Chalapathi Institute of Pharmaceutical Sciences

(Autonomous)

Guntur

ACADEMIC RULES & REGULATIONS

(w.e.f. 2016-2017)

B.Pharmacy

(Semester System)

Chalapathi Institute of Pharmaceutical Sciences

(A U T O N O M O U S)

Accredited by NAAC with "A" Grade, Approved by AICTE, PCI, New Delhi,
Recognized by Department of Technical Education, Govt. of Andhra Pradesh,
Recognized by DSIR for Scientific and Industrial Research,
UGC Under Section 2(f) & 12 B,Chalapathi Nagar, Guntur, Andhra Pradesh,
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I N D E X

CHALAPATHI INSTITUTE OF PHARMACEUTICAL SCIENCES

(AUTONOMOUS)

VISION

To inculcate excellence in various fields of pharmacy, mould the institution as centre of excellence in terms of academics and advanced research.

MISSION

Committed to impart quality pharmacy education and research to meet global standards

QUALITY POLICY

Chalapathi Institute of pharmaceutical sciences is committed to impart quality pharmacy education to the growing needs of the society by implementing quality management system on a continual contact basis and continually improved services.

We shall protect the interest of our students and prepare them to meet growing challenges with increased ability to serve the nation and society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)	
PEO1	**Proficiency:** Programme encompasses the students with profound functional knowledge in core subjects of pharmaceutical sciences like pharmaceutical chemistry, pharmaceutical analysis, pharmaceutics, pharmacognosy, pharmacology and pharmacy practice. This enables students to be competent enough and apply these tools in pharmaceutical and health care industries, research / clinical laboratories, hospitals and community pharmacies for overall maintenance of public health.
PEO2	**Practicability (Practical aptitude) :** Implementation of innovative teaching learning methodologies with visual aids / computer aided tools empowers the students in understanding the concepts with clarity and transparency. Students are trained in handling sophisticated equipment and in their troubleshooting procedures, problem based learning which makes them to apply the learned theoretical concepts to real time applications and meet the current pharmaceutical industrial demand.
PEO3	**Lifelong learner (Liaisons) :** To develop globally accepted competent students in terms of punctuality, amicability, communication skills and self learning. Students are encouraged to participate in class room seminars, group discussions, exhibitions, quizzes, conferences, symposia, seminars, workshops and health care programs. This enables the students with specific hard skills, capable of understanding the most advanced technologies, research and can integrate this knowledge and skills with contemporary needs of the society.
PEO4	**Collaborator :** To inculcate collective learning, knowledge sharing and knowledge transfer through their involvement in interdisciplinary research activities and to improve leadership, team work and managerial skills which helps them to play influential roles either in an organisation or in community.
PEO5	**Professionalism :** To promote the development of scholarly thinking, professional identity and ethics among the students for their further professional growth either in the pharmaceutical and health care industries or to pursue higher studies and research.

PROGRAM OUTCOMES (PO'S) OF BACHELOR OF PHARMACY	
PO1	**Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioural, social, and administrative pharmacy sciences; and manufacturing practices.
PO2	**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.
PO3	**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.
PO4	**Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO5	**Leadership skills:** Understand and consider the human reaction to change, motivation, issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO6	**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).
PO7	**Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour 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.
PO8	**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.
PO9	**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.
PO10	**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.
PO11	**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.

I / IV B.PHARMACY 1st SEMESTER

COURSE OUTCOMES: (w.e.f. 2016 EAMCET BATCH)

