications of natural products and primary metabolites.
			C214.2	Prepare and characterize heterocyclic drug intermediates using standard laboratory techniques.
			C214.3	Synthesize selected aromatic and heterocyclic drugs and demonstrate understanding of their reaction mechanisms.
			C214.4	Prepare and evaluate the physicochemical properties of selected miscellaneous drugs.
			C214.5	Analyze and determine the content, purity, and potency of drugs using standard assay techniques.
	17YBH412- Physical Pharmaceutics II – Practical	C215	C215.1	Evaluate partition coefficients and other physicochemical parameters to understand drug solubility, distribution, and bioavailability.
			C215.2	Determine particle size and particle size distribution of powders using appropriate methods and instruments.
			C215.3	Evaluate bulk powder properties and flow characteristics for formulation purposes.
			C215.4	Measure and analyze viscosity of pharmaceutical liquids and semisolids to understand rheological behavior.
			C215.5	Formulate and evaluate suspensions by studying the effect of suspending agents on sedimentation and stability.
	17YBH413- Pharmacology-I(Practical)	C216	C216.1	Apply chemical kinetics and stability study methods to evaluate drug degradation and predict shelf life of formulations.
			C216.2	Demonstrate proper handling, maintenance, and ethical use of laboratory animals following CPCSEA guidelines.

			C216.3	Perform basic laboratory techniques including blood collection, anesthetic use, euthanasia, and drug administration routes in animal models.
			C216.4	Evaluate pharmacological effects of drugs on isolated tissues and organ systems using standard experimental methods.
			C216.5	Analyze behavioral and CNS effects of drugs in animal models using appropriate experimental techniques.
	17YBH414- Pharmacognosy and Phytochemistry-I (Practical)	C217	C217.1	Determine the pharmacological activity of local anesthetics using experimental animal models and evaluate their efficacy.
			C217.2	Perform qualitative analysis of crude drugs using standard chemical tests to identify their nature and properties.
			C217.3	Evaluate microscopic features of plant materials for identification and quality assessment.
			C217.4	Measure and analyze microscopic structures of crude drugs for authentication and standardization.
			C217.5	Assess macroscopic physical characteristics of crude drugs to ensure quality and compliance with pharmacopeial standards.
V	17YBH501- Medicinal Chemistry – II	C301	C301.1	Quantify key parameters of crude drugs to evaluate their purity, composition, and suitability for pharmaceutical use.
			C301.2	Analyze the structure, mechanism of action, and therapeutic applications of antihistaminic and anti-neoplastic agents.
			C301.3	Explain the chemistry, pharmacological activity, and SAR of cardiovascular drugs and their role in treatment of heart and vascular disorders.
			C301.4	Evaluate the structure, activity, and therapeutic significance of advanced cardiovascular agents, including arrhythmic, lipid-lowering, and coagulants.
			C301.5	Describe the chemical structure, metabolism, and pharmacological effects of endocrine drugs and their clinical applications.
	17YBH502 - Industrial Pharmacy I	C302	C302.1	Apply knowledge of drug chemistry and SAR to understand the therapeutic and pharmacokinetic properties of antidiabetic and local anesthetic drugs.
			C302.2	Analyze physicochemical properties of drug substances and apply preformulation principles to optimize dosage form development.
			C302.3	Design and evaluate solid and liquid oral dosage forms with appropriate excipients and processing techniques.
			C302.4	Formulate and assess quality of capsule and pellet dosage forms using standard manufacturing and evaluation techniques.
			C302.5	Develop and evaluate parenteral and ophthalmic dosage forms, ensuring sterility, stability, and suitability of containers.
	17YBH503- Pharmacology II	C303	C303.1	Apply formulation and evaluation principles to cosmetic and aerosol products, and select appropriate packaging materials for stability.
			C303.2	Explain the mechanism of action and therapeutic application of drugs affecting the cardiovascular system.
			C303.3	Analyze the pharmacological effects and clinical relevance of drugs acting on cardiovascular and urinary systems.
			C303.4	Evaluate the mechanism and therapeutic use of autacoids and related drugs in inflammation, allergy, and cardiovascular modulation.
			C303.5	Illustrate the mechanism of action and clinical application of drugs acting on the endocrine system.
	17YBH504- Pharmacognosy & Phytochemistry II	C304	C304.1	Apply bioassay techniques to assess the potency and activity of drugs, and correlate pharmacological effects with endocrine and tissue responses.
			C304.2	Explain the formation of secondary metabolites in plants and analyze metabolic pathways using biogenetic approaches.

