Program: Bachelor of Pharmacy **Duration: 4 years**

COURSE OUTCOMES

I Year I Semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C111	Human Anatomy and Physiology I	CO.1 How does the structure of epithelial tissue relate to its function in protecting and lining body surfaces?
		CO.2 What are the primary functions of the skin in the integumentary system, and how do its structural features support these functions?
		CO.3 How do the meninges protect the central nervous system, and what role does cerebrospinal fluid play in this protection?
		CO.4 What are the primary functions of the sympathetic and parasympathetic nervous systems in the peripheral nervous system?
		CO.5 How do hormones act on target cells, and what is the role of the pituitary gland in regulating hormone release?
C112	Pharmaceutical Analysis I	CO.1 What is the difference between primary and secondary standards in pharmaceutical analysis, and how are they used in the preparation and standardization of solutions?
		CO.2 What are the key differences in the neutralization curves for titrations involving strong acids versus weak acids, and how do these differences influence the choice of acid-base indicator?
		CO.3 Compare Mohr's method and Volhard's method for the estimation of chloride ions and describe how complexometric titration can be used for the estimation of magnesium sulfate.
		CO.4 How do the principles of oxidation and reduction apply to cerimetry and iodometry, and what are the specific applications of each in redox titrations?
		CO.5 How do the principles and applications of conductometry, potentiometry, and polarography differ in electrochemical methods of analysis, particularly in terms of their measurement techniques and the types of electrodes used?
C113	Pharmaceutics I	CO.1 Summarize the evolution of the pharmacy

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Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		profession in India, covering education, industry, and career opportunities, and explain the roles of major pharmacopoeias (IP, BP, USP, and Extra Pharmacopoeia). Additionally, define dosage forms, prescription components, common errors, and posology, including pediatric dose calculations.
		CO.2 Discuss the key pharmaceutical calculations involving weights and measures, and describe the types and uses of powders. Also, outline the advantages and disadvantages of liquid dosage forms, including excipients and solubility enhancement techniques.
		CO.3 Define and prepare monophasic liquids (e.g., syrups, eardrops) and discuss biphasic liquids, focusing on suspensions and emulsions, including their types, preparation, and stability issues.
		CO.4 Define suppositories, including types, bases, preparation methods, and displacement value. Also, explain pharmaceutical incompatibilities with examples of physical, chemical, and therapeutic types.
		CO.5 Define and classify semisolid dosage forms. Describe the preparation and evaluation of ointments, pastes, creams, and gels, including factors influencing dermal drug penetration and the excipients used.
C114	Pharmaceutical Inorganic Chemistry-I	CO.1 Explain the history of pharmacopoeias and sources/types of impurities in pharmaceuticals. Describe limit tests for chloride, sulfate, iron, arsenic, lead, and heavy metals, including modified tests for chloride and sulfate. Summarize general preparation methods, assays for compounds and the medicinal uses of inorganic compounds in specified classes.
		CO.2 Explain buffer equations, capacity, and their use in pharmaceutical systems, including isotonic solutions. Describe key electrolytes for replacement therapy and their functions. Discuss fluoride's role in dental products and components like calcium carbonate and zinc eugenol cement.
		CO.3 Discuss the uses of acidifiers, antacids, and cathartics, including examples. Explain the mechanisms and types of antimicrobials, including potassium permanganate, boric acid, and iodine.
		CO.4 List and describe the uses of expectorants, emetics, haematinics, poisons and antidotes, and astringents, including potassium iodide, ammonium

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Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		chloride, copper sulfate, ferrous sulfate, sodium thiosulphate, and zinc sulfate.
		CO.5 Explain radioactivity, including α, β, and γ radiations, half-life, and radioisotopes like sodium iodide I-131. Describe the storage, precautions, and pharmaceutical uses of radioactive substances.
C115	Communication skills	CO.1 Define communication and its process, including key components and barriers. Briefly discuss factors affecting communication perspectives, such as visual perception and personal experiences.
		CO.2 Describe the elements of face-to-face communication, including tone of voice, body language, and verbal communication. Explain the Communication Styles Matrix and provide examples for direct, spirited, systematic, and considerate communication styles.
		CO.3 Explain basic listening skills and how to handle difficult situations. Outline effective written communication and key writing tips like subject lines, main points, and audience.
		CO.4 What is the purpose of an interview, and what are key do's and don'ts? Additionally, describe how to plan, structure, and deliver a presentation, including techniques for overcoming fear.
		CO.5 What are the key communication skills required for effective group discussions, and what are the essential do's and don'ts?
C116	Remedial Biology	CO.1 Define living organisms and their characteristics. Outline the five kingdoms of life and their features. Briefly describe the morphology and anatomy of flowering plants, including differences between monocotyledons and dicotyledons.
		CO.2 Summarize the composition and functions of blood and lymph, and describe the human heart, circulatory system, and cardiac cycle. Outline digestion and absorption processes, and explain the respiratory system, including breathing, gas exchange, and regulation.
		CO.3 Summarize the human excretory system's structure, function, and urine formation. Describe the nervous system's classification, neuron structure, and brain functions. Explain endocrine glands, their hormones, and the reproductive systems, including spermatogenesis, oogenesis, and the menstrual cycle.
		CO.4 Explain essential mineral nutrients, nitrogen metabolism, and the nitrogen cycle. Also, describe

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		photosynthesis, including photosynthetic pigments and factors affecting the process.
		CO.5 Outline plant respiration, including glycolysis and fermentation. Describe plant growth phases and regulators. Summarize cell structure and division, and the types and functions of plant tissues.
C117	Remedial Mathematics	CO.1 Explain partial fractions and their use in chemical kinetics. Describe logarithms, their properties, and applications in pharmaceuticals. Define and classify real-valued functions.
		CO.2 Explain matrix operations, determinants, and matrix inversion. Describe Cramer's rule, the Cayley-Hamilton theorem, and how matrices are used in pharmacokinetics.
		CO.3 Summarize the differentiation of constants, functions, products, quotients, and specific functions like exponential, logarithmic, and trigonometric. Also, explain successive differentiation and conditions for maxima and minima.
		CO.4 Summarize the distance formula, slope of a line, and conditions for parallelism and perpendicularity. Describe key integration methods and their applications.
		CO.5 Define order and degree in differential equations and explain separable, homogeneous, linear, and exact equations. Describe the Laplace transform, including its properties, transforms of elementary functions, and applications in solving linear differential equations, chemical kinetics, and pharmacokinetics.
C118	Human Anatomy and Physiology-I lab	CO.1 Describe the components and operation of a compound microscope. How is it used to study tissue samples?
		CO.2 How can you identify and differentiate epithelial and connective tissues under a microscope? Describe key characteristics of each.
		CO.3 Explain the microscopic features used to identify muscular and nervous tissues. What are the distinguishing characteristics of each tissue type?
		CO.4 How do you identify axial and appendicular bones in human anatomy? Provide examples of each type and their respective functions.
		CO.5 Describe the methods used to study the integumentary system and special senses, such as olfaction and taste, using specimens and models. How are these studies conducted to assess sensory function?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