Course Name :	Pharmaceutics - I (Theory),
Year of Study :	2016-17 First Year, First Semester
Course code :	CB101T
C101.1	To understand about pharmacy profession and pharmacopoeia.
C101.2	To summarize liquid dosage forms for internal use and external administration.
C101.3	To learn the pharmaceutical calculations and packaging materials.
C101.4	To elaborate the formulation and manufacturing methods of suppositories.
C101.5	To apply the principles of extraction in galenical preparations.
C101.6	To adapt and maximize the knowledge on powders, granules and semi solid dosage forms.
Course Name :	Pharmaceutical Chemistry – I [Organic – I] (Theory)
Year of Study :	2016-17 First Year, First Semester
Course code :	CB102T
C102.1	To recall the knowledge on fundamental principles of organic chemistry.
C102.2	To illustrate the structure, properties of atom and nomenclature of organic compounds.
C102.3	To build the knowledge on relation between electronic structure and chemical properties of organic compounds.
C102.4	To examine the different preparation methods, stability, essential reaction, properties and mechanisms of different organic compounds.
C102.5	To distinguish different substitution and elimination reactions, stereochemistry and identification of organic compounds.
C102.6	To elaborate different named reactions, their mechanisms and applications of organic compounds.

Course Name	**:**	Human Anatomy and Physiology – I (Theory)
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB103T

C103.1	To recognize the various homeostatic mechanisms, basic anatomical terms and cellular level organization.
C103.2	To summarize the characteristics of different types of tissues and their location in various organs.
C103.3	To organize the structure and functions of various sensory organs, bones and joints of human body.
C103.4	To analyze the anatomy of respiratory system and respiration process.
C103.5	To assess the physiology of digestion and organs of digestive system.
C103.6	To predict the functions of kidney and to maximize importance of fluid compartments, acid base balance and electrolytes.

Course Name	**:**	Computer Applications (Theory)
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB104T

C104.1	To recall the fundamentals and classification of computers.
C104.2	To describe operating systems, DOS, UNIX, WINDOWS, data handling and power point presentations.
C104.3	To understand the basics of internet and networking.
C104.4	To perceive types and operators, statements and applications of ‘C’ language.
C104.5	To deduce branching, decision making and looping statements.
C104.6	To elaborate the various applications of ‘C’ language.

Course Name :	Integrated Grammar and Communication skills (Theory)
Year of Study :	2016-17 First Year, First Semester
Course code :	CB105T
C105.1	To understand the importance of communication, barriers of communication and qualities of a good speaker/listener.
C105.2	To explain the need of human refinement, daily communication, self analyzing and evaluation skills and elements of discipline.
C105.3	To apply the skills of integrated grammar in daily communication.
C105.4	To explore vocabulary boosters and the usage of a good dictionary.
C105.5	To develop presentation skills, reading, writing, listening and storytelling skills.
Course Name :	Mathematics (Theory)
Year of Study :	2016-17 First Year, First Semester
Course code :	CB106T
C106.1	To understand the applications of mathematics in pharmacy.
C106.2	To demonstrate the need of algebra and analytical geometry in pharmaceutical sciences.
C106.3	To build up the ability to perform calculus, differential calculus and trigonometry.
C106.4	To assess the importance of intergral calculus in pharmaceutical sciences.
C106.5	To build the ability to use differential equations in solving pharmsceutical problems.

Course Name	**:**	Biology (Theory)
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB106T

C106.1	To understand the cell structure, cellular inclusions and the process of mitosis and meiosis in animals.
C106.2	To classify plants, animal kingdom and to understand the physiology of plants.
C106.3	To acquire the knowledge of taxonomic characteristics of plants belong to leguminosae, umbelliferaceae, solanaceae and rutaceae.
C106.4	To analyze morphology and functions of various plant parts such as root stem, leaf, fruit, flower and pollination.
C106.5	To determine the life cycle of animal parasite that can cause infection to human beings.
C106.6	To elaborate the anatomy and physiology of frog.

Course Name	**:**	Pharmaceutics – I (Practical)
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB107P

C107.1	To recall the aspects of pharmaceutical calculations and metrology.
C107.2	To know how to refer official pharmacopoeia.
C107.3	To understand and apply the principles and procedures in compounding, dispensing of monophasic and biphasic liquid dosage forms.
C107.4	To perform the preparation of dusting powder, oral rehydration salt, effervescent granules and tinctures.
C107.5	To prepare and evaluate suppositories and ointments.
C107.6	To perform evaluation tests for packaging materials.