			C304.3	Identify and classify secondary metabolites from different plant sources and evaluate their therapeutic and commercial applications.
			C304.4	Isolate, characterize, and identify selected phytoconstituents using laboratory and analytical techniques.
			C304.5	Demonstrate industrial processes and evaluate methods for large-scale production and estimation of important phytoconstituents.
	17YBH505- Pharmaceutical Jurisprudence	C305	C305.1	Apply modern analytical and extraction techniques for purification, identification, and quality evaluation of crude drugs and phytoconstituents.
			C305.2	Explain the provisions of the Drugs & Cosmetics Act, 1940, including licensing, manufacture, import, and penalties.
			C305.3	Analyze the regulatory framework for sale, labeling, and administration of drugs, and describe the roles of regulatory authorities.
			C305.4	Interpret key provisions of pharmacy-related legislations, including narcotic and psychotropic control, licensing, and penalties.
			C305.5	Evaluate laws governing drug advertisement, pricing, and ethical animal experimentation, ensuring compliance with statutory guidelines.
	17YBH511- Industrial Pharmacy –I	C306	C306.1	Apply knowledge of pharmaceutical ethics, IPR, and other relevant legislations in professional practice and drug-related decision making.
			C306.2	Perform preformulation studies to analyze physicochemical properties of drugs for dosage form development.
			C306.3	Formulate and evaluate tablets, including film coating, to ensure quality, stability, and patient acceptability.
			C306.4	Prepare and assess capsules and parenteral dosage forms with emphasis on content uniformity, sterility, and stability.
			C306.5	Conduct quality control tests on marketed pharmaceutical products to ensure compliance with pharmacopoeial standards.
	17YBH512- Pharmacology II	C307	C307.1	Formulate and evaluate topical and ophthalmic dosage forms, considering formulation parameters, packaging, and quality standards.
			C307.2	Demonstrate the use of in-vitro techniques and physiological solutions for studying drug effects on isolated tissues.
			C307.3	Evaluate the effects of drugs on cardiovascular function using isolated tissue and live animal models.
			C307.4	Analyze autonomic and smooth muscle responses to drugs and determine drug potency and receptor interactions.
			C307.5	Perform quantitative bioassays to measure drug activity and calculate pharmacological parameters such as PA2 and PD2.
	17YBH513- Pharmacognosy and Phytochemistry II	C308	C308.1	Evaluate anti-inflammatory and analgesic activities of drugs using standard animal models and experimental protocols.
			C308.2	Examine the morphological, histological, and powder characteristics of selected crude drugs and perform extraction for analysis.
			C308.3	Isolate and identify active phytoconstituents from natural sources using standard laboratory techniques.
			C308.4	Apply chromatographic techniques for the separation, detection, and analysis of phytoconstituents in herbal drugs.
			C308.5	Extract and analyze volatile oils from plant sources and detect their phytochemical constituents using TLC.
VI	17YBH601 - Medicinal Chemistry III	C309	C309.1	Perform qualitative chemical tests to identify the presence of key phytoconstituents in selected crude drugs.
			C309.2	Explain principles of rational drug design, including QSAR, prodrug approach, combinatorial chemistry, and computer-aided drug design (CADD).

			C309.3	Describe the chemistry, stereochemistry, and structure–activity relationships (SAR) of major classes of antimicrobial agents.
			C309.4	Explain the mechanisms of action, metabolism, adverse effects, and therapeutic uses of antibiotics, antimalarials, antivirals, antifungals, antiprotozoals, and anthelmintics.
			C309.5	Analyze SAR trends to rationalize drug activity, selectivity, and resistance patterns.
	17YBH602- Pharmacology III	C310	C310.1	Ilustrate synthetic pathways and chemical degradation of selected drugs.
			C310.2	Explain the pharmacology of drugs acting on the respiratory and gastrointestinal systems, including mechanisms of action, therapeutic uses, adverse effects, and contraindications.
			C310.3	Describe the principles of chemotherapy and pharmacology of antimicrobial agents used in infectious diseases.
			C310.4	Explain the pharmacology of antitubercular, antileprotic, antifungal, antiviral, anthelmintic, antimalarial, and antiamoebic drugs.
			C310.5	Discuss the pharmacological management of urinary tract infections, sexually transmitted diseases, malignancies, and immunological disorders including monoclonal antibodies and biosimilars.