C119	Pharmaceutical Analysis-I lab	CO.1 Describe the preparation and standardization process for sodium hydroxide and sulphuric acid. Why is standardization important for these solutions?
		CO.2 Explain the assay and standardization methods for ammonium chloride and ferrous sulphate. What is the role of the titrant in these assays?
		CO.3 How is potassium permanganate standardized, and what is its application in titration? Describe the method for standardizing ceric ammonium sulphate.
		CO.4 Describe the procedure for determining the normality of a solution using conductometric titration of a strong acid against a strong base. What factors affect the accuracy of this method?
		CO.5 Outline the process for the potentiometric titration of a strong acid against a strong base. How does this method compare to conductometric titration in terms of accuracy and application?
C1110	Pharmaceutics I lab	CO.1 Describe the preparation and standardization processes for Sodium hydroxide and Potassium permanganate. How do you ensure the accuracy of these solutions?
		CO.2 Explain the preparation of Paracetamol pediatric syrup and Piperazine citrate elixir. What are the key differences between these two formulations in terms of their components and uses?
		CO.3 How are Calamine lotion and Magnesium Hydroxide mixtures prepared as suspensions? Discuss their applications and any stability considerations during formulation.
		CO.4 Detail the methods for preparing Glycero gelatin suppositories and Bentonite gel. What are the purposes of these semisolid preparations, and how are they evaluated for quality?
		CO.5 Describe the procedure for the conductometric titration of a strong acid against a strong base. How does this technique compare to potentiometric titration in terms of accuracy and application?
C1111	Pharmaceutical Inorganic Chemistry-I lab	CO.1 Describe the procedures and significance of limit tests for chlorides, sulphates, and iron in pharmaceutical preparations. How do modified limit tests differ from standard ones?
		CO.2 Explain the methods used for limit tests of heavy metals, lead, and arsenic. Why are these tests important for ensuring the safety and quality of pharmaceutical products?
		CO.3 How are the purity and quality of substances like magnesium hydroxide, ferrous sulphate, sodium

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Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		bicarbonate, calcium gluconate, and copper sulphate tested in a laboratory setting?
		CO.4 What are the techniques used to determine the swelling power of bentonite and the neutralizing capacity of aluminum hydroxide gel? How do these tests contribute to the assessment of these substances' suitability for use?
		CO.5 Discuss the preparation and quality control of inorganic pharmaceuticals such as boric acid, potash alum, and ferrous sulphate. What are the key steps and considerations in their preparation?
C1112	Communication skills lab	CO.1 What are effective strategies for meeting new people and making friends in various social and professional settings? How can you ask questions to foster meaningful conversations?
		CO.2 Discuss the importance of pronunciation in effective communication. How do consonant and vowel sounds affect clarity, and what are some common pronunciation challenges with nouns?
		CO.3 What are the key principles of effective writing and e-mail etiquette? How can these principles improve written communication in a professional context?
		CO.4 How can listening comprehension and understanding direct and indirect speech enhance communication skills? Provide examples of how these skills are applied in everyday interactions
		CO.5 Describe the essential elements of a successful presentation. What skills are important for handling interviews and managing effective communication during presentations?
C1113	Remedial Biology lab	CO.1 What are the key steps involved in preparing and using a microscope for biological experiments? Include details on section cutting, mounting, staining, and preparing permanent slides
		CO.2 How are cells and their inclusions studied under a microscope, and what techniques are used to identify and analyze different cellular components?
		CO.3 Describe the methods used to study and identify the structural and functional modifications of stems, roots, and leaves in plants. How do these modifications contribute to plant adaptation
		CO.4 How can computer models be used to perform a detailed study of a frog's anatomy and physiology? Discuss the advantages of using digital tools for this purpose
		CO.5 Explain how to determine blood group, blood

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Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		pressure, and tidal volume in a laboratory setting. What are the methods and instruments used for each measurement, and what do these measurements indicate about an individual's health?

I Year II Semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C121	Human Anatomy and Physiology II	CO.1 Summarize the composition and functions of blood, including hematopoiesis, hemoglobin formation, and blood coagulation. Explain the role of the lymphatic system in fluid balance and immune function, and discuss the significance of blood transfusion. Lastly, identify key disorders related to blood and the lymphatic system
		CO.2 Outline the heart's anatomy, blood circulation, and the functions of arteries, veins, and capillaries. Describe the heart's conduction system, cardiac output, and blood pressure regulation. Briefly explain how an ECG helps diagnose heart disorders
		CO.3 Summarize the anatomy and functions of the digestive system, including the stomach, intestines, and accessory organs. Briefly describe the respiratory system's anatomy and mechanisms
		CO.4 Describe lung volumes, gas transport, and artificial respiration. Outline the urinary tract anatomy, kidney functions, urine formation, and acid-base balance
		CO.5 Outline the anatomy and functions of the male and female reproductive systems, including key processes like spermatogenesis, oogenesis, and menstruation. Briefly describe the basics of genetics, including DNA, genes, and inheritance patterns
C122	Pharmaceutical organic chemistry – I	CO.1 Explain the classification of organic compounds and the differences between common and IUPAC nomenclature for open-chain and carbocyclic compounds. Describe structural isomerism with examples
		CO.2 Explain sp^3 and sp^2 hybridization in alkanes and alkenes. Discuss halogenation of alkanes, the stability of alkenes, and E1 vs. E2 reactions. Describe electrophilic addition reactions of alkenes, including Markovnikov's and anti-Markovnikov's orientations, and outline the stability and reactions of conjugated dienes

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		CO.3 Compare SN1 and SN2 reactions, including their kinetics and factors affecting them. Describe the uses of key alkyl halides and the structure and uses of various alcohols
		CO.4 Describe key reactions of aldehydes and ketones, including aldol and Cannizzaro reactions. List the structure and uses of formaldehyde, acetone, and other carbonyl compounds
		CO.5 Compare the acidity of carboxylic acids and the effect of substituents. List the structure and uses of key carboxylic acids and amines, and describe their qualitative tests and basicity
C123	Biochemistry	CO.1 Outline glycolysis, the citric acid cycle, and gluconeogenesis, including their significance. Describe the HMP shunt, glycogen metabolism, and hormonal regulation of blood glucose. Briefly explain the electron transport chain and oxidative phosphorylation, including inhibitors and uncouplers
		CO.2 Summarize β-oxidation of palmitic acid, ketone body formation, and fatty acid synthesis. Discuss cholesterol's role and its conversion to bile acids, steroid hormones, and vitamin D. Briefly explain amino acid metabolism, including the urea cycle and disorders, and the catabolism of heme with associated disorders
		CO.3 Describe the biosynthesis and catabolism of purine and pyrimidine nucleotides, including hyperuricemia and gout. Explain the organization of the mammalian genome, the structure and functions of DNA and RNA, and the processes of DNA replication, transcription, and translation, including the genetic code and inhibitors of protein synthesis
		CO.4 Outline the roles and types of carbohydrates, lipids, nucleic acids, amino acids, and proteins. Explain free energy, reaction types, and the significance of ATP and cyclic AMP
		CO.5 Summarize enzyme properties, kinetics, and inhibition. Explain enzyme regulation, applications, and coenzyme functions
C124	Pathophysiology	CO.1 Describe cell injury, adaptive changes, and cell death. Outline the mechanisms of inflammation, wound healing, and the pathophysiology of atherosclerosis
		CO.2 Discuss hypertension, congestive heart failure, and ischemic heart disease in the cardiovascular system. Explain asthma and chronic obstructive airway diseases in the respiratory system, and