Course Name :	Pharmaceutical Chemistry – I [Organic – I] (Practical)
Year of Study :	2016-17 First Year, First Semester
Course code :	CB108P
C108.1	To explain different laboratory safety guidelines, apparatus and glassware used in pharmaceutical chemistry laboratory.
C108.2	To illustrate different molecular models, structures and determination of their physical constituents.
C108.3	To apply the knowledge in the preparation techniques and or methods, principles, mechanisms and preliminary qualitative analysis of organic compounds.
C108.4	To purify the different synthesized compounds.
C108.5	To experiment with systematic qualitative analysis of mono functional group organic compounds.
Course Name :	Human Anatomy and Physiology-I (Practical)
Year of Study :	2016-17 First Year, First Semester
Course code :	CB109P
C109.1	To outline the usage of compound microscope.
C109.2	To classify various tissues based on their characteristics by observing them under microscope.
C109.3	To develop the basic knowledge on the coordinated working of organs of various systems with the help of various models, charts and specimens.
C109.4	To categorize the physiology of special senses with the help of models, charts and specimens.
C109.5	To determine the tidal volume and vital capacity.
C109.6	To compile the histology of tissues and physiology of renal system by using physio Ex software.

Course Name	**:**	Computer Applications (Practical)
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB110P

C110.1	To recollect the fundamentals of computer and practice typing tutor.
C110.2	To describe properties of desktop and how to use DOS commands.
C110.3	To apply internal, external DOS commands and explain Microsoft word and excel.
C110.4	To create and apply different layouts of Microsoft word and excel.
C110.5	To deduce simple statements, expressions, looping structures and data types using 'C' language.
C110.6	To explain various applications of internet.

Course Name	**:**	Biology (Practical)
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB111P

C111.1	To understand basic experiments in biology.
C111.2	To perform macroscopical evaluation of various plant parts.
C111.3	To describe the histological characters of monocot and dicot plants.
C111.4	To analyze the plant taxonomy based macroscopy and microscopy findings.
C111.5	To assess the physiology of frog by using prodissector frog software.
C111.6	To improve knowledge on identification of various animal specimens.

Course Name	**:**	Assignments
Year of Study	**:**	2016-17 First Year, First Semester
Course code	**:**	CB112

C112.1	To understand the moto behind writing an assignment.
C112.2	To build the ability comprehensive search for the information.
C112.3	To make use of grammar and comprehension skill in writing an assignment.
C112.4	To appraise the skill of writing an assignment logically in an order
C112.5	To develop the ability to write references in scientific formats.

I / IV B.PHARMACY 2nd SEMESTER

Course Name :	Pharmaceutical Analysis – I (Theory)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB201T
C201.1	To gain knowledge on principles of glassware calibration, standardization and stochiometric calculations involved in pharmaceutical analysis.
C201.2	To understand the concepts of errors, limit tests and various types qualitative and quantitative analysis of drugs.
C201.3	To make use of various types of titrations indicators and gravimetric analysis.
C201.4	To perform experiments as per GLP, and understand the principles of Gasometry.
C201.5	To estimate and characterize the drugs and pharmaceuticals by using different methods like moisture content and alcohol content.
C201.6	To elaborate theory and importance of electro chemical techniques.
Course Name :	Physical Pharmacy – I (Theory)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB202T
C202.1	To know the molecular interactions, properties of different states of matter and physical transformation of pure substance.
C202.2	To describe the various physical properties of drug molecules and their determination.
C202.3	To understand the basic principles of thermodynamics and macroscopic description of physical systems.
C202.4	To compare and contrast the colligative properties of electrolytic solutions and concentrated solutions of non electrolytes.
C202.5	To describe the concepts of acid base equilibria, buffers and their importance in pharmaceutical systems.
C202.6	To explain electromotive forces and concepts of photochemistry.