	17YBH603- Herbal Drug Technology	C311	C311.1	Explain principles of toxicology, types of toxicity, and management of common poisonings
			C311.2	Explain the sources, cultivation, processing, identification, and authentication of herbal raw materials used in herbal drug production.
			C311.3	Describe Indian Systems of Medicine and preparation, standardization, and evaluation of traditional herbal formulations.
			C311.4	Explain the role, applications, and health benefits of nutraceuticals, herbal cosmetics, herbal excipients, and novel herbal formulations.
			C311.5	Apply WHO and ICH guidelines for quality control, evaluation, and stability testing of herbal drugs.
	17YBH604- Biopharmaceutics and Pharmacokinetics	C312	C312.1	Discuss herbal–drug and herb–food interactions and assess their safety implications in clinical use.
			C312.2	Explain the fundamental concepts of biopharmaceutics, including drug absorption, distribution, metabolism, and excretion, and their significance in drug therapy.
			C312.3	Analyze factors affecting drug absorption through various routes and evaluate clinical implications of protein binding and drug distribution.
			C312.4	Explain the concepts of bioavailability and bioequivalence, in-vitro dissolution, IVIVC, and methods to enhance bioavailability of drugs.
			C312.5	Apply pharmacokinetic models and plasma drug concentration–time data to calculate and interpret pharmacokinetic parameters.
	17YBH605- Pharmaceutical Biotechnology	C313	C313.1	Analyze single-dose, multiple-dose, and steady-state pharmacokinetics to design appropriate loading and maintenance dose regimens.
			C313.2	Explain the principles and applications of biotechnology in pharmaceutical sciences, including enzyme biotechnology, biosensors, protein engineering, and industrial use of microorganisms.
			C313.3	Describe the fundamental concepts of genetic engineering, recombinant DNA technology, cloning vectors, PCR, and their applications in the production of pharmaceutical products such as insulin, vaccines, and interferons.
			C313.4	Explain immunological principles including types of immunity, structure and function of immunoglobulins and MHC, hypersensitivity reactions, and preparation, storage, and stability of vaccines and blood products.
			C313.5	Describe microbial genetics, mutation, biotransformation, and immuno-blotting techniques such as ELISA, Western blotting, and Southern blotting, and explain their pharmaceutical and diagnostic applications.

	17YBH606- Quality Assurance	C314	C314.1	Explain fermentation technology, including media design, sterilization, fermenter design and controls, and large-scale production of antibiotics, organic acids, vitamins, and other biotechnological products.
			C314.2	Explain the principles of Quality Assurance, Quality Control, cGMP, TQM, ICH guidelines, QbD, ISO standards, and NABL accreditation applicable to pharmaceutical industries.
			C314.3	Describe organizational structure, personnel responsibilities, training, premises design, equipment qualification, and raw material management in compliance with GMP requirements.
			C314.4	Explain Quality Control tests for pharmaceutical packaging materials and apply Good Laboratory Practices (GLP) in non-clinical laboratory studies.
			C314.5	Explain pharmaceutical documentation systems including SOPs, BMR, MFR, quality audits, complaint handling, recalls, and waste disposal.
	17YBH611- Medicinal chemistry III	C315	C315.1	Explain the principles and applications of calibration, qualification, validation, analytical method validation, and good warehousing practices in pharmaceutical industries.
			C315.2	Prepare selected drugs and pharmaceutical intermediates using appropriate laboratory techniques, following standard safety and procedural norms.
			C315.3	Perform quantitative assays of selected drugs using official or standard analytical methods and interpret the results accurately.
			C315.4	Prepare medicinally important compounds or intermediates using modern techniques such as microwave irradiation and appreciate their advantages in drug synthesis.
			C315.5	Draw chemical structures and reaction mechanisms of drugs and intermediates using ChemDraw® software with appropriate chemical accuracy.
	17YBH612- Pharmacology III	C316	C316.1	Determine physicochemical properties (logP, cLogP, molecular weight, molar refractivity, hydrogen bond donors/acceptors) using drug design software and evaluate drug-likeness based on Lipinski's Rule of Five.
			C316.2	Perform dose calculations and basic pharmacokinetic parameter calculations required for experimental pharmacology studies.
			C316.3	Evaluate pharmacological activities of drugs using appropriate *in-vivo* and *in-vitro* experimental models related to gastrointestinal, endocrine, and immune systems.
			C316.4	Assess drug safety through acute toxicity, skin and eye irritation studies, and pyrogen testing using standard experimental protocols.
			C316.5	Estimate biochemical parameters using semi-auto analyzers and interpret the pharmacological significance of the results.