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Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		describe acute and chronic renal failure in the renal system
		CO.3 Outline key haematological diseases, including anemia types and hemophilia. Summarize endocrine disorders like diabetes and thyroid issues. Briefly describe epilepsy, Parkinson's disease, stroke, and major psychiatric disorders. Include peptic ulcer in the gastrointestinal system
		CO.4 Summarize inflammatory bowel diseases, jaundice, hepatitis types, and alcoholic liver disease. Briefly describe rheumatoid arthritis, osteoporosis, gout, and the principles of cancer, including classification and etiology
		CO.5 Describe meningitis, typhoid, leprosy, and tuberculosis. Discuss urinary tract infections and sexually transmitted diseases, including AIDS, syphilis, and gonorrhea
C125	Computer applications in pharmacy	CO.1 Summarize the binary, decimal, octal, and hexadecimal number systems, including conversions and basic operations. Briefly describe information systems concepts like requirement analysis, data flow diagrams, and project management
		CO.2 Describe the basics of HTML, XML, CSS, and programming languages. Explain web servers and server products. Additionally, provide an overview of databases, including MySQL, MS Access, and the Pharmacy Drug database
		CO.3 Outline the use of computers in pharmacy, including drug information systems, pharmacokinetics, electronic prescribing, and automated dispensing. Briefly describe diagnostic systems and patient monitoring technologies
		CO.4 Explain the objectives and concept of bioinformatics. Describe key bioinformatics databases and discuss its impact on vaccine discovery
		CO.5 Describe the role of computers in preclinical development, focusing on chromatographic data analysis (CDS), Laboratory Information Management Systems (LIMS), and Text Information Management Systems (TIMS
C126	Human anatomy and physiology – II lab	CO.1 What is hemocytometry, and how is it used to enumerate white blood cells (WBCs) and red blood corpuscles (RBCs)?
		CO.2 Describe the methods for determining bleeding time and clotting time, and explain their significance in clinical diagnostics

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		CO.3 How is hemoglobin content estimated and blood group determined? Discuss the importance of these tests in assessing overall health
		CO.4 What are the techniques for measuring heart rate, pulse rate, blood pressure, tidal volume, and vital capacity, and why are these measurements crucial in medical assessments?
		CO.5 Discuss the study of body systems using models, charts, and specimens, including the digestive, respiratory, cardiovascular, urinary, and reproductive systems. How are these studies applied in clinical and educational settings?
C127	Pharmaceutical organic chemistry - I lab	CO.1 What are the preliminary tests used in the systematic qualitative analysis of unknown organic compounds, and how do these tests help in identifying the nature of the compound
		CO.2 Describe the Lassaigne's test for detecting elements such as nitrogen, sulfur, and halogen in organic compounds. How are these elements identified through this test
		CO.3 How is the solubility test performed in the analysis of organic compounds, and what information does it provide about the compound's nature
		CO.4 Explain the functional group tests for phenols, amides, carbohydrates, and other organic groups. How do these tests assist in the identification of functional groups in an unknown organic compound
		CO.5 Discuss the methods for determining the melting point and boiling point of organic compounds. How can these physical properties be used to identify and confirm unknown compounds?
C128	Biochemistry lab	CO.1 What are the qualitative tests used to identify carbohydrates such as glucose, fructose, lactose, maltose, sucrose, and starch?
		CO.2 Describe the identification tests for proteins like albumin and casein. How are these proteins detected in a sample
		CO.3 Explain the DNSA method for quantifying reducing sugars and the Biuret method for quantifying proteins. What principles underlie these methods
		CO.4 How is urine analyzed for abnormal constituents, and what are the common indicators of abnormalities
		CO.5 Discuss the determination of blood creatinine, blood sugar, and serum total cholesterol. What are

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		the clinical significances of these measurements?

II Year I Semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C211	Pharmaceutical Organic Chemistry- II	CO.1 What is the orbital picture and evidence supporting the resonance and aromatic character of benzene, and how does Huckel's rule apply to its structure?
		CO.2 What are the key factors influencing the acidity of phenols and the basicity of aromatic amines, and how do substituents affect these properties? How are aryl diazonium salts synthetically utilized in chemical processes?
		CO.3 What are the key reactions and analytical constants associated with fatty acids, and what are the principles underlying their determination?
		CO.4 What are the key reactions and synthesis methods for Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane, and their derivatives, and what are their medicinal uses?
		CO.5 What are the key principles and limitations of Baeyer's strain theory, and how do Coulson and Moffitt's modification and Sachse-Mohr's theory provide insights into the stabilities of cyclopropane and cyclobutane?
C212	Physical Pharmaceutics-I	CO.1 What are the physicochemical properties of drug molecules and their relevance in pharmaceutical science?
		CO.2 What are the key physicochemical properties of drug molecules and how do they impact their determinations and applications in pharmaceutical science?
		CO.3 What are the key factors and techniques involved in characterizing the physical properties of powders, including particle size, shape, surface area, and flow properties?
		CO.4 What are the key methods for determining particle size and distribution in micromeretics?
		CO.5 How do buffers play a crucial role in maintaining isotonicity and pH stability in pharmaceutical and biological systems?
C213	Pharmaceutical Microbiology	CO.1 What are the key aspects of microbiology, and how do prokaryotes and eukaryotes differ in terms of their ultra-structure and growth requirements?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		CO.2 How are bacteria identified through staining techniques and biochemical tests, and what are the key principles, procedures, advantages, disadvantages, and real-world applications of different sterilization methods?
		CO.3 What are the key aspects of studying fungi, viruses, disinfectants, and sterility testing in pharmaceutical and microbiological fields?
		CO.4 What are the key principles for preventing contamination in an aseptic area and ensuring environmental cleanliness during the design and operation of laminar flow equipment?
		CO.5 What are the key considerations for microbial contamination and spoilage in pharmaceutical products, and how can antimicrobial agents be used to preserve them?
C214	Pharmaceutical Engineering	CO.1 What are the fundamental principles and applications of Bernoulli's theorem in fluid dynamics?
		CO.2 What are the primary objectives and key differences between Crystallization and Evaporation processes, and what are the main factors influencing each process?
		CO.3 What are the key principles, mechanisms, and applications of various drying techniques, and how do different types of distillation processes work, considering their uses and limitations in different scales?
		CO.4 Could you elaborate on which part of the topic you would like me to generate a single short question for?
		CO.5 What are the key factors influencing the efficiency of filtration processes and how do filter aids and media impact the overall filtration performance?
C215	Ph-Organic Chemistry-II lab	CO.1 What are the primary techniques used in laboratory experiments for recrystallization and steam distillation?
		CO.2 What are the methods for determining the acid value, saponification value, and iodine value of oils, including the standardization of reagents?
		CO.3 What are the key synthetic pathways for the preparation of the following compounds: Benzanilide, 2,4,6-Tribromo aniline, 5-Nitro salicylic acid, and Benzoic acid?
		CO.4 What are the key synthetic pathways for the preparation of the following compounds:

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		Benzanilide, 2,4,6-Tribromo aniline, 5-Nitro salicylic acid, and Benzoic acid?
		CO.5 How can Dibenzal acetone be synthesized from Benzaldehyde using the Claisen-Schmidt reaction?
C216	Physical Pharmaceutics-I Lab	CO.1 What methods can be used to determine the solubility of a drug at room temperature under various pH conditions?
		CO.2 What is the procedure for determining the partition coefficient of iodine in CCl4 and water?
		CO.3 How can microscopic methods be used to determine particle size and particle size distribution?
		CO.4 How is the solubility of a drug determined at room temperature under different pH conditions?
		CO.5 What are the steps involved in determining the stability constant and donor-acceptor ratio of a PABA-Caffeine complex by the solubility method?
C217	Pharmaceutical Microbiology Lab	CO.1 What are the key equipment and processes involved in experimental microbiology, including sterilization of glassware and media preparation?
		CO.2 What are the key techniques and procedures involved in sub-culturing bacteria and fungi, as well as in preparing nutrient stabs and slants, and how do staining methods such as Simple, Gram's staining, and acid-fast staining play a role in practical demonstrations?
		CO.3 How can pure cultures of microorganisms be isolated using the multiple streak plate technique and other methods?
		CO.4 What methods are commonly used for sterility testing of pharmaceuticals and bacteriological analysis of water in the pharmaceutical industry?
		CO.5 What are the key IMViC reactions and their significance in biochemical testing?
C218	Pharmaceutical Engineering Lab	CO.1 What methods are used to determine the radiation constant of brass, iron, unpainted glass, and painted glass, and how is the efficiency of steam distillation calculated?
		CO.2 How can we calculate the overall heat transfer coefficient in a heat exchanger?
		CO.3 How is the moisture content determined using the dew point method, and what are its applications in pharmaceutical machinery like rotary tablet machines and fluidized bed coaters?
		CO.4 What are the key objectives and experiments involved in size analysis by sieving and size reduction using a ball mill in pharmaceutical

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		manufacturing?
		CO.5 What are the key factors influencing the rate of filtration and evaporation in various major equipment like colloid mills, planetary mixers, fluidized bed dryers, and freeze dryers?

II year II semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C221	Ph-Organic Chemistry-III	CO.1 What distinguishes stereo isomerism, and what are its different forms?
		CO.2 What are the distinguishing features of geometrical isomerism and how is it different from conformational isomerism?
		CO.3 What are the key differences in the nomenclature, synthesis, reactions, and medicinal applications of pyrrole, furan, and thiophene, particularly focusing on their relative aromaticity, reactivity, and the basicity of pyrrole?
		CO.4 What are the medicinal uses and synthesis methods for pyridine, quinoline, isoquinoline, acridine, and indole, and what is the basicity of pyridine?
		CO.5 What are the key differences in the mechanisms of metal hydride reduction, Clemmensen reduction, Birch reduction, Wolff-Kishner reduction, Oppenauer oxidation, and Dakin reaction?
C222	Medicinal Chemistry-I	CO.1 What are the key historical milestones in the development of medicinal chemistry, and how do physicochemical properties influence the biological action of drugs, particularly in terms of ionization, solubility, and drug metabolism principles?
		CO.2 What are the key differences in the biosynthesis and catabolism of catecholamines? Additionally, how do the distribution and functions of alpha and beta adrenergic receptors vary within the body?
		CO.3 What are the biosynthesis and catabolism processes of acetylcholine, and how do they relate to the functioning of cholinergic receptors such as Muscarinic and Nicotinic receptors, and the distribution of parasympathomimetic agents?
		CO.4 What are the structural characteristics and pharmacological actions of Benzodiazepines,

PRINCIPAL
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Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		Barbiturates, and Anticonvulsants?
		CO.5 What are the various classes of drugs acting on the Central Nervous System and their specific subtypes and examples within those classes?
C223	Physical Pharmaceutics-II	CO.1 What are the key factors influencing the chemical degradation of pharmaceutical products, and how can medicinal agents be stabilized against common reactions like hydrolysis and oxidation?
		CO.2 How do rheological properties influence the deformation behavior of solids in the context of the Heckel equation and elastic modulus?
		CO.3 What are the key factors influencing the physical stability and formulation of coarse dispersions, including suspensions and emulsions, and how do these systems behave under different interfacial and rheological conditions?
		CO.4 How do surface active agents impact the spreading coefficient and adsorption at liquid and solid interfaces?
		CO.5 What are the general characteristics and properties of colloidal dispersions, and how do they vary in terms of size, shape, and classification of colloidal particles?
C224	Pharmacology-I	CO.1 What is the significance of spare receptors in the context of pharmacology and drug action?
		CO.2 What are the key principles of pharmacodynamics and how do receptors, drug interactions, and signal transduction mechanisms play a role in drug action?
		CO.3 What are the key neurotransmitter categories involved in the autonomic nervous system, and how do sympathomimetics and sympatholytics affect it?
		CO.4 What are the key neurotransmitters involved in neurohumoral transmission in the central nervous system, and how do they influence its pharmacology?
		CO.5 What are the key topics covered in the 7-hour pharmacology of the central nervous system course?
C225	Pharmacognosy and Phytochemistry-I	CO.1 What are the key mechanisms of action for opioid analgesics and antagonists in the central nervous system?
		CO.2 What are the key categories of drugs that affect the central nervous system?
		CO.3 How has plant tissue culture contributed to the development of edible vaccines in pharmacognosy?
		CO.4 How does Pharmacognosy contribute to both allopathy and traditional systems of medicine like