Course Name	**:**	Human Anatomy and Physiology – II (Theory)
Year of Study	**:**	2016-17 First Year, Second Semester
Course code	**:**	CB203T

C203.1	To relate the basic knowledge about the central nervous system including nervous tissue, brain, spinal cord and spinal/cranial nerves.
C203.2	To illustrate the concepts of neurotransmitters, receptors, sensory and integrative systems.
C203.3	To identify the importance of blood, lymphatic system and immunity in human body.
C203.4	To analyze the anatomy and physiology of heart and blood vessels.
C203.5	To appraise the essentiality of endocrine glands and their hormones.
C203.6	To predict the physiology of male and female reproductive organs and the basics of genetics.

Course Name	**:**	Pharmaceutical Chemistry – II [Inorganic] (Theory)
Year of Study	**:**	2016-17 First Year, Second Semester
Course code	**:**	CB204T

C204.1	To recall the sources, types of impurities and limit tests as per Pharmacopoeia
C204.2	To explain the concepts of buffers, major extra and intra cellular electrolytes, dental products and their method of preparation
C204.3	To apply the knowledge of gastrointestinal agents like acidifiers, antacids, cathartics and their method of preparation
C204.4	To classify antimicrobial agents and study the mechanism of action, assay and uses of selected compounds
C204.5	To explain the classification, method of preparation, assay and medicinal uses of selected expectorants, emetics, haematinics, antidotes and astringents
C204.6	To discuss the measurement of radioactivity, storage conditions, precautions and applications of radioisotopes

Course Name :	Professional ethics and human values (Theory)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB205T
C205.1	To remember and recall the human values and professional ethics.
C205.2	To outline the ethical norms, anti corruption measures and central vigilance bodies.
C205.3	To apply moral concepts and reasoning in pharmacy.
C205.4	To discover ethical issues in clinical pharmacy practice and manufacturing of pharmaceutical products.
C205.5	To appraise professional societies and various pharmaceutical associations.
C205.6	To adapt social pharmacy and code of pharmaceutical ethics.
Course Name :	Soft Skills (Theory)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB206T
C206.1	To explain the importance of human, cultural values and self evaluation and principles of discipline.
C206.2	To develop positive attitude, respecting elders and be active and disciplined I college activities.
C206.3	To construct the abilities of letter writing, email etiquettes, obey and follow principles and team discipline.
C206.4	To improve interpersonal skills, body language, and communication skills.
C206.5	To analyze the skills of decision making, negotiation, time management, mentoring and to develop leadership skills.
C206.6	To build up the skills of creative thinking.

Course Name :	Pharmaceutical Analysis – I (Practical)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB207P
C207.1	To explain the principles and importance of calibration of apparatus and standardization.
C207.2	To understand the practical concepts of preparation of standard solutions and reagents to perform various analysis.
C207.3	To perform various types of titrations, tests for purity, and identify the limits of impurities by limit tests.
C207.4	To evaluate and identify the prepared pharmaceutical compounds and to perform limit tests.
C207.5	Estimation of drugs and formulations by using different electro chemical methods.
C207.6	To establish the importance of significant figures and computation of analytical results.
Course Name :	Physical Pharmacy – I (Practical)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB208P
C208.1	To know the calibration of specific gravity bottle and determine density, viscosity of liquids.
C208.2	To find out surface tension and interfacial tension of liquids by drop number method and drop weight methods.
C208.3	To describe the construction of phase diagram of phenol-water system and find out effect of addition of sodium chloride / ethanol to phenol-water system.
C208.4	To compute cryoscopic constant of camphor and molecular weight by camphor-rast method.
C208.5	To estimate pKa of acids, buffer capacity, electromotive force by various methods.
C208.6	To determine various physicochemical properties of drug molecules.

