

2.6 Student performance and Learning outcomes

2.6.1 Teachers and students are aware of the stated programme and course outcomes of the programmes offered by the institution

List of Enclosures under

Sl. No.	File description
1	Display material of Vision, Mission, COs, POs and PEOs
2	Programme Outcomes (POs)
3	Programme Specific Outcomes (PSOs)
4	Course Outcomes (COs) of B. Pharmacy
5	Course Outcomes (COs) of Pharm D
6	Course Outcomes (COs) of M. Pharmacy



Display Material of Vision, Mission, COs, POs and PEOs



SREE DATTHA INSTITUTE OF PHARMACY


(Approved by AICTE & PCI, New Delhi, Affiliated to JNTUH, Hyderabad, T.S)

Nagarjuna Sagar Road, Sheriguda (V), Ibrahimpatnam (M), R.R.Dist., Greater Hyderabad-501510. T.S

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Display material of Vision, Mission, Cos, Pos and PEOs



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VISION

To develop this Institute as one of the premier institution in dynamic equilibrium with its social, ecological and economic environment, serving continuously to excellence in education, research and pharmaceutical service to nation.

MISSION





- To provide high quality enterprising students with excellent pharmaceutical and technological skills.
- To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical and economic issues.
- To pursue Research and disseminate research findings.
- To help in building national capabilities in pharmaceutical sciences, education and research

PEOs

PEO NO	PROGRAMME EDUCATIONAL OBJECTIVES
PEO-1	To produce pharmacy graduates with strong fundamental concepts and high technical competence in pharmaceutical sciences who shall be able to use the tools in pharmaceutical arena for success.
PEO-2	To develop a sense of teamwork and awareness amongst students towards the importance of interdisciplinary approach for developing competence in solving complex problems in the area of Pharmaceutical Sciences.
PEO-3	To promote the development of trained human resource in Pharmaceutical Science for spreading of quality education with highly professional and ethical attitude, strong communication skills, effective skills to work in a team.
PEO-4	To generate potential knowledge pools with interpersonal and collaborative skills to identify, assess and formulate problems and execute the solution in closely related pharmaceutical industries.
PEO-5	To train the students to contribute towards health care system and encourage the students to participate in life-long learning process for a highly productive career, and to relate the concepts of Pharmaceutical Sciences towards serving the betterment of the society.

PROGRAM OUTCOMES

- Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
- Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
- Problem Analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
- Modern Tool Usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
- Leadership Skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.
- Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
- Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
- Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
- The Pharmacist and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
- Environment and Sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

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VISION OF THE INSTITUTION

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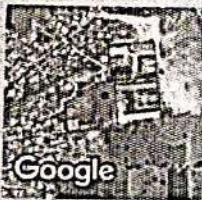
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Applying Minds

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VISION OF THE DEPARTMENT


To be a globally recognized pharmacy education and research centre producing budding pharmacists into perfect pharmacists who can integrate science and technology to advance pharmaceutical drug discovery and formulate patient friendly dosage forms, supporting health care.

MISSION OF THE DEPARTMENT

- Nurture students into knowledgeable, skilful and ethical professionals
- Nurture the faculty to expose all to world-class research and pharmaceutical infrastructure
- Sustain high performance by excellence in teaching, research and innovations
- Extensive partnerships and collaborations with industries/foreign universities for technology up gradation
- Develop skilled pharmacist to support healthcare locally, nationally and globally

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Programme Outcomes (POs)





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PROGRAM OUTCOMES (POs)

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Programme Specific Outcomes (PSOs)





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PROGRAM SPECIFIC OUTCOMES (PSOs)	
B. PHARMACY	
PSO1	To foster a research environment in various multidisciplinary aspects of pharmaceutical sciences involved in drug development and end product optimization.
PSO2	To accentuate the role of a pharmacist in the health care system and community well-being
PHARM. D. & PHARM. D. (PB)	
PSO1	Anticipate the patient's needs; participate in the creation of individualized disease management and prevention plans including patients' self-management and behavior changes.
PSO2	Knowledge to participate with inter professional health care team members in the management of health promotions for all patients by providing pharmaceutical care (Includes Medication therapy management/Therapeutic Drug monitoring)
PSO3	Graduates can apply their expertise to recognize possible adverse drug interaction or any side effects can also counsel the patients to comply with the prescribed treatment regimen.
PSO4	Knowledge to formulate evidence based health care plans, assessments and recommendations
PSO5	Comprehend the role to provide health care services to patients and families with the aim of preventing related problems and to maintain the overall health.
PSO6	Assimilate and enhance the quality of care and service to patients by optimizing the ability to use critical analysis and problem solving skills for better patient outcomes.
M. Pharm- Pharmaceutics	
PSO 1	To whirl a new chemical entity into a formulation that can be used safely and effectively by the patients.
PSO 2	To expertise in technical skills and gain knowledge in bioavailability and bioequivalence studies
PSO 3	To develop modest nanotechnology skill in the field of pharmaceutical research.
PSO 4	To impart knowledge and skill development on designing of dosage forms as per GMP guidelines
PSO 5	Establishing potentiality in multidisciplinary chore for betterment in quality of drug delivery systems.
PSO 6	Acquire core knowledge in computer simulations and problem analysis as per regulatory requirements for the development of dosage forms.
M. Pharmacy (Pharmaceutical Analysis)	
PSO 1	To learn the advanced analytical techniques for the determination of various drugs in single and combination dosage forms.
PSO 2	To operate, control, analyze and evaluate chemical substances, cosmetic products and finished products using hyphenated techniques.
PSO 3	To carry out the validation of manufacturing processes and apply the knowledge of validation to instruments and equipments.
PSO 4	To design a system, component or process to meet the desired needs within realistic constraints such as economic, environmental, sustainability social, ethical, health, safety and manufacturability for humans.
PSO 5	To understand the responsibilities of QA & QC departments like cGMP aspects, scope of quality certifications and importance of documentation.
PSO 6	To promote the development of skilled human resource in Pharmaceutical Sciences for propagation of quality education, right professional and ethical attitude, good communication skills, right mental attitude in a multidisciplinary Pharmaceutical Sciences area.
M. Pharmacy (Pharmacology)	



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PSO 1	Deal with various advanced instrumental techniques for identification, characterization and quantification of drugs.
PSO 2	Demonstrate basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, pharmacologist will understand the concepts of drug action and mechanisms involved.
PSO 3	Knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development.
PSO 4	Pharmacologist will appraise the regulations and ethical requirement for the usage of experimental animals.
PSO 5	Pharmacologist will have fundamental knowledge on the structure and functions of cellular components and interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.
PSO 6	Pharmacologist will easily demonstrate the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases to the society.
PSO 7	Impart knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity.
PSO 8	Pharmacologist will make the student competent in drug discovery process.
PSO 9	A talent pool would be created by involving students in research projects and to make students undertake research projects under faculty guidance for publication.
PSO.10	Promote ambitious desire to undertake higher studies and career growth.
M: Pharmacy (Pharmaceutical Regulatory Affairs)	
PSO 1	Gain the respective background information, regulatory framework and necessary resources to understand how pharmaceutical products are regulated in different countries and how regulatory affairs professionals can help organizations navigate through regulatory obstacles.
PSO 2	Apply the relevant regulations, policies, guidance documents as well as important initiatives with respect to pharmaceuticals, biologicals, natural health products and various other therapeutic products.
PSO 3	The course also helps students to discuss on how regulatory affairs professionals add value to various organizations and opportunities available within the industry.
PSO 4	Students able to develop and enhance communication skills, including verbal, nonverbal and written which is essential in professional environments of regulatory affairs. Students learn proper writing, editing and comprehension strategies.
PSO 5	Students gain knowledge of project management processes and their application to regulatory submissions. This course equips students with skills necessary for global regulatory submissions, from selection of submission type to planning and preparing such submissions for review by respective regulatory agencies.
PSO 6	Students become familiar with the legislative framework and regulations that guide the selection and designation of medical products globally. Case studies are used to provide practical experience in applying international regulations and legislations, including EU and US. Students are also introduced to softwares commonly used in the regulatory affairs field.



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Course Outcomes (COs)
Of
B. Pharmacy





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Sl. No.	Course code	Course name	Course outcome statement
B. Pharmacy I year I Semester			
1	PS101	Human anatomy and Physiology-I (Theory)	<p>Upon completion of the course the student shall be able to</p> <p>CO.101 Illustrate the gross morphology, structure and functions of various organs of the human body at cell and tissue levels.</p> <p>CO.102 Identify the structures and functions of skin.</p> <p>CO.103 Discuss about the various bones and joints.</p> <p>CO.104 Categories the various homeostatic mechanism and diseases caused by their imbalance</p> <p>CO.105 Infer the knowledge about the gross morphology, structure and functions of nervous systems in the human body</p>
2	PS102	Pharmaceutical analysis I (Theory)	<p>Upon completion of the course the student shall be able to</p> <p>CO.106 Illustrate relevance & significance of Analytical Chemistry to Pharmaceutical sciences</p> <p>Clarify the basic principles of data treatment and data handling.</p> <p>CO.107 Explain the basic concepts and principles of aqueous acid base titrations and clarify need of non-aqueous acid base titrations.</p> <p>CO.108 Clarify the different terms, basic principles and reaction conditions of precipitation, Complexation and redox reaction.</p> <p>CO.109 Understand and concept of electro chemical methods.</p> <p>CO.110 Utilise the concept of oxidation and reduction in redox titrations</p>
3	PS103	Pharmaceutics - I (Theory)	<p>Upon completion of the course the student shall be able to</p> <p>CO.111 Understand the history of Pharmacy profession</p> <p>CO.112 Infer the knowledge of handling a prescription</p> <p>CO.113 Understanding the importance of different incompatibilities and possibilities of overcoming them</p> <p>CO.114 To know about preparation and evaluation of different dosage forms</p> <p>CO.115 Know about excipients used in different dosage forms</p> <p>CO.116 Examine the stability problems of biphasic I liquid dosage forms</p>





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4	PS104	Pharmaceutical inorganic chemistry – I (Theory)	Upon completion of the course the student shall be able to CO.117 Infer about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO.118 Understand principles and working procedures involved in limit tests for commonly observed impurities CO.119 Identify different anions, cations and different inorganic pharmaceuticals. CO.120 Find different types of inorganic pharmaceuticals and their analysis CO.211 Examine the medicinal and pharmaceutical importance of inorganic compounds
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5	HS105	Communication skills (Theory)	Upon completion of the course the student shall be able to CO.121 Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation CO.122 Communicate effectively (Verbal and Non-Verbal) CO.123 Explain Technical and Business Communication CO.124 Effectively manage the team as a team player CO.125 Utilize knowledge of various soft skills like Empathy, Negotiation skills etc. CO.126 Develop interview skills CO.127 Develop Leadership qualities and essentials
6	BS106	Remedial biology (Theory)	Upon completion of the course the student shall be able to CO.128 Cell biology (Basic Nature of Plant cell and Animal cell) CO.129 Classification System of both Plants & Animals CO.130 Various tissue system and organ system in plant and animals CO.131 Theory of evolution CO.132 Anatomy and Physiology of plants and animals
7	BS107	Remedial mathematics	Upon completion of the course the student shall be able to CO.133 Apply mathematical concepts and principles to perform computations for Pharmaceutical Sciences. CO.134 Create, use and analyze mathematical representations and mathematical relationships. CO.135 Communicate mathematical knowledge and understanding to help in the field of Clinical Pharmacy CO.136 Perform abstract mathematical reasoning



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8	PS108	Human Anatomy & Physiology-I Lab	On completion of the course student will able to CO.137 Understand the uses and application of compound microscope CO.138 Interpret the various tissues of human body under microscope CO.139 Identify the various bones of human body. CO.140 Infer the uses and application of hemocytometer. CO.141 Analyse the blood sample for blood group determination, bleeding time, clotting time, blood cells counting CO.142 Determine heart rate and Pulse rate, blood pressure measurement by prescribed methods
9	PS109	Pharmaceutical Analysis-I Lab	On completion of the course student will able to CO.143 Develop the ideas with the fundamentals of analytical chemistry among the pupil. CO.144 Construct the fundamental methodology to prepare different strength of solutions CO.145 Facilitates to predict the sources of mistakes, impurities and errors. CO.146 Develop the fundamentals of volumetric analytical skills CO.147 Speculates the basic knowledge in the principles of assays of compounds in volumetric analytical Techniques like precipitation, Neutralization, complexometric, Non aqueous and Redox Titration methods.
10	PS110	Pharmaceutics-I Lab	On completion of the course student will able to CO.148 Preparation of different dosage forms as per prescribed formulae and methods. CO.149 Fundamentals of basic liquid dosage forms CO.150 Discuss and perform the preparation, sieving and packing of powders CO.151 Develop various types of emulsions. CO.152 Preparation and evaluation of suppositories CO.153 Preparation and evaluation of ointments.
11	PS111	Pharmaceutical Inorganic Chemistry – I Lab	On completion of the course student will able to CO.154 Understand the preparation and purification of different inorganic compounds and compare their properties. CO.155 Analyse heavy metals by limit test and apply them in different pharmaceutical substance. CO.156 Analyse normality, molarity, molality and report them CO.157 Evaluate purity of samples using various analytical techniques. CO.158 Explain concepts related to awareness of hazards and their precautionary measures. CO.159 Apply practical skills acquired in quantitative analysis for future analysis of medicinal compounds.