PRINCIPAL
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Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		Ayurveda, Unani, Siddha, Homeopathy, and Chinese medicine?
		CO.5 What are the therapeutic uses and commercial utilities of marine drugs derived from natural sources, and how do they differ from the primary metabolites found in carbohydrates, proteins, and lipids in pharmaceutical applications?
C226	Medicinal Chemistry-I Lab	CO.1 How are 1,3-pyrazole, 1,3-oxazole, and benzimidazole intermediates prepared for drug synthesis?
		CO.2 How is Benzocaine synthesized?
		CO.3 How are Phenytoin, Phenothiazine, and Barbiturate drugs prepared?
		CO.4 What are the assay methods for Chlorpromazine, Phenobarbitone, and Atropine?
		CO.5 What are the common assay methods for Ibuprofen, Aspirin, and Furosemide?
C227	Physical Pharmaceutics-II Lab	CO.1 How can the surface tension of a given liquid be accurately determined using the drop count or drop weight method?
		CO.2 How does the viscosity of a liquid change when measured using Ostwald's viscometer?
		CO.3 What are the key steps involved in determining the viscosity of a semisolid using a Brookfield viscometer?
		CO.4 How is the reaction rate constant determined for a first-order reaction?
		CO.5 What are the key degradation pathways observed during accelerated stability studies?
C228	Pharmacology-I Lab	CO.1 What are the guidelines set by CPCSEA for the maintenance of laboratory animals?
		CO.2 How is the effect of hepatic microsomal enzyme inducers on phenobarbitone sleeping time in mice studied?
		CO.3 Describe the procedure for administering drugs via different routes in mice or rats.
		CO.4 What are the steps involved in measuring the anticonvulsant effects of drugs using the MES and PTZ methods?
		CO.5 How is the locomotor activity of animals assessed using an actophotometer?
C229	Pharmacognosy and Phytochemistry -I Lab	CO.1 How do the chemical tests for Tragacanth, Acacia, Agar, Gelatin, Starch, Honey, and Castor oil differ in the analysis of crude drugs?
		CO.2 What are the methods for determining the size of starch grains, calcium oxalate crystals using an

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Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		eyepiece micrometer, and the fiber length and width?
		CO.3 How is the determination of the number of starch grains achieved using the Lycopodium spore method?
		CO.4 What are the standard methods for determining the moisture content of crude drugs?
		CO.5 What methods are commonly used to determine the swelling index and foaming properties of materials?
C2210	Gender Sensitization Lab	CO.1 Why is the study of gender important, and how do socialization processes contribute to the formation of gender roles, such as those associated with womanhood and masculinities?
		CO.2 What are the demographic consequences of sex selection and the declining sex ratio, and how does the concept of the gender spectrum challenge traditional binary understandings of gender?
		CO.3 How does the concept of "invisible labor" in housework affect perceptions of women's work, and what are the political and economic implications of unrecognized and unaccounted labor?
		CO.4 What are the key issues surrounding sexual harassment, domestic violence, and sexual violence, and how do they impact victims' experiences and responses?
		CO.5 How do relationships based on equality, such as those depicted in the context of Mary Kom and Onler, challenge traditional gender norms and contribute to co-existence?

III year I semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C311	Medicinal Chemistry-II	CO.1 What are the primary H1 and H2 receptors in the human body, and how do antihistaminic agents, such as diphenhydramine and cimetidine, affect them?
		CO.2 What anti-anginal medication is typically administered along with vasodilators, calcium channel blockers, and diuretics as part of the treatment regimen for angina pectoris?
		CO.3 What are the common anti-arrhythmic drugs in the class I and class III categories, and what is their mechanism of action?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		CO.4 What is the primary mechanism of action for the drugs affecting the endocrine system mentioned, and how do they differ in terms of their effects on the endocrine system?
		CO.5 What are some common antidiabetic agents and their classes?
C312	Industrial Pharmacy-I	CO.1 How do the formulation and manufacturing consideration and liquid orals differ in terms of excipients, processing methods, quality control tests, and official pharmacopoeia standards, and what are the common equipment and processing problems associated with these pharmaceutical dosage forms?
		CO.2 What are the common indications for using Warfarin among the listed anti-arrhythmic drugs and anti-hyperlipidemic agents?
		CO.3 What are the key aspects of the production, quality control, and formulation techniques for hard gelatin capsules, soft gelatin capsules, and pellets?
		CO.4 What are the key differences in the nomenclature, stereochemistry, and metabolism of steroids, and how do these differences affect the actions of drugs like corticosteroids and sex hormones on the endocrine system?"
		CO.5 What are the key considerations in the formulation ,preparation of pharmaceutical products in cosmetics and stability studies, including materials selection, influencing factors, legal requirements, stability aspects, and quality control tests?
C313	Pharmacology II	CO.1 How do anti-arrhythmic drugs contribute to the pharmacology of the cardiovascular system?
		CO.2 What is the primary pharmacological function of drugs used in the therapy of shock within the cardiovascular system, and what class of drugs are classified as hematinics, coagulants, and anticoagulants?
		CO.3 What are the key principles in endocrine pharmacology, specifically focusing on analogues and inhibitors of anterior pituitary hormones, thyroid hormones, hormones regulating plasma calcium levels, insulin, oral hypoglycemic agents, glucagon, and ACTH/corticosteroids?
		CO.4 What are the fundamental principles and practical applications of bioassays, the different types of bioassays, and how are insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, and histamine bioassays conducted and utilized?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

C314	Pharmacognosy and Phychemistry - II	CO.1 What are the key metabolic pathways in higher plants, and how do they contribute to the formation of secondary metabolites like shikimic acid, acetate-derived compounds, and amino acid-related products,
		CO.2 What are the therapeutic uses and general methods of extraction for alkaloids found in Vinca, Rauwolfia, Belladonna, and Opium?
		CO.3 What are the medicinal properties of tannins found in Catechu and Pterocarpus, and how do they differ from the therapeutic properties of resins, glycosides, and other terpenoids in plants like Benzoin, Guggul, Senna, and Gentian?
		CO.4 What methods can be employed for the isolation, identification, and analysis of the listed phytoconstituents in a 10-hour time frame?
		CO.5 What are the modern methods of extraction for the phytoconstituents Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine, and Vinblastine in industrial production and estimation?
C315	Cosmetic science	CO.1 How are surfactants, rheology modifiers, humectants, emollients, and preservatives classified and applied in cosmetic and cosmeceutical products?
		CO.2 What are the key formulation principles and building blocks for skin care products, and how do the relative skin sensory, advantages, and disadvantages of face wash, moisturizing cream, cold cream,?
		CO.3 What is the role of herbs in sun protection, and how are sunscreens classified based on SPF?
		CO.4 What are the key regulatory definitions of cosmetics in India and the EU, and how do cosmeceuticals differ from traditional cosmetics, particularly in their evolving role as quasi and over-the-counter drugs?
		CO.5 What are the common causes of dry skin and how can one effectively moisturize it, while also explaining the terms Comedogenic and dermatitis in relation to skincare?
C316	Industry pharmacy - I lab	CO.1 What is involved in the preformulation study of prepared granules?
		CO.2 How are Paracetamol tablets prepared and evaluated?
		CO.3 How are Aspirin tablets prepared and evaluated?
		What is the purpose of the coating on tablets?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		How are Tetracycline capsules prepared and what methods are used for their evaluation?
		How is Calcium Gluconate injection prepared?
C317	Pharmacology II lab	CO.1 What is in-vitro pharmacology and how are physiological salt solutions used in this context?
		CO.2 What is the effect of drugs on an isolated frog heart, and how is it studied in pharmacology?
		CO.3 How do drugs affect the blood pressure and heart rate of dogs?
		CO.4 What are the key findings from the study on diuretic activity of drugs in rats/mice?
		CO.5 What is the primary mechanism of action for acetylcholine on frog rectus abdominis muscle?
C318	Pharmacognosy & Pchemistry - II lab	CO.1 What are the key morphological and histological characteristics, characteristics, detection of bioactive compounds in Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel, and Coriander?
		CO.2 What methods and techniques can be employed for the isolation and detection of atropine from Belladonna and sennosides from Senna?
		CO.3 What is the key principle behind the separation of sugars by paper chromatography?
		CO.4 How is TLC (Thin Layer Chromatography) used to analyze a herbal extract?
		CO.5 How is distillation employed to extract volatile oils from plant materials, and how are the phytoconstituents detected using TLC
C319	Environmental Sciences	CO.1 How are renewable and non-renewable natural resources categorized, and what are the key issues associated with forests, water, minerals, food, energy, and land resources? What role can individuals play in their conservation?
		CO.2 What are the key concepts, structure, and functions of an ecosystem? Describe the characteristic features and functions of different types of ecosystems, including forest, grassland, desert, and aquatic ecosystems (such as ponds, streams, lakes, rivers, oceans, and estuaries).
		CO.3 What is biodiversity, and what are its types and values? How do threats like habitat loss and poaching impact it, and what role do In-Situ and Ex-Situ conservation methods and the National Biodiversity Act play in its protection?
		CO.4 What are the main types of environmental pollution—air, water, soil, and noise—and how do each of these pollutants impact ecosystems and