Course Name :	Human Anatomy and Physiology – II (Practical)
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB209P
C209.1	To find out heart rate, pulse rate, blood pressure, BMI and blood grouping.
C209.2	To identify the bleeding time, clotting time and Hb% in human blood
C209.3	To analyze the formed elements in human blood.
C209.4	To evaluate the effect of posture and muscle exercise on human blood pressure.
C209.5	To assess the function of blood.
Course Name :	Assignments
Year of Study :	2016-17 First Year, Second Semester
Course code :	CB210
C210.1	To understand the moto behind writing an assignment.
C210.2	To build the ability comprehensive search for the information.
C210.3	To make use of grammar and comprehension skill in writing an assignment.
C210.4	To appraise the skill of writing an assignment logically in an order
C210.5	To develop the ability to write references in scientific formats.

II / IV B.PHARMACY 3rd SEMESTER

Course Name : Pharmaceutical Chemistry - III (Theory)

Year of Study : 2017-18 Second Year, Third Semester

Course code : CB301T

C301.1	To define the nomenclature, preparation, reactions and uses of heterocyclic compounds.
C301.2	To explain the rules of aromaticity, preparation methods and reactions of organic compounds.
C301.3	To utilize the various techniques, reagents and study their applications in organic synthesis.
C301.4	To categorize medicinal compounds based on their structure, medicinal uses and inter conversions of organic compounds.
C301.5	To explain the concept of stereochemistry and various named reactions.
C301.6	To create interest in polynuclear aromatic hydrocarbons and named reactions.

Course Name: Pharmaceutical Microbiology (Theory)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB302T

C302.1	To remember the scope of microbiology and its branches, methods of classification, basic principles of microscopy, sterilization and antimicrobial activity.
C302.2	To understand the importance and implementation of sterilization in pharmaceutical processing and industry, identification of microbes.
C302.3	To utilize the know ledge in identification, cultivation and preservation of various microorganisms and sterility testing of products.
C302.4	To test for the microbiological standardization of pharmaceuticals, microbial characterization and clean area classification.
C302.5	To choose the cell culture technology for microbial growth and to evaluate the efficiency of preservatives.
C302.6	To compile the microbiological testing protocols, factors effecting microbial spoilage and to formulate microbiologically stable formulatios.

Course Name: Physical Pharmacy - II (Theory)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB303T

C303.1	To illustrate the significance of physical properties such as solubility. Partition coefficient, surface tension in the design of dosage forms.
C303.2	To classify complexes and summarize the factors affecting complexation.
C303.3	To explain various drug degradation pathways and methods of stabilization.
C303.4	To measure surface and interfacial tension of liquids.
C303.5	To assess physical stability of colloidal and coarse dispersions.
C303.6	To elaborate the rheological considerations of coarse dispersions and powders.

Course Name: Pharmaceutical Jurisprudence (Theory)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB304T

C304.1	To remember the code of ethics of pharmacist and Pharmaceutical legislations.
C304.2	To describe the Drugs and cosmetics act 1940 and Drugs and cosmetic rules 1945.
C304.3	To explain the pharmacy act 1948 and legislations related to medicinal and toilet preparations.
C304.4	To elaborate the legislations pertaining to narcotic drugs and psychotropic substances, objectionable advertisement and termination of pregnancy.
C304.5	To discuss the legislations to control price of bulk drugs and formulations.
C304.6	To explain legislations relating to Intellectual property rights, prevention of cruelty to animals and right to information.

Course Name: Environmental Sciences (Theory)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB305T

C305.1	To describe the scope, importance and development of environmental indicators.
C305.2	To compare various environmental and natural resources.
C305.3	To explain the characteristic features, structure and functions of ecosystem
C305.4	To categorize the local, global issues and different sources of environmental pollution.
C305.5	To develop knowledge on biodiversity and in conservation to improve the global environment.
C305.6	To discuss the importance and conservation methods of water resourses.

Course Name: Pharmaceutical Chemistry–II (Practical)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB306P

C306.1	To recall the IUPAC nomenclature rules and numbering of heterocyclics.
C306.2	To explain the principles involved in the preparation of organic compounds and application of reagents.
C306.3	To build the knowledge on preliminary qualitative analysis, bromination and condensation reactions of organic compounds.
C306.4	To analyze different named reactions, applications and stereochemistry of organic compounds.
C306.5	To assess different synthetic techniques and methods used in the preparation of organic compounds.
C306.6	To adapt separation method and qualitative analysis of binary mixtures.