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9	PS109	Pharmaceutical Analysis-I Lab	On completion of the course student will able to CO.143 Develop the ideas with the fundamentals of analytical chemistry among the pupil. CO.144 Construct the fundamental methodology to prepare different strength of solutions CO.145 Facilitates to predict the sources of mistakes, impurities and errors. CO.146 Develop the fundamentals of volumetric analytical skills CO.147 Speculates the basic knowledge in the principles of assays of compounds in volumetric analytical Techniques like precipitation, Neutralization, complexometric, Non aqueous and Redox Titration methods.
10	PS110	Pharmaceutics-I Lab	On completion of the course student will able to CO.148 Preparation of different dosage forms as per prescribed formulae and methods. CO.149 Fundamentals of basic liquid dosage forms CO.150 Discuss and perform the preparation, sieving and packing of powders CO.151 Develop various types of emulsions. CO.152 Preparation and evaluation of suppositories CO.153 Preparation and evaluation of ointments.
11	PS111	Pharmaceutical Inorganic Chemistry – I Lab	On completion of the course student will able to CO.154 Understand the preparation and purification of different inorganic compounds and compare their properties. CO.155 Analyse heavy metals by limit test and apply them in different pharmaceutical substance. CO.156 Analyse normality, molarity, molality and report them CO.157 Evaluate purity of samples using various analytical techniques. CO.158 Explain concepts related to awareness of hazards and their precautionary measures. CO.159 Apply practical skills acquired in quantitative analysis for future analysis of medicinal compounds.



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12	HS112	Communication skill – Lab	On completion of the course student will be able to CO.160 Apply communication skill to communicate verbally and nonverbally CO.161 Explain direct and indirect speech CO.162 Apply figure of speech in writing effectively CO.163 Develop interview skills CO.164 Remember etiquettes while composing an email CO.165 Design structure and plan a presentation
13	BS113	Remedial Biology – Lab	On completion of the course student will be able to CO.166 Understand the uses and application of compound microscope CO.167 Explain the different types of parts of plants and study about frog CO.168 Examine the various tissues of plants under microscope. CO.169 Identify the different type of bones in human body CO.170 Evaluate the blood sample for blood group determination. CO.171 Determine blood pressure and tidal volume.
B. Pharmacy I year II Semester			
14	PS201	Human anatomy and physiology-II (Theory)	Upon completion of the course the student shall be able to CO.201 Explain Basic fundamentals structural features of neurons, mechanism of neurotransmitters along with processes of neuroconduction and neurotransmission. CO.202 Clarify concepts and knowledge of anatomy, physiology & disorders of nervous system. CO.303 Identify the various organs of different systems of human body. CO.204 Explain concepts and knowledge of anatomy, physiology & disorders of respiratory system. CO.205 parts Explain and discuss knowledge of and urinary system and endocrine system involve in regulation of Bodyfunctions & how all of the human body contribute to the maintenance of homeostasis. CO.206 Describe organs involve in reproductive system, genetics, and aging process each contributes to the reproduction, growth and development of a human body.
15	PS202	Pharmaceutical organic chemistry – I (Theory)	Upon completion of the course the student shall be able to CO.207 Explain basic concepts and principles of organic chemistry and will be able to explain hybridization of atomic orbital of C, N, O CO.208 Assign IUPAC name and write structure of organic molecules of given IUPAC name containing diverse functional group CO.209 Recognize stereoisomers, assign configuration to stereoisomers and correlate the effect of intermolecular and intramolecular forces of attraction, on structure property relationship CO.210 Differentiate types of reactions, reagents, intermediate and types of reaction mechanism and recognize various factors that affect strengths of acids and bases CO.211 Memorize mechanism, stereochemistry of elimination reactions and describe mechanism of addition



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			reactions in alkenes, alkynes and summarize general methods of preparation of alkanes, alkenes and alkynes CO.212 Account for reactivity/stability of compounds,
16	BS203	Biochemistry (Theory)	Upon completion of the course the student shall be able to CO.213 To understand the importance of metabolism of substrates. CO.214 Will acquire chemistry and biological importance of biological macromolecules CO.215 Extend the knowledge of biochemical morphology to explain transport across biomembrane. CO.216 Illustrate and write the classification, structure, chemistry and biochemical role of different biomolecules like proteins, carbohydrates, lipids and vitamins. CO.217 Outline various metabolic pathways, their integration and significance. CO.218 Categorize nucleic acids; describe their chemistry, biochemical role and processes like replication, transcription, translation.
17	BS204	Pathophysiology (Theory)	Upon completion of the course the student shall be able to CO.219 Describe the etiology and pathogenesis of the selected disease states CO.220 Knowledge of signs and symptoms of the diseases CO.221 Identify the complications of the diseases. CO.222 Know most commonly encountered pathophysiological state(s) and/or disease mechanism(s), as well as any clinical testing requirements
18	CS205	Computer applications in pharmacy (Theory)	Upon completion of the course the student shall be able to CO.223 Understand different types of databases, applications of computers and databases in pharmacy CO.224 Illustrates the concept of number system in computers. CO.225 Make use of web technologies such as HTML, XML, CSS, programming languages, Web servers and pharmacy drug database. CO.226 Appraise the applications of computers in pharmacy such as drug information services, pharmacokinetics, mathematical model in drug design, hospital and clinical pharmacy etc.. CO.227 Explain about bioinformatics and its impact in vaccine discovery. CO.228 Elaborate the applications of computers for data analysis in preclinical development.
19	PS206	Human anatomy and physiology II Lab	Upon completion of the course the student shall be able to CO.229 Determine platelet count, reticulocytes count and osmotic fragility of blood sample CO.230 To identify the different bones of human skeleton and joints CO.231 Acquire the knowledge regarding health education in human life such as various devices of family planning and first aid



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20	PS207	Pharmaceutical organic chemistry I Lab	Upon completion of the course the student shall be able to CO.232 Identify/confirm the unknown organic compound CO.233 Knowledge about the naming reactions of carbonyl compounds CO.234 Demonstrate conduct of experiment effectively and safely in the organic chemistry laboratory CO.235 To perform common laboratory techniques including reflux, distillation, recrystallization, vacuum filtration, etc. CO.236 Apply laboratory skills to identify organic compound by qualitative analysis and synthesis of their derivatives containing diverse functional group CO.237 Synthesize different organic compounds and able to explain reaction mechanism behind the synthesis
21	BS208	Biochemistry Lab	Upon completion of the course the student shall be able to CO.238 Demonstrate laboratory skills to identify biomolecules by qualitative and quantitative tests. CO.239 To acquire knowledge in qualitative and quantitative estimation of the biological macromolecules. CO.340 To know the interpretation of data emanating from a Clinical Test Lab. CO.241 Isolate and identify biomolecules from various natural products. CO.242 Apply the gel electrophoresis as isolation technique.
22	CS209	Computer applications in pharmacy Lab	Upon completion of the course the student shall be able to CO.243 Demonstrate and make use of MS Office, MS Word, MS Excel, MS Access and MS Power point.. CO.244 Understand the paradigms of program languages and be exposed to at least one language from each model, C and SQL. CO.245 Summarize the report and printing the report from patient database CO.246 Design a questionnaire using a word processing package to gather information about a particular disease. CO.247 Create HTML web page to show personal information CO.248 Create mailing labels Using Label Wizard, generating label in MS WORD
B. Pharmacy II year I Semester			
23	PS301	Pharmaceutical Organic Chemistry – II (Theory)	Upon completion of the course the student shall be able to CO.3011 Basic knowledge regarding general methods of preparation of organic compounds. CO.302 Understand the reactions of some organic compounds. CO.303 To understand Reactivity of organic compounds. CO.304 Special emphasis on mechanisms and orientation of chemical reactions CO.305 To acquire knowledge in heterocyclic compounds CO.306 To acquire knowledge about the electrophilic and nucleophilic reactions.



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24	PS302	Physical Pharmaceutics – I (Theory)	Upon completion of the course the student shall be able to CO.307 Utilize the principles of gases state of matter and phase rule for formulation of stable aerosols and emulsions CO.308 Understand crystal habit, methods of crystal analysis and the importance of polymorphism in solubility and design of dosage forms. CO.309 Explain solubility, calculate molecular weight, understand distribution phenomenon and utilize them in understanding absorption of drugs. CO.310 Analyze the chemical stability tests of various drug products CO.311 Understand the laws of thermodynamics & concept of enthalpy. CO.312 Understand of physicochemical properties of drugs including solubility, distribution, adsorption, and stability.
25	BS303	Pharmaceutical Microbiology (Theory)	Upon completion of the course the student shall be able to CO.313 Acquire, articulate, retain and apply specialized language and knowledge relevant to microbiology. CO.314 Acquire and demonstrate competency in laboratory safety and in routine and specialized microbiological laboratory skills applicable to microbiological research or clinical methods, including accurately reporting observations and analysis. CO.315 Communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing.
26	PC304	Pharmaceutical Engineering (Theory)	Upon completion of the course the student shall be able to CO.316 Understand basic principles of industrial process involved in processing of drug and excipients. CO.317 Understand basic principles of process engineering and to develop new pharmaceutical process and modify existing one. CO.318 Apply basic principles of unit operations like crystallization, Drying, Distillation, Extraction, mass transfer, heat transfer etc. where it involves. CO.319 Apply advance modules as per the changing priorities and requirements of the modern pharmaceutical industries CO.320 Understand the fundamental principles and facts in pharmaceutical engineering about Unit operations CO.321 Understand the material handling techniques.
27	PS305	Pharmaceutical Organic Chemistry II Lab	Upon completion of the course the student shall be able to CO.322 Demonstrate laboratory skills to separate and identify the organic compounds from the given unknown binary organic compounds having different functional reactive groups (solid-solid binary mixture) CO.323 Demonstrate and explain techniques like column chromatography CO.324 Synthesize organic compounds based on molecular rearrangements

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28	PS306	Physical Pharmaceutics I Lab	Upon completion of the course the student shall be able to CO.325 Calculate Critical solution temperature, evaluate the effect of addition of electrolyte on Critical solution temperature of phenol -water system and construct ternary phase diagram for three component systems. CO.326 Calculate solubility of substance at different temperature, in different solvents, understand the effects of co-solvents on solubility and the importance of partition co-efficient required for preformulation studies. CO.327 Calculate the heat of solution for some components CO.328 Calculate and evaluate unknown concentration of electrolytes by conduct metric titrations
29	BS307	Pharmaceutical Microbiology Lab	Upon completion of the course the student shall be able to CO.329 Demonstrate isolation of and identification of microbes. CO.330 Acquire knowledge about validating the microbiological equipment and reporting the observations CO.331 Describe the applications of antibiotic assay, sterility testing of WFI & MIC (minimum inhibitory concentration)) in the field of pharmacy and emphasize their principles.
30	PC308	Pharmaceutical Engineering Lab	Upon completion of the course the student shall be able to CO.332 Perform various processes involved in pharmaceutical manufacturing process. CO.333 Appreciate and comprehend significance of plant lay out design for optimum CO.334 Appreciate the various preventive methods used for corrosion control in Pharmaceutical industries
B. Pharmacy II year II Semester			
31	PS401	Pharmaceutical Organic Chemistry - III (Theory)	Upon completion of the course the student shall be able to CO.401 Understand the basic principles of heterocyclic chemistry. CO.402 Draw the structures and synthesize simple pharmaceutically active organic compounds having five and six membered heterocyclic compounds. CO.403 Infer detailed mechanisms for common name reaction CO.404 Apply experimental techniques, procedures and safe laboratory practices with the application of theoretical knowledge CO.405 Identify Stereo-chemical features of drug molecules i.e optical geometric isomers CO.406 Apply the knowledge of medicinal value of heterocyclics in choosing pharmacophore design.
32	PC402	Physical pharmaceutics - II (Theory)	Upon completion of the course the student shall be able to CO.413 Describe the types of colloids and their characteristics. CO.414 Infer the rheological properties and order of reaction CO.415 Describe the concepts of physicochemical properties of drugs and understand their importance in designing