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		human health?
		CO.5 How do key environmental policies and legislation (e.g., Environmental Protection Act, Air Act) support sustainable development? Discuss the concepts of sustainable development, green building, ecological footprint, and low-carbon lifestyles in addressing environmental challenges.

III year II semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C321	Medicinal chemistry III	CO.1 What are the key historical developments in the discovery and development of Beta-Lactam antibiotics, Aminoglycosides, and Tetracyclines, and how do their structures, stereochemistry, and structure-activity relationships contribute to their functions as antimicrobial agents?
		CO.2 What is the historical background of Macrolide antibiotics, including Erythromycin, Clarithromycin, and Azithromycin, and their important products?
		CO.3 What is the structure-activity relationship (SAR) of quinolone antibiotics, with a focus on the development and properties of Ciprofloxacin?
		CO.4 What is the mechanism of action of Amphotericin-B, and how does it differ from that of synthetic antifungal agents like Ketoconazole?
		CO.5 What are the key approaches and physicochemical parameters employed in drug design, and how do techniques like pharmacophore modeling, docking, and combinatorial chemistry contribute to the process of drug discovery?
C322	Pharmacology-III	CO.1 Which drugs are typically used in the management of COPD, and what are their primary modes of action in improving the condition?hat are the main differences between emetics and anti-emetics, and how do they work to affect nausea and vomiting?
		CO.2 What are the key differences between the various classes of antibiotics, including penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolones, tetracycline, and aminoglycosides?
		CO.3 What is the primary mode of action of anthelmintics against parasitic worms? How are antimalarial drugs used to prevent and treat malaria?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		CO.4 What are the key differences in the treatment approach between urinary tract infections and sexually transmitted diseases, as well as the chemotherapy of malignancy?
		CO.5 Could you summarize the clinical symptoms and appropriate management for poisoning caused by barbiturates, morphine, organophosphorus compounds, and lead, mercury, and arsenic?
C323	Herbal drug technology	CO.1 What are the key aspects of herb sourcing, processing, and the herbal drug industry, particularly in the context of India's involvement in medicinal and aromatic plants?
		CO.2 What are the key health benefits and potential applications of nutraceuticals in managing conditions like diabetes, cardiovascular diseases, cancer, irritable bowel syndrome, and gastrointestinal disorders,
		CO.3 What are the key stability testing requirements outlined by WHO and ICH guidelines for herbal drugs?
		CO.4 What are the key stability testing requirements outlined by WHO and ICH guidelines for herbal drugs?
		CO.5 What are the key components of GMP (Schedule – T), and what are their objectives in ensuring compliance with infrastructural requirements, working space, storage area, machinery and equipment, standard operating procedures, health and hygiene, documentation, and records in a pharmaceutical or manufacturing facility?
C324	Biopharmaceutics & Pharmacokinetics	CO.1 What are the key factors influencing drug absorption through the gastrointestinal tract (GIT) and how do they impact the clinical significance of protein binding of drugs?
		CO.2 What are the key factors influencing drug absorption through the gastrointestinal tract (GIT) and how does protein binding affect the distribution and clinical significance of drugs in the body?
		CO.3 What are the key factors that influence the renal excretion of drugs, and how does bioavailability relate to drug metabolism and clearance?
		CO.4 What considerations are important when administering drugs through extravascular routes in a one-compartment open model?

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		CO.5 What are the key factors contributing to non-linearity in pharmacokinetics, and how does the Michaelis-Menten method play a role in estimating parameters during the biotransformation of drugs?
C325	Pharmaceutical Quality Assurance	CO.1 What are the key principles and concepts of Quality by Design (QbD) in the context of pharmaceutical manufacturing?
		CO.2 How does personnel training, hygiene, and record-keeping contribute to maintaining quality in a pharmaceutical manufacturing facility?
		CO.3 What are the key quality control tests and criteria for evaluating containers, rubber closures, and secondary packing materials in pharmaceutical manufacturing?
		CO.4 How can a pharmaceutical company ensure effective management of return goods, including the handling of recalls and waste disposal, while addressing customer complaints and evaluating their complaints handling process?
		CO.5 What are the key principles and steps involved in the calibration, qualification, and validation of equipment and analytical methods in the pharmaceutical industry?
C326	Medicinal chemistry III lab	CO.1 What is the primary synthesis method for each of the following compounds: Sulphanilamide, 7-Hydroxy, 4-methyl coumarin, Chlorobutanol, Triphenyl imidazole, Tolbutamide, and Hexamine?
		CO.2 How is the assay of chloroquine typically performed in pharmaceutical analysis?
		CO.3 How does microwave irradiation contribute to the preparation of medicinally important compounds or intermediates in pharmaceutical synthesis?
		CO.4 How can ChemDraw® be used to draw chemical structures and reactions, and what are some key features of this software for chemists?"
		CO.5 How does drug design software facilitate the determination of physicochemical properties, including logP, clogP, MR, molecular weight, hydrogen bond donors and acceptors, and drug likeliness screening based on Lipinski's Rule of Five for a class of drugs?
C327	Pharmacolgy III Lab	CO.1 What methods are employed for dose calculation in pharmacological experiments?
		CO.2 How is antiallergic activity assessed through mast cell stabilization assay?
		CO.3 How does the administration of a pylorus ligand (SHAY) in a rat model affect anti-ulcer