	17YBH613- Herbal Drug Technology	C317	C317.1	Apply appropriate biostatistical methods to analyze experimental pharmacology data and draw valid scientific conclusions.
			C317.2	Perform preliminary phytochemical screening and quantitative estimation of active constituents such as alkaloids, phenols, and aldehydes in herbal drugs.
			C317.3	Evaluate herbal formulations and natural excipients using standard pharmacopoeial and quality assessment methods.
			C317.4	Prepare, incorporate, and evaluate standardized herbal extracts in cosmetic and conventional dosage forms in accordance with pharmacopoeial requirements.
			C317.5	Analyze herbal drug monographs from official pharmacopoeias and interpret quality, purity, and standardization parameters.
VII	17YBH701- Instrumental Methods of Analysis	C401	C401.1	Apply good laboratory practices and documentation while handling herbal raw materials and formulations, ensuring quality and regulatory compliance.
			C401.2	Explain the principles of UV-Visible spectroscopy and fluorimetry, and demonstrate their applications in qualitative and quantitative drug analysis.

		C401.3	Describe the principles, instrumentation, and applications of IR spectroscopy, flame photometry, atomic absorption spectroscopy, and nepheloturbidometry in drug analysis.
		C401.4	Understand the fundamentals of chromatographic and electrophoretic techniques, including column chromatography, thin layer chromatography, paper chromatography, and electrophoresis, and analyze their applications in drug separation.
		C401.5	Explain the theory, instrumentation, and applications of gas chromatography (GC) and high-performance liquid chromatography (HPLC) for drug analysis.
	17YBH702- Industrial Pharmacy-II	C402	C402.1	Discuss the principles, methodologies, and applications of ion exchange chromatography, gel chromatography, and affinity chromatography in pharmaceutical analysis.
			C402.2	Explain pilot plant scale-up techniques for solids, liquids, and semi-solids, and analyze considerations for personnel, space, raw materials, and relevant documentation in industrial production.
			C402.3	Describe technology transfer processes from laboratory to commercial production, including quality risk management, documentation, regulatory compliance, and practical challenges in commercialization.
			C402.4	Understand regulatory affairs in pharmaceutical product development, including IND and NDA applications, clinical research protocols, biostatistics, and responsibilities of regulatory professionals.
			C402.5	Discuss quality management systems in the pharmaceutical industry, including Total Quality Management (TQM), Quality by Design (QbD), Six Sigma, ISO standards, GLP, and Out-of-Specifications (OOS) management.
	17YBH703- Pharmacy Practice	C403	C403.1	Explain Indian regulatory requirements for drug approval, including CDSCO and State Licensing Authority processes, Certificate of Pharmaceutical Product (COPP), and procedures for new drug approval.
			C403.2	Explain hospital organization, hospital pharmacy functions, and community pharmacy structure, including legal requirements and dispensing practices.
			C403.3	Analyze adverse drug reactions, drug interactions, and methods for their detection, reporting, and management.
			C403.4	Describe hospital drug distribution systems, hospital formulary preparation, therapeutic drug monitoring, and medication adherence strategies.
			C403.5	Conduct patient medication history interviews and provide effective patient counseling in hospital and community pharmacy settings.
	17YBH704- Novel Drug Delivery System	C404	C404.1	Explain the role and functioning of pharmacy and therapeutic committees and drug information services.
			C404.2	Explain the principles of controlled drug delivery systems and analyze drug properties and polymer characteristics influencing the design and performance of controlled release formulations.
			C404.3	Describe microencapsulation methods, mucosal and implantable drug delivery systems, and evaluate their formulation considerations, advantages, limitations, and pharmaceutical applications.
			C404.4	Analyze transdermal, gastroretentive, and nasopulmonary drug delivery systems with respect to formulation approaches, drug permeation, therapeutic advantages, and clinical applications.
			C404.5	Explain the concepts and approaches of targeted drug delivery systems and assess the role of vesicular and particulate carriers in site-specific drug delivery.
	17YBH711- Instrumental Methods of Analysis-Practical	C405	C405.1	Describe ocular and intrauterine drug delivery systems and evaluate formulation strategies to overcome biological barriers and achieve controlled and localized drug delivery.

			C405.2	Perform UV–Visible spectrophotometric experiments to determine absorption maxima and quantitatively estimate drugs using Beer–Lambert's law.
			C405.3	Apply colorimetric and fluorimetric techniques for quantitative analysis of pharmaceutical substances and study fluorescence phenomena.