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			dosage formulation. CO.416 Compare the concepts and properties of suspensions and emulsions. CO.417 Evaluate the suitable method to determine the particle size of powders. CO.418 Understand the principles of chemical kinetics and utilize them for stability testing and to interpret the expiry date of all IS formulations.
33	PC403	Pharmacology – I (Theory)	Upon successful completion of the course, students will be able to: CO.419 Understand the basic concepts of Pharmacology like mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics). CO.420 Explain the principles and mechanisms of drug action at receptor levels (Pharmacodynamics). CO.421 Describe about the drug adverse effects, clinical uses, drug interactions and drug discovery. CO.422 Discuss the Pharmacological action, uses, adverse effects, interactions and mechanism actions of drugs acting on Peripheral nervous system and on their related disorders. CO.425 Understand the Pharmacological action, uses, adverse effects, interactions and mechanism action of drugs acting on Central nervous system and on their associated disorders. CO.426 Describe about the Pharmacological action, uses, adverse effects, interactions and mechanism action of Psychopharmacological agents related drugs and disease.
34	PC404	Pharmacognosy & Phytochemistry – I (Theory)	Upon successful completion of the course, students will be able to: CO.427 Describe meaning and significance of Pharmacognostic parameters of crude drugs. CO.428 Outline reason of evolutionary significance of secondary metabolites production in plants and other organism and deduce their significance as medicinal molecules. CO.429 Discriminate primary and secondary metabolites from their source and explain their industrial applications. CO.430 Explain definition, source, classification, chemical structure, uses, and summaries biosynthetic pathway of primary and secondary metabolites. CO.431 Illustrate methods of extraction and explain rationale behind qualitative and quantitative analysis of primary and secondary metabolites. CO.432 Develop skills for sectioning of plant material, staining, mounting and focusing; choose staining reagents required for specific part of plant. CO.433 Draw morphological and microscopical diagrams, label component and judge purity of crude drugs. CO.434 Assemble extraction apparatus, isolate single component and evaluate them by various chemical and physical parameters. CO.435 Operate various equipments as per SOPs and principle of experiments.



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35	PS405	Pharmaceutical Jurisprudence (Theory)	<p>Upon successful completion of the course, students will be able to:</p> <p>CO.813 Understand detailed study of various rules and regulations of import, manufacture and conditions for grant of license for manufacture of different categories of drugs and describes Schedules to act and rules of Drugs and Cosmetics Act 1940 and its rules 1945 in India.</p> <p>CO.814 Infers detailed study of various schedules of the D & C act. discuss rules and regulations of packing, label King and sale drugs and explains administration of Drugs and Cosmetics Act 1940 and its rules 1945 in India</p> <p>CO.815 Identify the importance of application of Pharmacy act 1948 for pharmacy education regulations and registration as pharmacist in India</p> <p>CO.816 Describes the role of Medicinal and toilet preparations act 1955 and Narcotic Drugs and Psychotropic substances Act-1985 and Rules in India to control misuse of alcohol and prevent drug addiction respectively.</p> <p>CO.817 Categories the prohibited advertisements as per drugs and magic remedies (objectionable advertisements) Act 1954, infers regulation of prevention of cruelty to animals act 1960.</p> <p>CO.818 Analyze the evolution of Drug legislation in India and importance of other acts like Medical Termination of Pregnancy Act. Right to Information Act and Intellectual Property Rights (IPR) and describes code of Pharmaceutical ethics and Pharmacist oath.</p>
36	PS406	Physical Pharmaceutics – 11 Lab	<p>Upon successful completion of the course, students will be able to:</p> <p>CO.1 Understand the pre formulation parameters-bulk density, true density and porosity of powders and working of Brookfield viscometer</p> <p>CO.444 Examine the flow properties of powders by angle of repose, carrs consolidation index and hausner's ration.</p> <p>CO.445 Identify the particle size distribution by sieving and microscopy method.</p> <p>CO.446 Analyse the stability by carrying out accelerated stability studies Interpret a suitable suspending agent based on sedimentation volume.</p> <p>CO.447 Calculate the viscosity of liquids by ostwalds viscometer and viscosity of semisolids by brookfield viscometer.</p> <p>CO.448 Find out reaction rate constant of first and second order constant by acid and alkaline hydrolysis.</p>
37	PS407	Pharmacology-I lab	<p>Upon successful completion of the course, students will be able to:</p> <p>CO.449 Learn the working of various equipments used in pharmacology.</p> <p>CO.450 Infer about the maintenance of animal laboratory according CPCSEA Guidelines.</p> <p>CO.451 Describe the methods of blood withdrawal, various drug administrations to various types of animals.</p> <p>CO.452 Apply simulated experiments to understand isolation of different organs/tissues from the laboratory animals.</p> <p>CO.453 Use simulated experiments to interpret the effect of drugs on animals.</p> <p>CO.454 Explain the various receptor actions using isolated tissue preparation</p>

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38	PC408	Pharmacognosy and Phytochemistry – I Lab	Upon successful completion of the course, students will be able to: CO.455 Understand the chemical identification some crude drugs by performing specific chemical test. CO.2 Calculate microscopically size of starch grains, fibres and calcium oxalate crystals by using eye piece micrometer. CO.456 Identify qualitative evaluation of physical parameters of crude drugs like moisture content, ash value and extractive value. CO.457 Apply microscopic determination for evaluation of vein islet number, vein termination, palisade ratio, stomatal number and index of crude drugs.
39	MC 400	Gender Sensitization Lab	Upon successful completion of the course, students will be able to: CO.436 Developed a better understanding of important issues related to gender in contemporary India. CO.436 Sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender CO.437 Grasp of how gender discrimination works in our society and how to counter it. CO.438 Acquire insight into the gendered division of labour and its relation to politics and economics.
40	PC408	Pharmacology – II Lab	Upon successful completion of the course, students will be able to: CO.449 Learn the working of various equipments used in pharmacology. CO.450 Infer about the maintenance of animal laboratory according CPCSEA Guidelines. CO.451 Describe the methods of blood withdrawal, various drug administrations to various types of animals. CO.452 Apply simulated experiments to understand isolation of different organs/tissues from the laboratory animals. CO.453 Use simulated experiments to interpret the effect of drugs on animals. CO.454 Explain the various receptor actions using isolated tissue preparation
B. Pharmacy III year I Semester			
41	PS501	Medicinal Chemistry – I (Theory)	Upon completion of the course the student shall be able to CO.407 Examine the relationship between various physicochemical properties of the drugs to their biological activity CO.408 Explain the significance of various biologically active scaffolds and their relation to biological activity. CO.409 Infer the synthetic schemes and reactions involved in the synthesis of various drugs. CO.410 Understand the concept of SAR and mechanism of action of various classes of drugs acting on ANS and CNS. CO.411 Apply the medicinal chemistry knowledge of various classes of drugs for Drug design CO.412 Identify structures of various antidotes in drug poisoning and their implications



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42	PS502	Industrial Pharmacy – I (Theory)	Upon successful completion of the course, students will be able to: CO.506 Interpret preformulation studies and its application in development of different dosage forms. CO.507 Understand the methods of preparation and evaluation of solid dosage forms. CO.508 Infer importance of parenterals and aerosols evaluation of its efficacy. CO.509 Compare the methods of preparation, analysis and evaluation of different cosmetics. CO.510 Apply the concept in selection of suitable packagene material for pharmaceutical products.
43	PS503	Pharmacology – II (Theory)	Upon successful completion of the course, students will be able to: CO.511 Students would have understood the mechanism of drug action and its relevance in the treatment of different diseases CO.512 They would be trained with isolation of different organs/tissues from the laboratory animals by simulated experiments CO.513 They would have observed the various receptor actions using isolated tissue preparation CO.514 Students would appreciate the correlation of pharmacology with related medical sciences CO.515 They would have understood the cell communication mechanism CO.516 They would appreciate the newer targets of several disease conditions for treatment CO.517 Explain OECD guidelines (425) for Acute oral toxicity. CO.518 Explain principles of bioassay, its types including advantages and disadvantages.
44	PS504	Pharmacognosy and Phytochemistry – II (Theory)	Upon successful completion of the course, students will be able to: CO.519 Differentiate underlying reason of evolutionary significance of alkaloids formation in plants and other organism and deduce their significance as medicinal molecules. CO.520 Explain definition, source, chemical structure, uses, and summaries biosynthetic pathway of alkaloids, terpenoids and resins. CO.521 Illustrate methods of extraction and explain rationale behind qualitative and quantitative analysis of alkaloids, terpenoids and resins. CO.522 Describe historical significance, contribution of alkaloids in modern drug discovery and currently marketed semisynthetic analogue. CO.523 Develop skills for sectioning of plant material, staining, mounting and focusing; choose staining reagents required for specific part of plant.
45	PS508	Cosmetic science (Theory)	Upon successful completion of the course, students will be able to: CO.524 Apply the steps of the cosmetic development process to be able to navigate the decision making required to formulate, manufacture and market a cosmetic product. CO.525 Utilize concepts of functional classes of raw materials in sourcing and selection of ingredients for synthetic, natural and organic cosmetic products. CO.526 Modify cosmetic formulations to achieve stable products with prescribed sensory properties.



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CO.527 Analyze a finished product against regulatory requirements to ensure compliance for sales and marketing in global jurisdictions.

CO.528 Summarize current literature of product components and packaging to communicate ethical, health and environmental concerns to relevant stakeholders.

CO.529 Construct an appropriate product evaluation strategy for claims substantiation, safety and shelf life documentation.

CO.530 Carry out the quantitative analysis of various medicinal compound
 CO.531 Understand various reactions for synthesis of medicinal compounds
 CO.532 Infer application of microwave technique in synthesizing medicinal compounds
 CO.533 Examine the usage of Chem draw software to draw structure and reactions of medicinal compound
 CO.534 Analyze various physicochemical properties of medicinal compounds

CO.826 Analyze different reformulation studies for various drugs.

CO.827 Prepare different solid dosage forms and evaluate their parameters.

CO.828 Understand coating process for granule and tablets.

CO.829 Prepare and analyze the quality of different parenteral dosage forms

CO.830 Prepare and evaluate different semisolid dosage form

CO.831 Describe different packing material for dosage form

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

CO.536 Learn about in-vitro pharmacological experiments and equipments used in pharmacology.

CO.537 Describe about the monitoring of blood pressure

CO.538 Perform bioassay of drugs like histamine, oxytocin, serotonin and acetylcholine

CO.539 Understand determination of PA2 and PD2 value of drug

CO.540 Use simulated experiments to understand the isolation of different organs/tissues from the laboratory animals

CO.541 Apply simulated experiments to interpret the effect of drugs in animals

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

CO.542 Analyze transverse sections and powdered samples of some important crude drugs and describes its microscopic characteristics

CO.543 Describe morphology and carries out extraction and detection of some important crude drugs.

CO.544 Infer and performs isolation active principles from respective natural sources and detects them.