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		activity, particularly in comparison to NSAIDs-induced ulcer models?
		CO.4 How do specific drugs influence gastrointestinal motility in experimental studies?
		CO.5What methods are employed for dose calculation in pharmacological experiments?
C328	Herbal Drug Technology lab	CO.1 What methods are employed in the preliminary phytochemical screening of crude drugs, and what compounds are typically identified through these screenings?
		CO.2 How effective are natural origin excipients in enhancing the performance of pharmaceutical formulations?
		CO.3 How does the incorporation of prepared and standardized extracts impact the efficacy of cosmetics formulations, such as creams, lotions, and shampoos, and what criteria are used for their evaluation?
		CO.4 How are prepared and standardized extracts incorporated into cosmetics formulations and evaluated in compliance with pharmacopoeial standards?
		CO.5 What method is used to determine the phenolic content in the given substance?
C329	Human values and professional Ethics	CO.1 What are the key concepts of professional ethics, and how do personal and professional ethics intersect in addressing ethical dilemmas? Discuss the role of emotional intelligence, value education, and professional associations in navigating professional risks and achieving success.
		CO.2 How do ethical theories such as deontology, utilitarianism, and virtue theory address moral dilemmas and autonomy?
		CO.3 What does the code of pharmaceutical ethics entail, and how does it shape the pharmacist's responsibilities and oath?
		CO.4 How do workplace rights, ethical standards in research, and professional judgment impact organizational procedures and handling of research misconduct?
		CO.5 What are the key global issues in professional ethics, including business ethics, corporate governance, and sustainability, and how do they relate to technology, international trade, and environmental concerns?
		CO.6 What are the key concepts of professional ethics, and how do personal and professional ethics

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		intersect in addressing ethical dilemmas? Discuss the role of emotional intelligence, value education, and professional associations in navigating professional risks and achieving success.

IV year I semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C411	Instrumental Methods of Analysis	CO.1 Can you outline the key factors influencing electronic transitions and the impact of chromophores and auxochromes on spectral shifts, considering the role of solvent effects, alongside an exploration of deviations in Beer and Lambert's laws?
		CO.2 What are the key principles and instrumental components influencing the analysis of molecular vibrations, radiation sources, and detection methods in various spectroscopic techniques, and how do they impact applications in analytical chemistry?
		CO.3 How do various chromatographic and electrophoretic techniques differ in their methodologies, advantages, disadvantages, and applications in analytical separation science?
		CO.4 How do the principles, instrumentation, and specific operational techniques of Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC) differ, and what are their respective advantages, disadvantages, and applications in analytical separations?
		CO.5 How do various chromatographic methods, such as Ion Exchange, Gel, and Affinity chromatography, differ in their principles, mechanisms, methodologies, and applications in the separation and purification of biomolecules or chemical compounds?
C412	Industrial Pharmacy-II	CO.1 What are the key considerations and strategies involved in the scale-up of pharmaceutical production from pilot plant to full-scale manufacturing, encompassing aspects such as personnel requirements, space, raw materials, documentation, SUPAC guidelines, and the role of platform technology?
		CO.2 How do the WHO guidelines for Technology Transfer address the multifaceted aspects of transfer protocols, quality risk management, documentation,

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		regulatory compliance, and practical challenges in commercialization, including case studies and the role of Technology Transfer agencies in India such as APCTD, NRDC, TIFAC, BCIL, TBSE/SIDBI,
		CO.3 How do Regulatory Affairs encompass historical evolution, the role of regulatory bodies, and the multifaceted responsibilities of professionals, alongside the comprehensive regulatory requirements for drug approval, covering aspects from non-clinical development to clinical research, statistics,
		CO.4 How do Quality Management Systems and Certifications, including ISO standards, Total Quality Management, and concepts like Six Sigma, facilitate and ensure quality, compliance, and operational excellence across industries while addressing issues like Out of Specifications (OOS), Change Control, ISO 9000 series, ISO 14000, NABL, GLP?
		CO.5 How do the Central Drug Standard Control Organization (CDSCO) and State Licensing Authorities function, and what are their respective responsibilities, approval procedures, and regulatory requirements, particularly concerning New Drugs, the Common Technical Document (CTD),
C413	Pharmacy Practice	CO.1 How does the organizational structure and function of Hospital Pharmacy differ from that of Community Pharmacy, considering the roles of pharmacists, staff requirements, legal aspects, and dispensing practices in both settings?
		CO.2 How do the processes and policies in Drug Distribution within hospital settings differ for inpatients and ambulatory patients, particularly focusing on distribution systems, charging policies, labeling, and the dispensing of controlled drugs, in contrast to the considerations and the Indian scenario in Therapeutic Drug Monitoring?
		CO.3 How do Drug and Poison Information Centers facilitate information retrieval and dissemination, including computerized services and storage techniques, while also addressing the significance and steps involved in patient counseling, encompassing special cases that require pharmacist intervention,
		CO.4 How do the responsibilities and functions of a Clinical Pharmacist in drug therapy monitoring and patient care differ from the concepts of Over-the-

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		Counter (OTC) sales, and what factors contribute to the rational use of common OTC medications?
		CO.5 How does the organization of a drug store and the principles of purchase and inventory control impact the stocking, procurement, and efficient management of materials, encompassing stock types, storage conditions, purchase procedures, inventory control methods, and financial analysis of drug expenditures?
C414	Novel Drug Delivery System	CO.1 How do Controlled Drug Delivery Systems utilize principles of diffusion, dissolution, and ion exchange in the design of formulations, considering the physicochemical and biological properties of drugs, and how do polymers, in terms of classification, properties, and advantages, play a role in the formulation of controlled release drug delivery systems?
		CO.2 How do microencapsulation methods, mucosal drug delivery principles including bio adhesion concepts, and implantable drug delivery systems differ in their design, advantages, disadvantages, and applications for controlled drug release and targeted delivery within pharmaceutical systems?
		CO.3 How do Transdermal Drug Delivery Systems, Gastroprotective Drug Delivery Systems, and Nas pulmonary Drug Delivery Systems differ in their approaches, components, and applications for drug delivery, considering factors affecting permeation, formulation approaches, and the variety of delivery mechanisms for each system?
		CO.4 What are the key concepts and approaches in targeted drug delivery systems, and what are the advantages and disadvantages of using liposomes, noisome, nanoparticles, and monoclonal antibodies in drug delivery?
		CO.5 What are the fundamental aspects of intraocular drug delivery, including intraocular barriers, methods to overcome them, and the characteristics of ocular formulations and ocuserts?
C415	Pharmaceutical regulatory science	CO.1 What are the key stages in the drug discovery and development process, including pre-clinical studies, non-clinical activities, and clinical studies
		CO.2 What are the approval processes and timelines for Investigational New Drug (IND), New Drug Application (NDA), and Abbreviated New Drug Application (ANDA) in the United States, and what are the considerations for making changes to an