Course Name: Pharmaceutical Microbiology(Practical)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB307P

C307.1	To find suitable sterilization method and standard indicator organisms for sterility testing.
C307.2	To classify microorganisms based on staining and biochemical properties.
C307.3	To identify pharmaceutically important microbes and microbes isolated from sterility testing, their quantification.
C307.4	To test sterile products for their sterility and to perform antibiotic assay using microbes.
C307.5	To estimate the amount of biomass in the given sample and to characterize the microbial contamination.
C307.6	To choose the correct method to sterilize and evaluate the sterilization process and to develop protocol to prevent contamination.

Course Name: Physical Pharmacy – II (Practical)

Year of Study: 2017-18 Second Year, Third Semester

Course code: CB308P

C308.1	To understand the concepts of micromeritics, rheology of powders and fluids.
C308.2	To explain the chemical kinetics and stability testing of drugs.
C308.3	To demonstrate the effect of different suspending agents and their concentrations on physical stability of suspensions.
C308.4	To analyze particle size and particle size distribution using s
C308.5	To determine the flow properties of powders and study the influence of glidant on angle of repose.
C308.6	To determine the viscosity of liquids and semisolids, reaction rate constants for first order and second order.

II / IV B.PHARMACY 4th SEMESTER

Course Name : Pharmaceutical Engineering (Theory)

Year of Study : 2017-18 Second Year, Fourth Semester

Course code : CB401T

C401.1	To classify and explain various unit operations involved in manufacturing of pharmaceuticals.
C401.2	To understand the concepts of flow of fluids, size reduction and size separation.
C401.3	To summarize different mechanisms of heat transfer.
C401.4	To compare and contrast different types of evaporation and distillation process.
C401.5	To determine the factors influencing mixing, filtration and centrifugation.
C401.6	To elaborate various preventive methods used for corrosion control in pharmaceutical industries.

Course Name : Biochemistry (Theory)

Year of Study : 2017-18 Second Year, Fourth Semester

Course code : CB402T

C402.1	To remember the properties, biological significance and metabolic reactions of carbohydrates, proteins, lipids and amino acids.
C402.2	To understand the metabolism of carbohydrates and process of electron transport and ATP formation.
C402.3	To apply the concept of catalytic activity and enzyme inhibition in design of new drugs, diagnostic and therapeutic applications of enzymes.
C402.4	To distinguish the process of DNA replication, transcription and translation.
C402.5	To appraise the principles of clinical significance involved in the analysis of blood and urine samples.
C402.6	To discuss the metabolism and disorders associated to nucleic acids, lipids and amino acids.

Course Name: Pharmaceutical Chemistry-IV (Medicinal Chemistry - I) (Theory)

Year of Study: 2017-18 Second Year, Fourth Semester

Course code: CB403T

C403.1	To recall the classification of medicinal compounds by quoting examples.
C403.2	To explain various approaches in drug discovery, drug development and retro synthesis.
C403.3	To apply the knowledge of MOA and therapeutic uses of medicinal compounds.
C403.4	To study the relationship between the structure and biological activity of selected categories of drugs.
C403.5	To choose the synthetic route for medicinal compounds.
C403.6	To propose the appropriate diagnostic agent for diagnosis and treatment.

Course Name: Pharmacology - I (Theory)

Year of Study: 2017-18 Second Year, Fourth Semester

Course code: CB404T

C404.1	To understand the concepts of routes of administration, ADRs, receptors, SAR, drug action, drug toxicity, agonism and antagonism.
C404.2	To summarize various drug discovery phases, clinical trial phases and pharmacovigilance.
C404.3	To interpret the pharmacology of local anesthetics and drugs acting on autonomic nervous system.
C404.4	To categorize the pharmacology of drugs acting as anti inflammatory and autacoids.
C404.5	To appraise the pharmacology of major classes of drugs acting on central nervous system.
C404.6	To predict the effect of various drugs against respiratory and gastrointestinal complications.