CO.545 Apply paper chromatography for separation of sugars and developed TLC of herbal extract for detection of phytoconstituents

46	PS509	Medicinal Chemistry-I lab	CO.527 Analyze a finished product against regulatory requirements to ensure compliance for sales and marketing in global jurisdictions. CO.528 Summarize current literature of product components and packaging to communicate ethical, health and environmental concerns to relevant stakeholders. CO.529 Construct an appropriate product evaluation strategy for claims substantiation, safety and shelf life documentation.
47	PS510	Industrial Pharmacy - I Lab	CO.530 Carry out the quantitative analysis of various medicinal compound CO.531 Understand various reactions for synthesis of medicinal compounds CO.532 Infer application of microwave technique in synthesizing medicinal compounds CO.533 Examine the usage of Chem draw software to draw structure and reactions of medicinal compound CO.534 Analyze various physicochemical properties of medicinal compounds
48	PS511	Pharmacology - II Lab	CO.826 Analyze different reformulation studies for various drugs. CO.827 Prepare different solid dosage forms and evaluate their parameters. CO.828 Understand coating process for granule and tablets. CO.829 Prepare and analyze the quality of different parenteral dosage forms CO.830 Prepare and evaluate different semisolid dosage form CO.831 Describe different packing material for dosage form Upon successful completion of the course, students will be able to: CO.536 Learn about in-vitro pharmacological experiments and equipments used in pharmacology. CO.537 Describe about the monitoring of blood pressure CO.538 Perform bioassay of drugs like histamine, oxytocin, serotonin and acetylcholine CO.539 Understand determination of PA2 and PD2 value of drug CO.540 Use simulated experiments to understand the isolation of different organs/tissues from the laboratory animals
49	PS512	Pharmacognosy and Phytochemistry Lab	CO.541 Apply simulated experiments to interpret the effect of drugs in animals Upon successful completion of the course, students will be able to: CO.542 Analyze transverse sections and powdered samples of some important crude drugs and describes its microscopic characteristics CO.543 Describe morphology and carries out extraction and detection of some important crude drugs. CO.544 Infer and performs isolation active principles from respective natural sources and detects them. CO.545 Apply paper chromatography for separation of sugars and developed TLC of herbal extract for detection of phytoconstituents

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			CO.546 Evaluate TLC for detection of phytoconstituents Perform distillation of volatile oils. CO.547 Analyze some crude drugs for chemical identification by performing chemical tests.
50	MC500	Environmental sciences (Theory)	Upon successful completion of the course, students will be able to: CO.548 Extend basic knowledge on environment and its allied problems CO.549 Compare the natural, renewable and non renewable resources and the problems associated with them CO.550 Motivate the learners to participate in environment protection and improvement. CO.551 Analyze the concepts of eco system including structure and functions. CO.552 Adopt skills in identifying and solving environmental problems. CO.553 Develop an attitude of concern for the environment.
B. Pharmacy III year II Semester			
51	PS601	Medicinal chemistry – II (Theory)	Upon successful completion of the course, students will be able to: CO.501 Write the chemical synthesis of some drugs. CO.502 Know the structural activity relationship of different class of drugs. CO.503 Acquire knowledge about the mechanism pathways of different class of medicinal compounds. CO.504 Acquire knowledge about the chemotherapy for cancer. CO.505 Understand the chemistry of drugs with respect to their pharmacological activity.
52	PS602	Pharmacology – III (Theory)	Upon completion of this course the student should be able to: CO.605 Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases CO.606 Comprehend the principles of toxicology and treatment of various poisonings and appreciate correlation of pharmacology with related medical sciences.
53	PS603	Herbal Drug Technology (Theory)	Upon completion of this course the student should be able to: CO.607 Understand raw material as source of herbal drugs from cultivation to herbal drug product CO.608 Know the WHO and ICH guidelines for evaluation of herbal drugs CO.609 Know the herbal cosmetics, natural sweeteners, nutraceuticals CO.610 Appreciate patenting of herbal drugs, GMP.
54	PS604	Biopharmaceutics & Pharmacokinetics (Theory)	Upon completion of the course student shall be able to: CO.611 Understand the basic concepts in biopharmaceutics and pharmacokinetics. CO.622 Use plasma data and derive the pharmacokinetic parameters to describe the process of drug absorption, distribution, metabolism and elimination. CO.613 Critically evaluate biopharmaceutic studies involving drug product equivalency CO.614 Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters. CO.615 Detect potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them



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55	PS605	Pharmaceutical Quality Assurance (Theory)	Upon completion of the course student shall be able to: CO.616 Define the responsibilities of QA and QC departments CO.617 Understand the concept of quality management, evaluate the process of quality audit and review CO.618 Distinguish among the cGMP and GLP aspects in relevance to pharmaceutical industry CO.619 Interpret the process pertaining to various aspects of documentation organize validation parameters related to analytical methods CO.620 Demonstrate the scope of quality certifications applicable to pharmaceutical industries CO.621 Plan the significance of qualification and calibration procedure for various analytical instruments
56	MC600	Human Values and Professional Ethics (Theory)	Upon completion of the course student shall be able to: CO.622 Understand the importance of Values and Ethics in their personal lives and professional careers. CO.623 Know the rights and responsibilities as an employee, team member and a global citizen.
57	PS609	Medicinal Chemistry – II Lab	Upon completion of the course student shall be able to: CO.624 Carryout the quantitative analysis of various medicinal compound CO.625 Understand various reactions for synthesis of medicinal compound CO.626 Infer application of microwave technique in synthesizing medicinal compounds CO.627 Examine the usage of Chem draw software to draw structure and reactions of medicinal compound CO.628 Analyze various physicochemical properties of medicinal compounds
58	PS610	Pharmacology –III Lab	Upon completion of the course student shall be able to: CO.629 Understand about dose calculation in pharmacology experiments. CO.630 Identify the methods of inducing different diseases to various types of animals. CO.631 Use simulated experiments to understand isolation of different organs/tissues from the laboratory animals. CO.632 Describe about determination of acute skin and eye irritation/Corrosion of a test substances. CO.633 Apply simulated experiments to interpret the effect of drugs on animals. CO.634 Discuss the application of Biostatistics in various pharmacological experiments.
59	PS611	Herbal Drug Technology Lab	Upon completion of the course student shall be able to: CO.635 Examine crude drug sample by preliminary phytochemical screening CO.636 Calculate alcohol content of Asava and Arista CO.637 Produce herbal cosmetics and conventional herbal formulation by incorporating prepared and standardize extracts CO.638 Evaluate excipient of natural origin and analyze monograph of herbal drugs from recent pharmacopoeia CO.639 Calculate percentage of aldehyde, phenol and total alkaloid content in extract
60	PS612	BPPK Lab	Upon completion of the course student shall be able to: CO.832 Know the importance of pilot plant scaleup technique CO.833 Learn about technology development and transfer

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			CO.834 Know the application of regulatory affair. CO.835 Evaluate and know the importance or regulatory requirement for the new drug approval CO.836 Understand the importance of quality management system. CO.837 Know the importance of Indian regulatory requirements
B. Pharmacy IV year I Semester			
61	PS701	Instrumental Method of Analysis (Theory)	Upon completion of the course student shall be able to: CO.701 Apply, the principles, instrumentation involved in various analytical instrument, and their applications in Pharmaceutical industry and research. CO.702 Understand the aspects of separation for multi components. CO.703 Analysis drugs and excipients using various instrumentation techniques. CO.704 Make accurate analysis and report the results in defined formats. CO.705 Analyze test samples, Active Pharmaceutical Ingredients (APIs) and formulations using above instrument. CO.706 Process & interpret the data obtained through experimentation and report the results as per regulatory requirements.
62	PS702	Industrial Pharmacy – II (Theory)	Upon completion of the course student shall be able to: CO.707 Know the importance of pilot plant scaleup technique CO.708 Learn about technology development and transfer CO.709 Know the application of regulatory affair. CO.710 Evaluate and know the importance or regulatory requirement for the new drug approval CO.711 Understand the importance of quality management system. CO.712 Know the importance of Indian regulatory requirements.
63	PS703	Pharmacy Practice (Theory)	Upon completion of the course student shall be able to: CO.713 Know the various drug distribution methods in hospitals CO.714 Appreciate the pharmacy stores management and inventory control CO.715 Monitor the drug therapy of the patients through medication chart review and obtained medication history interview and counsel the patient CO.716 To identify and detect drug related problem and assess adverse drug reaction CO.717 Interpreted selected laboratory results CO.718 Describe patient counseling in community pharmacy and appreciate the concept of rational drug therapy.



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64	PS704	Medicinal chemistry – III (Theory)	Upon completion of the course student shall be able to CO.601 Understand the importance of drug design and different techniques of drug design. CO.602 Understand the chemistry of drugs with respect to their biological activity. CO.603 Know the metabolism, adverse effects and therapeutic value of drugs. CO.604 Know the importance of SAR of drugs
65	PS705	Pharmaceutical Marketing	CO.822 Upon completion of the course student shall be able to: CO.823 CO.824 Understand the Organizational Structure of a company. CO.825 Develop work habits and attitudes necessary for job success (technical competence, professional attitude, organization skills etc.)
66	PS709	Instrumental Method of Analysis Lab	Upon completion of the course student shall be able to: CO.731 Describes the assay of compounds by Spectroscopic methods. CO.732 Understand the assay of compounds by simultaneous methods. CO.733 Studies quenching of fluorescence. CO.734 Understand the Determination of alkaline earth metals by flame photometry. CO.735 Illustrates the Separation of compounds by chromatographic methods. CO.736 Explains the techniques like HPLC and Gas Chromatography.
67	PS710	Practice School	Upon completion of the course student shall be able to: CO.737 To design and describe the experimental procedures and evaluations. CO.738 To illustrate the principle involved in the drug discover process CO.739 To acquire the hands — on- training on the equipments used in the various drug development process and quality control. CO.740 To analyse the theoretical skills, compare and contrast with the practical technical skills. CO.741 To develop the practical skills so as to assess the problems encountered while working on the instruments
68	PS711	Industrial training	Upon completion of the course student shall be able to: CO.742 Understand the Organizational Structure of a company. CO.743 Develop work habits and attitudes necessary for job success (technical competence, professional attitude, organization skills etc.) CO.744 Develop written communication and technical report writing skills. CO.745 Develop knowledge of contemporary issues.
69	PS707	Pharmacovigilance (Theory)	Upon completion of the course student shall be able to: CO.725 Understand history and development of pharmacovigilance and understand drug safety monitoring scenario in India CO.726 Describe process of identification, reporting and assessment of new adverse drug reactions. CO.727 Find about different coding, terminologies and communications used in pharmacovigilance.

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			CO.728 Examine the methods to generate safety data during pre-clinical and specific populations like paediatrics, geriatrics, pregnancy and lactation CO.729 Identify the various guidelines like ICH and ICSR CO.730 Discuss about international guidelines like CIOMS.
			B. Pharmacy IV year II Semester
70	PS801	Biostatistics and Research Methodology (Theory)	Upon completion of the course student shall be able to: CO.801 Describe basics of biostatistics, measures of central tendency, measures of dispersion and correlation CO.802 Illustrates the regression methods and concept of probability. CO.803 Understands various techniques of analysis of variance (ANOVA) including parametric and nonparametric methods. CO.804 Introduce about research, types of graphs, design of research methodology. CO.805 Infer the concept of hypothesis testing and statistical softwares. CO.806 Explains about design and analysis of experiments
71	PS802	Social and Preventive Pharmacy (Theory)	Upon completion of the course student shall be able to: CO.807 Understands fundamentals of health and disease, sociology and hygienist. CO.808 Describes prevention and control of some infectious diseases CO.809 Create awareness on national health programs CO.810 Explain mother and child care, elderly health care and family welfare programs CO.811 Intervenes role of WHO in Indian nation programs CO.812 Illustrates community services in rural, urban and schools.
72	PS803	Novel Drug Delivery System (Theory)	Upon completion of the course student shall be able to: CO.719 Select appropriate drug candidates and calculate the dose for formulation of Modified Drug Release System. CO.720 Describe, classify and select appropriate Polymers for formulating modified release systems. CO.721 Describe merits, demerits, application, formulation and evaluation of Novel Drug Delivery Systems. CO.722 Explain manufacturing techniques, product evaluation and safety considerations of Therapeutic aerosols. CO.723 Explicate the merits, demerits, applications, formulation techniques and evaluation of Microcapsules. CO.724 Describe the basic concept of Optimization, factors, variables and apply it in design of experiments.
73	PS804	Computer Aided Drug Design (Theory)	Upon successful completion of the course, students will be able to: CO.819 Understanding how drugs function at the molecular level. CO.820 Understanding the relationships between physico-chemical properties of drugs and their biological activities. CO.821 Knowing how drugs interact with receptors of different kinds. Knowing the types of interactions between drugs and receptors.