			C405.4	Analyze inorganic ions using flame photometry and turbidimetric/nephelometric methods.
			C405.5	Separate and identify pharmaceutical compounds and biomolecules using chromatographic techniques such as paper, thin layer, and column chromatography.
	17YBH712-Practice School	C406	C406.1	Demonstrate operational principles and applications of advanced analytical instruments including HPLC and Gas Chromatography.
			C406.2	Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE
			C406.3	Know the various statistical techniques to solve statistical problems
			C406.4	Appreciate statistical techniques in solving problems
			C406.5	Understand need for research
VIII	17YBH801- Biostatistics and Research Methodology	C407	C407.1	Study Factorial Design
			C407.2	Explain the basic concepts of statistics and biostatistics, compute measures of central tendency and dispersion, and analyze correlations, including Karl Pearson's coefficient and multiple correlation, using pharmaceutical examples.
			C407.3	Apply regression techniques to fit lines and curves, calculate probabilities for binomial, normal, and Poisson distributions, and perform hypothesis testing, including t-tests, ANOVA, and standard error calculations in pharmaceutical contexts.
			C407.4	Demonstrate non-parametric statistical tests, including Wilcoxon Rank Sum, Mann-Whitney U, Kruskal-Wallis, and Friedman tests, and design research methodology including graphs, sample size determination, and study protocols.
			C407.5	Construct regression models, analyze blocking and confounding in factorial designs, and perform statistical analysis using Excel, SPSS, MINITAB®, and R for industrial and clinical trial data.
	17YBH802- Social and Preventive Pharmacy	C408	C408.1	Design and analyze factorial experiments, including 2^2 and 2^3 designs, apply response surface methodology, and optimize experimental conditions using central composite and historical designs.
			C408.2	Explain the concepts of health and disease, and analyze social, cultural, and environmental factors influencing public health, nutrition, and hygiene.
			C408.3	Describe the principles of preventive medicine, and evaluate strategies for prevention and control of common communicable and non-communicable diseases, including drug abuse.
			C408.4	Discuss national health programs, their objectives, functioning, and outcomes, and assess their impact on public health in India.
			C408.5	Examine national health intervention programs for mothers, children, the elderly, and specific health issues, and analyze the role of international organizations such as WHO in implementing these programs.
	17YBH804ET- Pharmaceutical Regulatory Science	C410	C410.1	Evaluate community health services in rural, urban, and school settings, and formulate strategies for health promotion, sanitation improvement, and education initiatives.
			C410.2	Explain the stages of drug discovery and development, including pre-clinical and clinical studies, and differentiate between innovator and generic drug products.
			C410.3	Describe the regulatory approval processes for IND, NDA, and ANDA, and analyze the roles of national and international regulatory authorities governing pharmaceutical products.
			C410.4	Demonstrate knowledge of procedures for registration of Indian drug products in overseas markets, including export regulations, technical documentation, DMF, CTD, eCTD, and ACTD.

		C410.5	Explain the process of clinical trial management, including protocol development, IRB/IEC procedures, informed consent, GCP obligations, and pharmacovigilance.
17YBH809ET- Cosmetic Science	C411	C411.1	Understand and apply regulatory concepts, including guidelines, laws, acts, and reference documents such as Orange Book, Purple Book, and Federal Register, for pharmaceutical compliance.
		C411.2	Explain the classification of cosmetic and cosmeceutical products, and describe the structure and function of skin, hair, and oral cavity, along with the role of cosmetic excipients.
		C411.3	Apply the principles of formulation for skin, hair, and oral care products, including creams, shampoos, hair oils, deodorants, and toothpastes, and analyze their advantages, disadvantages, and mechanisms of action.
		C411.4	Discuss the role of sunscreens, SPF, and herbal ingredients in cosmetic products, and demonstrate knowledge of analytical specifications and methods for cosmetics such as BIS standards.
		C411.5	Examine cosmetic evaluation techniques, including measurement of skin and hair properties, and assess soaps and syndet bars for their efficacy and skin benefits.
17YBH813PW- Project work	C412	C412.1	Evaluate cosmetic problems related to skin, hair, and oral health, and formulate strategies for prevention and management using appropriate cosmetic products.
		C412.2	Integrate knowledge from pharmaceutical sciences to identify and define a research problem.
		C412.3	Design and develop experimental or computational models using modern tools.
		C412.4	Plan, execute, and validate projects following GMP, GLP, and ethical standards.
		C412.5	Interpret and analyze data using statistical, computational, and analytical methods.