Course Name : Pathophysiology (Theory)

Year of Study : 2017-18 Second Year, Fourth Semester

Course code : CB405T

C405.1	To understand the process of cell injury and mechanism of inflammation.
C405.2	To understand the etiopathogenesis of various disease states mentioned.
C405.3	To apply the concepts of pathogenesis of disease states to understand pharmacology.
C405.4	To evaluate the signs and symptoms of various disease states mentioned.
C405.5	To assess the complications of various disease states mentioned.
C405.6	To create awareness regarding preventive measures of infectious and communicable diseases.

Course Name : Pharmaceutical Engineering (Practical)

Year of Study : 2017-18 Second Year, Fourth Semester

Course code : CB406P

C406.1	To understand the basic principles involved in unit operations such as size reduction, size separation, distillation and drying.
C406.2	To demonstrate and explain about the construction, working and applications of pharmaceutical equipments such as colloid mill, planetary mixer, fluidized bed dryer and freeze dryer.
C406.3	To experiment with the process variables of filtration, evaporation and infer the same.
C406.4	To determine radiation constant of brass, iron, unpainted and painted glass.
C406.5	To determine overall heat transfer coefficient by heat exchanger and calculate the efficiency of steam distillation.
C406.6	To estimate moisture content, loss on drying and construct drying curves for calcium carbonate and starch.

Course Name: Biochemistry (Practical)

Year of Study: 2017-18 Second Year, Fourth Semester

Course code: CB407P

C407.1	To remember the qualitative analysis of carbohydrates and proteins.
C407.2	To explain the principle and clinical significance of blood glucose estimation.
C407.3	To identify the amount of reducing sugars and proteins by DNSA and Biuret method.
C407.4	To examine the constituents present in urine and their clinical significance.
C407.5	To determine the effect of temperature and substrate concentration on salivary amylase activity.
C407.6	To elaborate the clinical significance of serum creatinine and serum cholesterol.

III / IV B.PHARMACY 5th SEMESTER

Course Name : Pharmacognosy – I (Theory)

Year of Study : 2018-19 Third Year, Fifth Semester

Course code : CB501T

C501.1	To recall the history, scope and development of pharmacognosy.
C501.2	To remember different sources of crude drugs and also classify them accordingly.
C501.3	To illustrate students about cultivation, collection, processing and storage of crude drugs.
C501.4	To plan systematic pharmacognostic study of primary metabolites, ayurvedic drugs, marine drugs and teratogens.
C501.5	To analyze quality of crude drugs.
C501.6	To elaborate the applications of advanced technologies like polyploidy, mutation and hybridization in medicinal plants.

Course Name : Pharmaceutics – II (Theory)

Year of Study : 2018-19 Third Year, Fifth Semester

Course code : CB502T

C502.1	To understand the goals and objectives of preformulation.
C502.2	To apply the formulation concepts of solid, liquid, sterile and cosmetic products.
C502.3	To gain knowledge of formulation and manufacture of aerosols.
C502.4	To evaluate solid, liquid, sterile and cosmetic preparations.
C502.5	To analyze the stability of dosage forms.
C502.6	To create and design various pharmaceutical products along with their packaging materials.

Course Name : Pharmaceutical Biotechnology (Theory)

Year of Study : 2018-19 Third Year, Fifth Semester

Course code : CB503T

C503.1	To remember the basic concepts of biotechnology with respect to enzyme technology, immunology, diagnostic methods and rDNA technology.
C503.2	To understand different causes of infections and drawbacks of existing vaccines and be able to develop evidences to support findings.
C503.3	To apply the knowledge gained to develop new concepts to deal with day to day societal needs.
C503.4	To develop diagnostic methods, fermentation techniques and official pharmaceutical products.
C503.5	To evaluate and decide the desired methods to develop new outcomes using biotransformations.
C503.6	To plan systematically for different parameters to perform fermentations, genetic improvement and develop immunological compounds.