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74	PS808	NDDS Lab	<p>Upon completion of the course student shall be able to:</p> <p>CO.840 Select appropriate drug candidates and calculate the dose for formulation of Modified Drug Release System.</p> <p>CO.841 Describe, classify and select appropriate Polymers for formulating modified release systems.</p> <p>CO.842 Describe merits, demerits, application, formulation and evaluation of Novel Drug Delivery Systems.</p> <p>CO.843 Explain manufacturing techniques, product evaluation and safety considerations of Therapeutic aerosols.</p> <p>CO.844 Explicate the merits, demerits, applications, formulation techniques and evaluations of Microcapsules.</p> <p>CO.845 Describe the basic concept of Optimization, factors, variables and apply it in design of experiments.</p>
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Sl. No.	Course code	Course name	Course outcomes statement
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PHARM. D.

Pharm.D. I Year			
1	1.1	Human Anatomy and Physiology (Theory)	<p>Upon completion of the course student shall be able to:</p> <p>CO.1.1.1 Describe the gross anatomy, morphology, structure and functions of various organs of human body at the cell and tissue level.</p> <p>CO.1.1.2 Categorize the various Hemopoietic mechanisms and their imbalance diseases.</p> <p>CO.1.1.3 Understand the gross morphology, structure and function of various systems in the human body.</p> <p>CO.1.1.4 Identify different types of family planning methods, devices and perform the pregnancy diagnosis test.</p> <p>CO.1.1.5 Appreciate coordinated working pattern of different organs of each system.</p> <p>CO.1.1.6 Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.</p>
2	1.2	Pharmaceutics (Theory)	<p>Upon completion of the course student shall be able to:</p> <p>CO.1.2.1 Understand the basic concepts of different dosage forms for formulating and dispensing.</p> <p>CO.1.2.2 Utilize the knowledge of pharmaceutical posology in dose solution of various dosage form.</p> <p>CO.1.2.3 Knowing the importance of pharmacy and different pharmacopoeias.</p> <p>CO.1.2.4 Explain the role of additives involved in development of various dosage forms.</p> <p>CO.1.2.5 Utilizing the applications of surgical instruments used in hospitals.</p> <p>CO.1.2.6 Analyze the instabilities in formulations and suggest suitable measures to overcome it.</p>

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Course Outcomes (COs) Of Pharm. D.





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74	PS808	NDDS Lab	Upon completion of the course student shall be able to: CO.840 Select appropriate drug candidates and calculate the dose for formulation of Modified Drug Release System. CO.841 Describe, classify and select appropriate Polymers for formulating modified release systems. CO.842 Describe merits, demerits, application, formulation and evaluation of Novel Drug Delivery Systems. CO.843 Explain manufacturing techniques, product evaluation and safety considerations of Therapeutic aerosols. CO.844 Explicate the merits, demerits, applications, formulation techniques and evaluation of Microcapsules. CO.845 Describe the basic concept of Optimization, factors, variables and apply it in design of experiments.
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Sl. No.	Course code	Course name	Course outcomes statement
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Pharm.D. I Year

1	1.1	Human Anatomy and Physiology (Theory)	Upon completion of the course student shall be able to: CO.1.1.1 Describe the gross anatomy, morphology, structure and functions of various organs of human body at the cell and tissue level. CO.1.1.2 Categorize the various Hemopoietic mechanisms and their imbalance diseases. CO.1.1.3 Understand the gross morphology, structure and function of various systems in the human body. CO.1.1.4 Identify different types of family planning methods, devices and perform the pregnancy diagnosis test CO.1.1.5 Appreciate coordinated working pattern of different organs of each system. CO.1.1.6 Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body
2	1.2	Pharmaceutics (Theory)	Upon completion of the course student shall be able to: CO.1.2.1 Understand the basic concepts of different dosage forms for formulating and dispensing. CO.1.2.2 Utilize the knowledge of pharmaceutical posology in dose solution of various dosage form CO.1.2.3 Knowing the importance of pharmacy and different pharmacopoeias. CO.1.2.4 Explain the role of additives involved in development of various dosage forms. CO.1.2.5 Utilizing the applications of surgical instruments used in hospitals. CO.1.2.6 Analyze the activities in formulations and suggest suitable measures to overcome it,



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3	1.3	Medicinal Biochemistry (Theory)	Upon completion of the course student shall be able to: CO.1.3.1 Describe cell and biochemical organization explain the role of enzymes involved in metabolic process of carbohydrates. Protein, amino acids by animals' models CO.1.3.2 Understand the metabolism and biological role of carbohydrates and lipids. CO.1.3.3 Discuss the coenzyme system involved in the biological oxidation and electron transport chain. CO.1.3.4 Analyse various organ functioning test. CO.1.3.5 Examining various electrolyte in body fluids by conducting biochemical test CO.1.3.6 Interpret various hormones, lipoproteins and protein levels in serum for better understanding the endocrine and various infectious disease.
4	1.4	Pharmaceutical Organic Chemistry (Theory)	Upon completion of the course student shall be able to CO.1.4.1 Give systematic names to simple organic compounds and poly functional group. CO.1.4.2 Achieve an understanding of the behavior of organic compounds and to establish a foundation for studies into natural and synthetic products of pharmaceutical interest. CO.1.4.3 Acquire the knowledge and understanding of the basic experimental principles of pharmaceutical organic chemistry. CO.1.4.4 Draw the structures and synthesize simple pharmaceutically active organic compounds. Describe detailed mechanisms for common reactions.
5	1.5	Pharmaceutical Inorganic Chemistry (Theory)	Upon completion of the course student shall be able to CO.1.5.1 Acquainted with the principles of limit tests. Understand the principles and procedures of analysis of drugs and also regarding the application of inorganic pharmaceutical. CO.1.5.2 Acquire knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals CO.1.5.3 Appreciate the importance of inorganic pharmaceuticals in preventing and curing the disease. CO.1.5.4 Know the analysis of the inorganic pharmaceuticals their applications.
6	1.6	Remedial Mathematics	Upon completion of the course student shall be able to CO.1.6.1 Apply mathematical concepts and principles to perform computations for Pharmaceutical Sciences. CO.1.6.2 Create, use and analyze mathematical representations and mathematical relationships CO.1.6.3 Communicate mathematical knowledge and understanding to help in the field of Clinical Pharmacy CO.1.6.4 Perform abstract mathematical reasoning

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7	1.7	Remedial Biology (Theory)	Upon completion of the course student shall be able to understand/learn CO.1.7.1 Cell biology (Basic Nature of Plant cell and Animal cell) CO.1.7.2 Classification System of both Plants & Animals CO.1.7.3 Various tissue system and organ system in plant and animals CO.1.7.4 Theory of evolution CO.1.7.5 Anatomy and Physiology of plants and animals
8	1.1	Pharmaceutics (Practical)	Upon completion of the course student shall be able to understand/learn CO.1.1.1P Review the basic requirements in compounding and dispensing of pharmaceutical products CO.1.1.2P Applying the knowledge of different techniques involved in preparation of drug products. CO.1.1.3P Examine the incompatibilities observed in pharmaceutical dosage forms. CO.1.1.4P Conduct the dose calculations for different aces. CO.1.1.5P Design of appropriate labels for dosage forms CO.1.1.6P Examine the formulas used in different pharmacopoeias in development of various pharmaceutical dosage forms.
9	1.2	Medicinal Biochemistry (Practical)	Upon completion of the course student shall be able to CO.1.2.1P Analyze quantitative and qualitative analysis of normal constituents in urine CO.1.2.2P Analyze quantitative and qualitative tests to normal constituents in blood. CO.1.2.3P Calculate the glucose levels in blood to identify diabetes mellitus CO.1.2.4P Correlate the results obtained from quantitative experiments with that of normal biochemical values CO.1.2.5P Examine lipids in blood. CO.1.2.6P Determine the electrolytes present in serum by using various diagnostic tests.
10	1.3	Pharmaceutical Organic Chemistry (Practical)	Upon completion of the course student shall be able to CO.1.3.1P Nomenclature of simple organic compounds in different classes and make 3D Stereo models to learn easily. CO.1.3.2P Determination of some important physical properties like m.pt, b.pt, solubility etc CO.1.3.3P Purification of Organic compounds CO.1.3.4P Synthesis of organic compounds and study about principles, reactions and mechanism. CO.1.3.5P Synthesis of organic compounds with named reactions and study about mechanisms. CO.1.3.6P Systematic qualitative analysis of some unknown organic compounds



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11	1.4	Pharmaceutical Inorganic Chemistry (Practical)	Upon completion of the course student shall be able to CO.1.4.1P Understand the principles and procedures for analysis of inorganic pharmaceuticals their applications CO.1.4.2P Explain different pharmaceutical buffers, their preparations and uses in pharmaceutical system CO.1.4.3P Understand the medicinal importance of inorganic pharmaceuticals CO.1.4.4P Having basic knowledge about various impurities in pharmaceuticals and also principles and methods of limit tests to control common impurities in pharmaceutical substances. CO.1.4.5P To highlight the domain of radiopharmaceuticals used in the diagnostics and therapy
12	1.5	Human Anatomy and Physiology (Practical)	Upon completion of the course student shall be able to understand/learn CO.1.5.1P Demonstrate the principle and working of various instruments used in HAP. CO.1.5.2P Identify of microscopical features of various types of cells and tissues CO.1.5.3P Identify gross anatomy and physiology of various bones. CO.1.5.4P Perform hematological tests and also record BP, heart rate & pulse CO.1.5.5P Appreciate coordinated working pattern of different organs of each system. CO.1.5.6P Explain the physiology of skeletal muscle contraction
13	1.7	Remedial biology (Practical)	Upon completion of the course student shall be able to understand/learn CO.1.7.1P Know about the kingdoms of plants, basic concepts and components of animal with reference to human and know about the basic concept, history and background with pharmacognosy CO.1.7.2P Recognize about the different cell inclusions, cell wall components and some secondary metabolite CO.1.7.3P To know anatomy and physiology of animals in reference to human beings CO.1.7.4P Distinguish about the different methods of adulteration of crude drugs CO.1.7.5P Perform hematological tests and also record BP, heart rate & pulse
Pharm. D. II Year			
14	2.1	Pathophysiology (Theory)	Upon completion of the course student shall be able to CO.2.1.1 Describe the etiology and pathogenesis of the selected disease states CO.2.1.2 Demonstrate a basic understanding of the concepts and elements of disease CO.2.1.3 Name the signs and symptoms of the diseases CO.2.1.4 Mention the complications of the diseases CO.2.1.5 Distinguish environmental factors, physical, psychosocial, and cognitive characteristics of various diseases and conditions. CO.2.1.6 Identify implications of therapeutic interventions for diseases and conditions. CO.2.1.7 Discuss common laboratory and diagnostic tests

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15	2.2	Pharmaceutical Microbiology (Theory)	Upon completion of the course student shall be able to CO.2.2.1 Understand the world of microbiology, identify the microorganism based on the morphology & structure and growth and nutritional requirements of the organism CO.2.2.2 Identify the microorganism based on staining techniques and biochemical reactions CO.2.2.3 Recognize the importance of sterilization and disinfectants process and aseptic conditions CO.2.2.4 Realize the role of immune system in keep individual healthy and identify the disease by performing various diagnostic tests CO.2.2.5 Describe how the microorganisms play a key role in assay of vitamins and antibiotics CO.2.2.6 Describe various diseases – etiology, pathology, diagnosis and treatment
16	2.3	Pharmacognosy & Phyto pharmaceuticals (Theory)	Upon completion of the course student shall be able to CO.2.3.1 Understand the basic principles of cultivation, collection and storage of crude drugs; CO.2.3.2 Know the source, active constituents and uses of crude drugs CO.2.3.3 Appreciate the applications of primary and secondary metabolites of the plant
17	2.4	Pharmacology - I (Theory)	Upon completion of the course student shall be able to CO.2.4.1 Define the basic terms of Medical Pharmacology CO.2.4.2 Select the appropriate dose and routes for drugs administration CO.2.4.3 Describe the pattern of absorption, distribution, metabolism and excretion of various drugs CO.2.4.4 Classify the drugs based on the mechanism of action and indications CO.2.4.5 Identify the types of adverse drug reactions, drug-drug interactions, food-drug interactions and contraindications CO.2.4.6 Apply the pharmacological knowledge in therapeutic aspects
18	2.5	Community Pharmacy (Theory)	Upon completion of the course student shall be able to CO.2.5.1 Provide patient-centered care to diverse patients using the best available evidence. CO.2.5.2 Educate patients through counseling and provide health screening services in public. CO.2.5.3 Identify symptoms of minor ailments and provide appropriate medication. CO.2.5.4 Exhibit code of ethics and ensure rational use of drugs in practice. CO.2.5.5 Participate in prevention programs of communicable diseases. CO.2.5.6 Demonstrate knowledge of the entrepreneurial and management skills in community pharmacies.
19	2.6	Pharmacotherapeutics-I (Theory)	Upon completion of the course student shall be able to CO.2.6.1 Describe the pathophysiology and management of cardiovascular, respiratory and endocrine diseases CO.2.6.2 Develop the patient case-based assessment Skills CO.2.6.3 Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases



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			CO.2.6.4 Develop clinical skills in the therapeutic management of these conditions CO.2.6.5 Continue to develop communication skills. CO.2.6.6 Students will provide patient – centered care to diverse patients using the evidence-based medicine
20	2.2	Pharmaceutical Microbiology (Practical)	Upon completion of the course student shall be able to CO.2.2.1P Know microorganism growth multiplication and their industrial usage. CO.2.2.2P Able to identify specific organism by using morphological, cultural and biochemical test CO.2.2.3P To validate the efficiency of sterilization techniques and disinfection procedures CO.2.2.4P To make the environment free of microorganism by aseptic techniques CO.2.2.5P Critically interpret all the assessment methods to validate the disinfection and sterilization
21	2.3	Pharmacognosy & Phyto pharmaceuticals (Practical)	Upon completion of the course student shall be able to CO.2.3.1P Understand the Pharmacognosy laboratory and experiments CO.2.3.2P Carry out the transverse section of plant parts to understand the arrangement of cells and tissues CO.2.3.3P Compare the tissue system and to understand the purity of the drugs CO.2.3.4P Carry out the chemical tests to determine the purity of drugs and to understand the nature of chemical constituents present CO.2.3.5P Know the different evaluation methods for the drugs
22	2.6	Pharmacotherapeutics-I (Practical)	Upon completion of the course student shall be able to CO.2.6.1P Describe the pathophysiology and management of cardiovascular, respiratory and endocrine diseases CO.2.6.2P Develop the patient case-based assessment Skills CO.2.6.3P Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of these diseases CO.2.6.4P Develop clinical skills in the therapeutic management of these conditions CO.2.6.5P Continue to develop communication skills. CO.2.6.6P Students will provide patient – centered care to diverse patients using the evidence-based medicine

Pharm.D. III Year





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23	3.1	Pharmacology - II (Theory)	Upon completion of the course student shall be able to CO.3.1.1 Identify and explain the pharmacodynamics and pharmacokinetic properties of drugs of various categories CO.3.1.2 Recognize the adverse effects of drugs CO.3.1.3 Avoid adverse drug reactions CO.3.1.4 Recognize indications of different drugs and avoid contraindications CO.3.1.5 Provide vital information to patients about drugs during patient counseling CO.3.1.6 Design & execute animal experiments to identify the pharmacological properties of known drugs and unknown samples.
24	3.2	Pharmaceutical Analysis (Theory)	Upon completion of the course student shall be able to CO.3.2.1 The importance of Quality in Pharmaceuticals. CO.3.2.2 The students will gain appropriate knowledge about appropriate analytical skills required for the analysis of API and formulations. CO.3.2.3 To understand the basic knowledge on assay of single and multiple component pharmaceuticals by using various analytical instruments CO.3.2.4 To develop basic practical skills using instrumentation techniques parameters
25	3.3	Pharmacotherapeutics - II (Theory)	Upon completion of the course student shall be able to CO.3.3.1 Students will be able to describe the pathophysiology and management of infectious, cancer, renal failure and diseases CO.3.3.2 Students will be developing Patient case based Assessment Skills CO.3.3.3 Students will be able to describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of diseases CO.3.3.4 Students will have developed clinical skills in the therapeutic management of these conditions. CO.3.3.5 Continue to develop communication skills. CO.3.3.6 Students will provide patient – centered care to diverse patients using the evidence based medicine
26	3.4	Pharmaceutical Jurisprudence (Theory)	Upon completion of the course student shall be able to CO.3.4.1 Define the concepts of the pharmaceutical legislation in India CO.3.4.2 Practice the professional ethics in pharmacy field and ethics involved in Prevention of Cruelty to animals CO.3.4.3 Define the concepts of Drug Policy, Drug Price Control Order, Patent and Design Act, Drugs and Magic Remedies Act CO.3.4.4 Critically interpret the various schedules involved the Drugs and Cosmetics Act, Narcotics and Psychotropic Substances Act CO.3.4.5 Apply the basic concepts of labeling and packaging of drugs

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27	3.5	Medicinal Chemistry (Theory)	CO.3.4.6 Define the concepts of Pharmacy Act, Medicinal and Toilet Preparation Act
28	3.6	Pharmaceutical Formulations (Theory)	Upon completion of the course student shall be able to CO.3.5.1 Helps in correlating between pharmacology of a disease and its mitigation or cure. CO.3.5.2 To understand the drug metabolic pathways, adverse effect and therapeutic value of drugs CO.3.5.3 To know the structural activity relationship of different class of drugs. CO.3.5.4 Well acquainted with the synthesis of some important class of drugs. CO.3.5.5 Knowledge about the mechanism pathways of different class of medicinal compounds. CO.3.5.6 To understand the chemistry of drugs with respect to their pharmacological activity.

29	3.1	Pharmacology (Practical)	II Upon completion of the subject student shall be able to CO.3.1.1P Define the basic concepts of experimental pharmacology. CO.3.1.2P Identify the commonly used laboratory animals and apparatus in pharmacology CO.3.1.3P Calculate the dose and decide the route of administration of drugs. CO.3.1.4P Design experiments to test the safety and efficacy of experimental drugs CO.3.1.5P Design and execute a bioassay to determine the potency of experimental drugs
30	3.2	Pharmaceutical Analysis (Practical)	Upon completion of the subject student shall be able to CO.3.2.1P To understand the construction and working of various analytical instruments CO.3.2.2P To know principle and mechanism of instrumentation CO.3.2.3P To understand the different modern techniques of drug analysis. CO.3.2.4P To appreciate the advantages of instrumental methods of drug analysis.

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31	3.3	Pharmacotherapeutics - II (Practical)	Upon completion of the subject student shall be able to CO.3.3.1P Writing the SOAP Note (Subjective, Objective, Assessment, Plan) for the given case. CO.3.3.2P Preparing Treatment Chart Review to ensure the appropriateness of medication orders. CO.3.3.3P Applying the Pharmacotherapeutic Treatment Guideline and its related knowledge to evaluate the health outcomes of treatment plan and services. CO.3.3.4P Critically evaluating and identifying the Drug Related Problems/ Adverse Drug Reactions and making appropriate therapeutic interventions. CO.3.3.5P Providing systematic Patient Education to the patient/caregivers on drug, disease and lifestyle related information's.
32	3.5	Medicinal Chemistry (Practical)	Upon completion of the subject student shall be able to CO.3.5.1P Nomenclature of simple organic compounds and make 3D Stereo models to learn easily. CO.3.5.2P Determination of some important physical properties like m.pt, b.pt, solubility, etc CO.3.5.3P Purification of Organic compounds CO.3.5.4P Synthesis of organic compounds and study about principles, reactions and mechanism. CO.3.5.5P Synthesis of organic compounds with named reactions and study about mechanisms. CO.3.5.6P Systemic qualitative analysis of some unknown organic compounds
33	3.6	Pharmaceutical Formulations (Practical)	Upon completion of the subject student shall be able to CO.3.6.1P Understand the principle involved in formulation of various pharmaceutical dosage forms; CO.3.6.2P Understand the practical aspects of various formulations including the cosmetics. CO.3.6.3P Perform evaluation of pharmaceutical dosage forms; and CO.3.6.4P Understand and appreciate the various calculations related to dosage forms/formulation development CO.3.6.5P Understand the choice the right equipment for various dosage forms
34	4.1	Pharmacotherapeutics - III (Theory)	Pharm.D. IV Year Upon completion of the subject student shall be able to CO.4.1.1 Understand pathophysiology of selected disease states and the rationale for drug therapy CO.4.1.2 Understand therapeutic approach to management of these diseases; CO.4.1.3 Understand the controversies in drug therapy; CO.4.1.4 Know the importance of preparation of individualised therapeutic plans based on diagnosis; CO.4.1.4 Identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time course of clinical and laboratory indices of therapeutic response and adverse effects)



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35	4.2	Hospital Pharmacy (Theory)	Upon completion of the subject student shall be able to CO.4.2.1 Know various drug distribution methods; CO.4.2.2 Know the professional practice management skills in hospital pharmacies; CO.4.2.3 Provide unbiased drug information to the doctors; CO.4.2.4 Know the manufacturing practices of various Formulations in hospital set up; CO.4.2.5 Appreciate the practice based research methods; CO.4.2.6 Appreciate the stores management and inventory control.
36	4.3	Clinical Pharmacy (Theory)	Upon completion of the subject student shall be able to CO.4.3.1 Monitor drug therapy of patient through medication chart review and clinical review; CO.4.3.2 Obtain medication history interview and counsel the patients; CO.4.3.3 Identify and resolve drug related problems; CO.4.3.4 Detect, assess and monitor adverse drug reaction; CO.4.3.5 Interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states; CO.4.3.6 Retrieve, analyze, interpret and formulate drug or medicine information.
37	4.4	Biostatistics & Research Methodology (Theory)	Upon completion of the subject student shall be able to CO.4.4.1 Know the various statistical methods to solve different types of problems CO.4.4.2 Operate various statistical software packages CO.4.4.3 Appreciate the importance of Computer in hospital and Community Pharmacy CO.4.4.4 Appreciate the statistical technique in solving the pharmaceutical problems
38	4.5	Biopharmaceutics & Pharmacokinetics (Theory)	Upon completion of the subject student shall be able to CO.4.5.1 Broader understanding about the concepts of biopharmaceutics and pharmacokinetics. CO.4.5.2 Ability to calculate the various pharmacokinetic parameters by using various mathematical models. CO.4.5.3 Ability to design a basic protocol for the conduct of BA/BE study and the interpretation of the BA/BE data CO.4.5.4 Preparedness to use the concepts of pharmacokinetic principles in the clinical contexts. CO.4.5.5 Ability to design and perform in-vitro dissolution studies for various drugs as per the standards of official monographs CO.4.5.6 Basic understanding about the concepts of in-vitro - in-vivo correlations (IVIVC)
39	4.6	Clinical Toxicology (Theory)	Upon completion of the subject student shall be able to CO.4.6.1 Developing general working knowledge of the principles and practice of clinical toxicology CO.4.6.2 Demonstrating an understanding of the health implications of toxic exposures and commonly involved chemicals for toxicity CO.4.6.3 Demonstrating and applying an understanding of general toxicology principles and clinical management practice

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			CO.4.4.4 Demonstrating and applying an understanding of the history, assessment, and therapy considerations associated with the management of a toxic exposure CO.4.4.5 Demonstrating and apply an understanding of the characteristics of and treatment guidelines for specific toxic substances CO.4.4.6 Proposing several preventive approaches to reduce unintentional poisonings CO.4.4.7 Enabling the pharmacist to function as contributing health care team member when faced with a toxic exposure experience, including emergencies.
40	4.1	Pharmacotherapeutics - III (Practical)	Upon completion of the subject student shall be able to CO.4.1.1P Describe the pathophysiology and management of cardiovascular, respiratory and endocrine diseases CO.4.1.2P Develop the patient case-based assessment Skills CO.4.1.3P Describe the quality use of medicines issues surrounding the therapeutic agents in the treatment of diseases CO.4.1.4P Develop clinical skills in the therapeutic management of these conditions CO.4.1.5P Continue to develop communication skills. CO.4.1.6P Students will provide patient – centered care to diverse patients using the evidence-based medicine
41	4.2	Hospital Pharmacy (Practical)	Upon completion of the subject student shall be able to CO.4.2.1P Define the basic concepts in Hospital pharmacy CO.4.2.2P Critically interpret and apply Inventory control methods CO.4.2.3P Execute professional responsibilities of hospital pharmacist and identify drug related problems CO.4.2.4P Provide professional services like patient counseling and technical inputs for parenteral nutritional support CO.4.2.5P Execute the activities related to hospital formulary and pharmacy and therapeutics committee CO.4.2.6P Able to manufacture common pharmaceutical formulations within Hospital setup
42	4.3	Clinical Pharmacy (Practical)	Upon completion of the subject student shall be able to CO.4.3.1P Define the role of clinical pharmacist at various healthcare settings CO.4.3.2P Monitor drug therapy of the patient through medication chart review and clinical review CO.4.3.3P Conduct the medication history interview and counsel the patients CO.4.3.4P Detect, assess and monitor adverse drug reactions (ADR) CO.4.3.5P Interpret-selected laboratory results (as monitoring parameters) of specific disease states CO.4.3.6P Provide drug / poison information services by retrieving, analyzing, interpreting and formulate drug and medicine information by utilizing various databases and softwares.