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		approved NDA/ANDA?
		CO.3 What are the key components and procedures involved in the export of pharmaceutical products, and how do Technical Documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), and ASEAN Common Technical Document (ACTD) play a role in facilitating this process
		CO.4 How are clinical trial protocols developed, and what are the procedures for forming and working with Institutional Review Boards/Independent Ethics Committees, obtaining informed consent, and meeting Good Clinical Practice (GCP) obligations for investigators, sponsors, and monitors in the context of managing and monitoring clinical trials?
		CO.5 What are the fundamental terminologies, guidance, guidelines, regulations, laws, and acts relevant to pharmaceuticals and drug development, and how do resources like the Orange Book, Federal Register, Code of Federal Regulations, and Purple Book impact the industry and regulatory landscape?
C416	Instrumental Methods of Analysis Lab	CO.1 How is the absorption maxima of organic compounds determined, and what is the influence of different solvents on the absorption maxima of these compounds?
		CO.2 What is the colorimetric method used for the estimation of dextrose, and how does it work?
		CO.3 How is sulfanilamide estimated using colorimetry, and what is the underlying principle of this method?
C417	Practice school	CO.1 What is the structure and purpose of the industry and hospital visits and interactions with executives in the context of promoting experiential learning and hands-on experience across different departments, and how are the findings and outcomes documented?
		CO.2 What are the key objectives and expected outcomes working on hospital-oriented case studies in areas such as cardiovascular, diabetes, gastrointestinal, gynecological, pulmonary, and pediatric cases?
		CO.3 What are the prevalent prescription trends and commonly prescribed medications observed through the analysis of multiple retail pharmacy shops in the designated area, including insights on prescription patterns and medical audit findings?
C418	Industrial training	CO.1 Reflecting on industrial training

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		experience, what were the most valuable lessons learned during the time at the pharmaceutical company? How do plan to apply these lessons to future career in pharmacy?
		CO.2 Can you describe a specific project or task worked on during industrial training that allowed you to apply the knowledge and skills gained from the program? How did this experience contribute to professional development?
		CO.3 After completed industrial training, how has this experience influenced career aspirations in the field of pharmacy? What are short-term and long-term goals, and how do the plan to achieve on industrial training experience?

IV year II semester

COURSE CODE	COURSE NAME	COURSE OUTCOME
C421	Biostatistics and Research Methodology	CO.1 How do measures of central tendency (mean, median, mode) applied to pharmaceutical examples illustrate data patterns, and how are measures of dispersion (range, standard deviation) utilized to address pharmaceutical problems?
		CO.2 How are regression techniques such as curve fitting by the method of least squares and multiple regression applied in pharmaceutical examples to analyze relationships between variables?
		CO.3 How are non-parametric tests like Wilcoxon Rank Sum, Mann-Whitney U, Kruskal-Wallis, and Friedman used in pharmaceutical research, and what roles do they play in analyzing data?
		CO.4 How do various statistical analysis tools applied in both industrial settings and clinical trials, contribute to the process of designing experiments and conducting statistical analysis within these domains?
		CO.5 How does factorial design, and its advantages, contribute to experimental analysis, and what role do response surface methodologies.
C422	Social and Preventive Pharmacy	CO.1 How do social, educational, and cultural factors influence health and disease, encompassing topics such as public health evaluation, nutritional

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		deficiencies, socio-cultural impacts on health, and personal hygiene practices?
		CO.2 How do the general principles of preventive medicine apply to a diverse range of diseases considering the methods and strategies for disease control and prevention in each case?
		CO.3 How do national health and immunization initiatives contribute to the prevention and control of various diseases, and what are the key strategies employed in each program to achieve their objectives?
		CO.4 How do national health intervention programs focusing on maternal and child health, family welfare, and what role does the WHO play in supporting these national health programs?
		CO.5 How do community health services such as Primary Health Centers (PHCs), and health promotion initiatives in schools contribute to improving health in rural and urban areas, emphasizing the role of preventive healthcare and education?
C423	Pharmaceutical Jurisprudence	CO.1 What are the key regulations and penalties surrounding the import, manufacture, and distribution of prohibited drugs and cosmetics, as well as the necessary licenses or permits in adherence to the Act and its rules?
		CO.2 What are the comprehensive regulations and penalties governing the wholesale and retail sale of drugs, restricted licenses, labeling and packing requirements, as well as the administrative bodies involved in enforcing and overseeing the compliance with the Act and its rules?
		CO.3 What are the key regulatory frameworks and penalties governing the PCI,&SPC, registration of pharmacists, as well as the provisions and penalties under the Medicinal and Toilet Preparation and the Narcotic Drugs and Psychotropic Substances and its rules?
		CO.4 Explain the regulatory measures and key provisions of the Prevention of Cruelty to Animals Act and the National Pharmaceutical Pricing Authority's Drugs Price Control Order in relation to animal welfare and pharmaceutical pricing in India.
		CO.5 What are the key components of the Medical Termination of Pregnancy Act in pharmaceutical legislation?
C424	Experimental	CO.1 What are some common techniques for

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

	Pharmacology	collecting blood and administering drugs in laboratory animals, and can you provide examples of popular transgenic and mutant animals used in scientific research?
		CO.2 How are dose selection, calculation, and conversion processes carried out in preclinical screening models, and why is it important to include sham negative and positive control groups when grouping animals for preclinical studies?
		CO.3 What are the key preclinical screening models used to assess the activity of drugs affecting the autonomic nervous system, including sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, and skeletal muscle relaxants?
		CO.4 What are the preclinical screening models commonly used to evaluate the efficacy and safety of diuretics, anticoagulants, and drugs with potential anticancer activity?
		CO.5 How do research methodology and bio-statistics play a role in selecting a research topic, reviewing relevant literature, formulating research hypotheses, and designing studies, and how can statistical tools like Student's t-test and One-way ANOVA be used for data interpretation and graphical representation in research?
C425	Project Work	CO.1 What is the rationale behind selecting the specific research topic? How does your chosen research topic contribute to the existing body of knowledge in the field of pharmacy?
		CO.2 What are the potential implications of the project findings for the pharmaceutical industry or clinical practice? How do the results of research contribute to addressing existing challenges or gaps in pharmacy practice or drug development?
		CO.3 Can you describe the methodology and experimental design employed in the project? How did you decide on the specific techniques and procedures used in research?
		CO.4 Based on the project findings, what are some potential areas for future research or follow-up studies? Are there any recommendations or suggestions arising from

PRINCIPAL
Global College of Pharmacy
Chilkur (V), Moinabad (M),
R.R. Dist. T.S

		your research that could inform future pharmacy practice, policy, or education?
		CO.5 What were the key findings of the project, and how did you analyze the data obtained? Did encounter any unexpected results during research, and if so, how did you address them?