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43	4.5	Biopharmaceutics & Pharmacokinetics (Practical)	<p>Upon completion of the subject student shall be able to</p> <p>CO.4.5.1P Define the basic concepts in biopharmaceutics and pharmacokinetics</p> <p>CO.4.5.2P Critically interpret biopharmaceutic studies including drug product equivalency</p> <p>CO.4.5.3P Use raw data and derive the pharmacokinetic models and parameters that best describe the process of drug absorption, distribution, metabolism and excretion</p> <p>CO.4.5.4P Design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters</p> <p>CO.4.5.5P Identify potential clinical pharmacokinetic problems and apply basic pharmacokinetic principles to solve them</p> <p>CO.4.5.6P Use software for various pharmacokinetic data analysis</p>
Pharm.D. V Year			
44	5.1	Clinical Research	<p>Upon completion of the subject student shall be able to</p> <p>CO.5.1.1 Understanding of basic concepts of drug development process what it is, how it differs from standard care and why it is undertaken. Demonstrate the competencies of clinical research designs and the regulatory approval process.</p> <p>CO.5.1.2 Familiarize with the various regulatory documents and the guidelines and to evaluate critical domestic and global regulatory and health care implications on the product development.</p> <p>CO.5.1.3 Effectively assess and manage ethical aspects of conduct of clinical trial.</p> <p>CO.5.1.4 Familiarize with the roles and responsibilities of the personnel involved in conduct of clinical research to ensure the quality research is undertaken</p>
45	5.2	Pharmacoepidemiology & Pharmacoeconomics (Theory)	<p>Upon completion of the subject student shall be able to</p> <p>CO.5.2.1 Identify the applications of pharmacoepidemiology and pharmacoeconomics in clinical settings</p> <p>CO.5.2.2 Discuss the various pharmacoepidemiological outcome measures</p> <p>CO.5.2.3 Describe the concept of risk in pharmacoepidemiology and different methods of measuring risk</p> <p>CO.5.2.4 Explain the various pharmacoepidemiological methods</p> <p>CO.5.2.5 Explain the sources of data for pharmacoepidemiological studies</p> <p>CO.5.2.6 Discuss the methods to measure outcomes in pharmacoeconomic studies</p> <p>CO.5.2.7 Describe the current pharmacoeconomic evaluation methods</p> <p>CO.5.2.8 Software used in Pharmacoepidemiology and Pharmacoeconomics Analysis.</p>
46	5.3	Clinical Pharmacokinetics & Pharmacotherapeutic Drug Monitoring	<p>Upon completion of the subject student shall be able to</p> <p>CO.5.3.1 Design the dosage regimen for the given drug based on the pharmacokinetic principles and route of administration</p> <p>CO.5.3.2 Individualize the dosage regimen for the patients with altered pharmacokinetics viz. renal / hepatic impairment, pediatric, elderly, etc.</p>



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	(Theory)	CO.5.3.3 Intervene the potential drug-drug interactions in a given case with appropriate recommendations for dosage adjustments CO.5.5.4 Associate the genetic polymorphisms of the patients, if any with the clinical outcomes of the patients CO.5.3.5 Formulate protocol(s) for the therapeutic drug monitoring of drug(s) and initiate the service in collaboration with other healthcare team members CO.5.3.6 Interpret the results of therapeutic drug monitoring services of various drugs and give required recommendations for the dosage adjustment of those drugs, if required towards optimizing the treatment outcome
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Sl. No.	Course code	Course name	Course outcomes statement
PHARMACOLOGY			
I YEAR I Semester			
1	Professional Core-I	Advanced Pharmacology – I	Upon completion of the course the student shall be able to: <ul style="list-style-type: none">• Discuss the pathophysiology and pharmacotherapy of certain diseases• Explain the mechanism of drug actions at cellular and molecular level• Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases



Course Outcomes (COs)
of
M. Pharmacy



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	(Theory)	CO.5.3.3 Intervene the potential drug-drug interactions in a given case with appropriate recommendations for dosage adjustments CO.5.5.4 Associate the genetic polymorphisms of the patients, if any with the clinical outcomes of the patients CO.5.3.5 Formulate protocol(s) for the therapeutic drug monitoring of drug(s) and initiate the service in collaboration with other healthcare team members CO.5.3.6 Interpret the results of therapeutic drug monitoring services of various drugs and give required recommendations for the dosage adjustment of those drugs, if required towards optimizing the treatment outcome
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Sl. No.	Course code	Course name	Course outcomes statement
PHARMACOLOGY			
I YEAR I Semester			
1	Professional Core-1	Advanced Pharmacology - I	Upon completion of the course the student shall be able to: <ul style="list-style-type: none">• Discuss the pathophysiology and pharmacotherapy of certain diseases• Explain the mechanism of drug actions at cellular and molecular level• Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

Applying Micos





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2	Professional Core-II	Clinical Pharmacology and Pharmacotherapeutics	<p>Upon completion of the course the student shall be able to understand</p> <ul style="list-style-type: none"> • the pathophysiology of selected disease states and the rationale for drug therapy; • the controversies in drug therapy; • the importance of preparation of individualised therapeutic plans based on diagnosis; • needs to identify the patient-specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects); • summarize the therapeutic approach to management of these diseases including reference to the latest available evidence; • Therapy (including alternatives, time-course of clinical and laboratory indices of therapeutic response and adverse effects); • Pathophysiology and applied Pharmacotherapeutics of diseases associated with following system/diseases with of special reference to the drug of choice.
3	Professional Elective-I	Clinical Research and Pharmacovigilance	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Explain the regulatory requirements for conducting clinical trial • Demonstrate the types of clinical trial designs • Explain the responsibilities of key players involved in clinical trials • Execute safety monitoring, reporting and close-out activities • Explain the principles of Pharmacovigilance • Detect new adverse drug reactions and their assessment • Perform the adverse drug reaction reporting systems and communication in pharmacovigilance
4	Professional Elective-II	Principles of Toxicology	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Explain the various toxicologies • Explain various toxicologies of lungs, liver, genic etc • Appreciate the importance and mechanism of skin and reproductive toxicology • Explain various mechanisms and affects of pesticides
5		Research Methodology & IPR	<p>Upon completion of the course, the student shall be able to, Understand research problem formulation.</p> <ul style="list-style-type: none"> • Analyze research related information • Follow research ethics • Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular

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			<ul style="list-style-type: none"> • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits
6	Laboratory-I	Advanced Pharmacology - I Lab	<ul style="list-style-type: none"> • Upon completion of the course, the student shall be able to, • Know various routes of drug administration • Learn techniques of blood sampling, anesthesia and euthanasia of experimental animals • Learn bioassay of Ach using isolated ileum/rectus abdominis muscle preparation by interpolation method, three point method and four point method.
7	Laboratory-II	Clinical Pharmacology and Pharmacotherapeutics Lab	<ul style="list-style-type: none"> • Upon completion of the course, the student shall be able to, • Know the rational use of medicines in special population • Learn Calculation of Bioavailability and Bioequivalence • Learn Interpretation Therapeutic Drug Monitoring reports of a patient • Know the calculation of various Pharmacoeconomic outcome analysis
I YEAR II Semester			
8	Professional Core-III	Advanced Pharmacology - II	<ul style="list-style-type: none"> • Upon completion of the course the student shall be able to: • Explain the mechanism of drug actions at cellular and molecular level • Discuss the Pathophysiology and pharmacotherapy of certain diseases • Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases
9	Professional Core-IV	Pharmacological Screening Methods and Toxicology	<ul style="list-style-type: none"> • Upon completion of the course the student shall be able to, • Appraise the regulations and ethical requirement for the usage of experimental animals. • Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals • Describe the various newer screening methods involved in the drug discovery process • Appreciate and correlate the preclinical data to humans
10	Professional Elective-III	Pharmaco epidemiology and Pharmacoeconomics	<ul style="list-style-type: none"> • Upon completion of this course it is expected that students shall be able to: • Understand the various epidemiological methods and their applications • Understand the fundamental principles of Pharmacoeconomics. • Identify and determine relevant cost and consequences associated with pharmacy products and services. • Perform the key Pharmacoeconomics analysis methods • Understand the Pharmacoeconomic decision analysis methods and its applications. • Describe current Pharmacoeconomic methods and issues.

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			<ul style="list-style-type: none"> Understand the applications of Pharmacoeconomics to various pharmacy settings.
11	Professional Elective-IV	Pharmaceutical Management	<p>Upon completion of this course it is expected that students shall be able to:</p> <ul style="list-style-type: none"> Know how to manage a Pharma industry and its various departments viz QA, QC, RA, Production etc. Develop leadership qualities, communication & interpersonal skills, decisions making, motivation, organization & various managerial functions & professional skills required for a dynamic professional. Understand the concept of managerial control, its levels & role, importance in pharma industry
12	Laboratory-III	Advanced Pharmacology – II Lab	<p>Upon completion of this course it is expected that students shall be able to:</p> <ul style="list-style-type: none"> Record the dose response curve of Histamine using isolated guinea-pig ileum preparation Know bioassay of Histamine using isolated guinea-pig ileum preparation by interpolation method, three point method, four point method
13	Laboratory-IV	Pharmacological Screening Methods and Toxicology lab	<p>Upon completion of this course it is expected that students shall be able to evaluate</p> <ul style="list-style-type: none"> Analgesic property of drug using analgesimeter Anti-inflammatory effect of drugs using rat-paw edema method Anticonvulsant activity of drugs using maximal electroshock and pentylenetetrazole methods. Antidepressant activity of drugs using pole climbing apparatus and pentobarbitone induced sleeping time methods Cardiotonic activity of drugs using isolated frog heart and mammalian heart preparations.
II YEAR I Semester			
14	Professional Elective-V	Hospital and Community Pharmacy	<p>Upon completion of this course it is expected that students shall be able to:</p> <ul style="list-style-type: none"> Understand the organizational structure of hospital pharmacy Understand drug policy and drug committees Know about parenteral drug distribution practices Know the structures of retail pharmaceuticals Understand the community pharmacy management Know about value added services in community pharmacies
15	Open Elective	Pharmaceutical Administration	<p>Upon completion of this course it is expected that students shall be able to:</p> <p>Possess interpersonal skills such as the ability to empathize and establish relationships with patients, the public and other professionals and ability to work well as part of a team.</p>



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- Known about the art of time management and organizational skills; the ability to critically evaluate data and commercial awareness.
- Know numeracy and computation; problem-solving skills and the ability to think clearly and methodically and information technology

PHARMACEUTICS

I YEAR I Semester

16	Professional Core-I	Modern Pharmaceutics-I	<ul style="list-style-type: none"> Upon completion of this course it is expected that students shall be able to: • Explain the preformulation parameters, apply ICH guidelines and evaluate drug, drug excipients compatibility. Explain about formulation and development, use of excipients in tablets, powders, capsules, micro-encapsules and coating techniques. They also learn and apply the statistical design in different formulations.
17	Professional Core-II	Applied Biopharmaceutics and Pharmacokinetics	<ul style="list-style-type: none"> Upon completion of this course it is expected that students shall be able to: • Tell factors affecting the bioavailability and stability of dosage form; they also know the bioequivalence studies and protocols for bioequivalent studies. • Know the parameters for the disposition, absorption and Michaelis-Menton constants for nonlinear kinetics
18	Professional Elective-I	Total Quality Management	<ul style="list-style-type: none"> Upon completion of this course it is expected that students shall be able to: • Learn the established regulatory guidelines in GMP, GCP, GLP, USFDA, WHO, ISO etc to become a perfect budding pharmacist. • Acquire vast knowledge regarding the quality control aspects of different regulatory bodies as per their requirements throughout the world.
19	Professional Elective-II	Stability of Drugs and Dosage Forms	<ul style="list-style-type: none"> Upon completion of this course it is expected that students shall be able to: • Describe the evaluation of stability of solutions, solids and formulations against adverse conditions. • Suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.
20		Research Methodology & IPR	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Understand research problem formulation. • Analyze research related information • Follow research ethics • Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social

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21	Laboratory- I	Modern Pharmaceutics - I Lab	<p>benefits</p> <p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Learn preformulation studies of solid dosage forms. • Know the effect of compressional force on tablet disintegration time • Learn effect of particle size on dissolution of tablets • Learn determination of first order, second order rate constants by acid and alkaline hydrolysis
22	Laboratory- II	Applied Biopharmaceutics and Pharmacokinetics Lab	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Know evaluation of drug-protein binding analysis • Learn calculation of Urinary Pharmacokinetics, Bioavailability and Bioequivalence Studies
I YEAR II Semester			
23	Professional Core-III	Modern Pharmaceutics - II	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Understand the planning of pilot plant techniques used for all pharmaceutical dosage forms such as tablets, capsules, parenterals, aerosols, cosmetics and neutraceuticals.
24	Professional Core-IV	Advanced Drug Delivery Systems	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Select the drugs for CDDs design of the formulation fabrication of systems of above drug delivery systems with relevant applications.
25	Professional Elective-III	Industrial Pharmacy	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Explain the machinery involved in milling, mixing, filtration, drying and packing material constructions used in the production of pharmaceutical materials. • Learn salient features of GMP, TQM applicable in industry. • Understand the effluent treatments and prevent the pollution. They also should evaluate the validation of analytical methods and processes
26	Professional Elective-IV	Nano based Drug Delivery Systems	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases



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27	Laboratory-III	Modern Pharmaceutics – II Lab	Upon completion of the course, the student shall be able to, • Know preparation and evaluation of different creams, lotion • Know preparation and evaluation Film coated tablets, Floating tablets, Fast dissolving tablets and Chewable tablets
28	Laboratory-IV	Advanced Drug Delivery System Lab	Upon completion of the course, the student shall be able to, • Know formulation and evaluation of sustained release oral matrix tablet, sustained release oral reservoir system, microspheres / microen capsules, transdermal films, mucoadhesive system and enteric coated pellets / tablets
29	Professional Elective-V	Scale up and Technology Transfer	Upon completion of the course, the student shall be able to, • Manage the scale up process in pharmaceutical industry. • Assist in technology transfer. • To establish safety guidelines, which prevent industrial hazards
30	Open Elective	Entrepreneurship and management	Upon completion of the course, the student shall be able to, • Sell themselves and their ideas, Students master oral and visual presentation skills and establish a foundation of confidence in the skills necessary to cause others to act. • Find problems worth solving. Students advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world problems and projects. • Mobilize people and resources. Students identify and secure customers, stakeholders, and team members through networks, primary customer research, and competitive and industry analyses in order to prioritize and pursue an initial target market in real-world projects. • Create value. Students are able to create presentations and business plans that articulate and apply financial, operational, organizational, market, and sales knowledge to identify paths to value creation through 1) company formation (for-profit); 2) social innovation (nonprofit); or 3) intellectual property licensing. • Develop and cultivate endurance. Students increase their awareness and deliberately practice the skills and disciplines necessary to increase confidence and agency; foster self-efficacy and self-advocacy; improve communication and problem-solving skills; manage strong impulses and feelings; and identify personal purpose.
PHARMACEUTICAL ANALYSIS			
1ST YEAR I Semester			
31	Professional Core-I	Modern Pharmaceutical Analytical Techniques	Upon completion of the course, the student shall be able to, • Apply the theories in the Analysis of various bulk drugs and their formulations. • Be in a position to apply their knowledge in developing the new methods for the determination and validate the procedures.



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32	Professional Core-II	Pharmaceutical and Food Analysis	<p>Upon completion of the course, the student shall be able to understand various analytical techniques in the determination of</p> <ul style="list-style-type: none"> • Food constituents • Food additives • Finished food products • Pesticides in food • Pharmaceuticals (API & Dosage forms) • And also student shall have the knowledge on food regulations and legislations
33	Professional Elective-I	Advanced Pharmaceutical Analysis	<p>Upon completion of the course, the student shall be able to</p> <ul style="list-style-type: none"> • Understand the quantitative determination of various organic compounds. • Learn the spectral analysis, dissolution parameters and microbial assays.
34	Professional Elective-II	Stability of Drugs and Dosage forms	<p>Upon completion of the course, the student shall be able to</p> <ul style="list-style-type: none"> • Describe the evaluation of stability of solutions, solids and formulations against adverse conditions. • Suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.
35	Research Methodology & IPR		<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Understand research problem formulation. • Analyze research related information • Follow research ethics • Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits
36	Laboratory-I	Modern Pharmaceutical Analytical Techniques lab	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> • Know Calibration of glassware, pipette, meter, UV-Visible spectrophotometer, FTIR spectrophotometer and HPLC instrument • Learn simultaneous estimation of multi component containing formulations by UV spectrophotometry • Learn incompatibility studies, identification and functional groups – Determination by FTIR



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37	Laboratory-II	Pharmaceutical and food Analysis Lab	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Know the determination of total reducing sugar and proteins Learn determination of saponification value, Iodine value, Peroxide value, Acid value, fat content and rancidity in food products
I YEAR II Semester			
38	Professional Core-III	Advanced Instrumental Analysis I	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Know various spectral aspects of X-Ray, IR, SEM, ORD etc which help them in further projects works and also industrial opportunities.
39	Professional Core-IV	Pharmaceutical Quality control and Quality Assurance	<ul style="list-style-type: none"> Upon completion of the course student shall be able to: Define the responsibilities of QA and QC departments Understand the concept of quality management, evaluate the process of quality audit and review Distinguish among the GMP and GLP aspects in relevance to pharmaceutical industry Interpret the process pertaining to various aspects of documentation organize validation parameters related to analytical methods Demonstrate the scope of quality certifications applicable to pharmaceutical industries Plan the significance of qualification and calibration procedure for various analytical instruments
40	Professional Elective-III	Modern Bio-analytical Techniques	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to understand Extraction of drugs from biological samples Separation of drugs from biological samples using different techniques Guidelines for BA/BE studies
41	Professional Elective-IV	Advanced Instrumental Analysis - II	<ul style="list-style-type: none"> Upon completion of the subject student shall be able to Know various electrochemical methods, fluorimetry, AAS, RIA, ELISA etc. which help them in further projects works and also industrial opportunities
42		Research Methodology & IPR	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Understand research problem formulation. Analyze research related information Follow research ethics Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept and creativity. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits



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43	Laboratory-III	Advanced Instrumental Analysis I Lab	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Determine chlorides and sulphates by Nephelo – Turbidity Test percentage of purity of official compounds by potentiometric and conduct metric titrations Determine compounds of sodium, potassium and calcium by Flame photometry. Estimate riboflavin/quinine sulphate by fluorimetry
44	Laboratory-IV	Pharmaceutical Quality control and Quality Assurance	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Separate biomolecules molecules utilizing various sample preparation techniques Analyze quantitatively components by gel electrophoresis and HPLC techniques. Know protocol preparation and performance of bioanalytical method validation Extract drugs and metabolites from biological matrices by SPE/LLE
II YEAR I Semester			
45	Professional Elective-V	Scale up and Technology Transfer	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Manage the scale up process in pharmaceutical industry. Assist in technology transfer. To establish safety guidelines, which prevent industrial hazards.
46	Open Elective	Entrepreneurships and management	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, Sell themselves and their ideas. Students master oral and visual presentation skills and establish a foundation of confidence in the skills necessary to cause others to act.
PHARMACEUTICAL REGULATORY AFFAIRS			
I YEAR I Semester			
47	Professional Core-I	Good Regulatory Practice	<ul style="list-style-type: none"> At completion of this course it is expected that students will be able to understand The key regulatory and compliance elements with respect to Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices and Good Documentation Practices. Prepare and implement the check lists and SOPs for various Good Regulatory Practices. Implement Good Regulatory Practices in the Healthcare and related Industries. Prepare for the readiness and conduct of audits and inspections.
48	Professional Core-II	Drug Regulatory Affairs	<ul style="list-style-type: none"> Know the different competent regulatory authorities globally. Aware of technical aspects pertaining to the marketing authorization application (MAA)

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49	Professional Elective-I	Total Quality Management	<ul style="list-style-type: none"> Upon completion of this course it is expected that students shall be able to: • Learn the established regulatory guidelines in GMP, GCP, GLP, USFDA, WHO, ISO etc to become a perfect budding pharmacist. • Acquire vast knowledge regarding the quality control aspects of different regulatory bodies as per their requirements throughout the world.
50	Professional Elective-II	Stability of Drugs and Dosage forms	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to • Describe the evaluation of stability of solutions, solids and formulations against adverse conditions. • Suggest the measures to retain stability and storage conditions for retaining the efficacy of the products.
51		Research Methodology & IPR	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to, • Understand research problem formulation. • Analyze research related information • Follow research ethics
52	Laboratory- I	Regulatory Practice and Documentation Lab	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to • Prepare SOPs, Analytical reports (Stability and validation) • Know protocol preparation for documentation of various types of records (BMR, MFR, DR) • Know preparation of regulatory dossier as per Indian CTD format and submission in SUGAM
53	Laboratory- II	Drug Regulation and Registration Lab	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to • Know GMP Audit Requirements as per CDSCO • Learn preparation of checklist for registration of IND, NDA and ANDA as per ICH CTD format. • Learn preparation of submission to FDA, EMA and MHRA using eCTD software
I YEAR II Semester			
54	Professional Core-IV	Regulatory aspects of medical devices	<ul style="list-style-type: none"> Upon completion of the course, the student shall be able to know; • Basics of medical devices and IVDs, process of development, ethical and quality considerations. • Harmonization initiatives for approval and marketing of medical devices and IVDs. • Regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN. • Clinical evaluation and investigation of medical devices and IVDs.
55	Professional Core-III	Regulatory aspects of herbals and biologicals	<ul style="list-style-type: none"> Upon the completion of the course the student shall be able to : • Know the regulatory Requirements for Biologics and Vaccines • Understand the regulation for newly developed biologics and biosimilars • Know the pre-clinical and clinical development considerations of biologics • Understand the Regulatory Requirements of Blood and/or Its Components Including Blood Products and label requirements

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56	Professional Elective-III	Nano based Drug delivery systems	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> Select the right kind of materials, able to develop nano formulations with appropriate technologies, evaluate the product related test and for identified diseases
57	Professional Elective-IV	Advanced Drug Delivery Systems	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> Select the drugs for CDDS design of the formulation fabrication of systems of above drug delivery systems with relevant applications.
58	Research Methodology & IPR		<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> Understand research problem formulation. Analyze research related information Follow research ethics Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits
59	Laboratory-III	Regulatory aspects of herbals and biologicals Lab	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> Know preparation of Biologics License Applications Prepare documents required for Vaccine Product Approval Know document required for the approval of herbal products of diverse dosage forms(3products) as per regulations requirements Learn registration requirement comparison study in emerging markets and preparing check list for market authorization
60	Laboratory-IV	Regulatory aspects of medical devices Lab	<p>Upon completion of the course, the student shall be able to,</p> <ul style="list-style-type: none"> Know clinical investigation plan for medical devices Learn preparation and submission of medical devices for approval Learn GMP of manufacturing of medical devices of diverse nature Know preparation and submission of nutraceuticals devices for approval

II YEAR I Semester

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61	Professional Elective-V	Scale up and Technology Transfer	Upon completion of the course, the student shall be able to, Manage the scale up process in pharmaceutical industry. <ul style="list-style-type: none">• Assist in technology transfer.• To establish safety guidelines, which prevent industrial hazards.
62	Open Elective	Entrepreneurships and management	Upon completion of the course, the student shall be able to, <ul style="list-style-type: none">• Sell themselves and their ideas. Students master oral and visual presentation skills and establish a foundation of confidence in the skills necessary to cause others to act.• Find problems worth solving. Students advance their skills in customer development, customer validation, competitive analysis, and iteration while utilizing design thinking and process tools to evaluate in real-world



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