Course Name: Pharmacy Practice (Theory)

Year of Study: 2018-19 Third Year, Fifth Semester

Course code: CB504T

C504.1	To acquire the knowledge on organization of hospitals, various methods of distribution and hospital formulary in hospitals and apply it in the practice of pharmacy.
C504.2	To outline the organization and structure of community pharmacy and to build ability to design and run own community pharmacy.
C504.3	To demonstrate the knowledge of therapeutic drug monitoring, patient medication history interview and to apply the knowledge on assessment of drug related problems.
C504.4	To categorize and evaluate the role of hospital pharmacist in pharmacy and therapeutic committee, drug information services, patient counseling, education and training programmes in hospitals.
C504.5	To explain the principles of drug store management and inventory control methods during practice.
C504.6	To interpret clinical laboratory tests of specific disease states to provide better patient centered service.

Course Name	**:**	Pharmaceutical Quality Assurance (Theory)
Year of Study	**:**	2018-19 Third Year, Fifth Semester
Course code	**:**	CB505T

C505.1	To remember the concepts of quality assurance, quality management and ICH guidelines.
C505.2	To explain the ISO, NABL and QbD concepts in pharmaceutical industry.
C505.3	To identify the organization and personnel responsibilities.
C505.4	To analyze quality control parameters and good laboratory practices in pharmaceutical industry.
C505.5	To evaluate the complaints and documents maintenance in industry. with required regulatory guidelines.
C505.6	To elaborate the calibration, validation procedures and good warehousing practices .

Course Name	**:**	Pharmacognosy - I (Practical)
Year of Study	**:**	2018-19 Third Year, Fifth Semester
Course code	**:**	CB506P

C506.1	To remember different characteristic features in identification and quantification of crude drugs.
C506.2	To understand and identify cellular structures like phloem fibres, calcium oxalate crystals and starch granules for quantitative evaluation.
C506.3	To examine crude drugs based on the knowledge of leaf constants and chemical tests.
C506.4	To utilize the knowledge in propagation of tissue culture in seed germination and callus development.
C506.5	To analyze crude drugs by ash values/extractive values/swelling index.
C506.6	To evaluate crude drugs by qualitative analysis using lycopodium spore method.

Course Name : Pharmaceutics - II (Practical)

Year of Study : 2018-19 Third Year, Fifth Semester

Course code : CB507P

C507.1	To reproduce and relate the knowledge of preformulation in testing active pharmaceutical ingredients and excipients.
C507.2	To recall and make use of tableting and coating equipments in the manufacture of tablets.
C507.3	To make use of hand operated capsule filling machine to prepare capsules.
C507.4	To apply the knowledge of quality control tests on evaluating marketed tablets and capsules.
C507.5	To formulate and evaluate sterile dosage forms and cosmetic products.
C507.6	To assess the quality control tests for glass and packaging materials.

III / IV B.PHARMACY 6th SEMESTER

Course Name : Pharmaceutical chemistry-V (Theory)
[Medicinal Chemistry – II]

Year of Study : 2018-19 Third Year, Sixth Semester

Course code : CB601T

C601.1	To recall the source, classification and structures of medicinal compounds.
C601.2	To explain the mechanism of action and therapeutic uses of drugs.
C601.3	To build the relationship between structure and biological activity.
C601.4	To examine the synthetic route for selected medicinal compounds.
C601.5	To judge the therapeutic strategies for treatment of diseases / disorders.
C601.6	To adapt the concepts related to medicinal compounds.

Course Name : Biopharmaceutics and Pharmacokinetics (Theory)

Year of Study : 2018-19 Third Year, Sixth Semester

Course code : CB602T

C602.1	To recall and understand basic concepts of absorption, distribution, metabolism and excretion for bioavailability and bioequivalence.
C602.2	To identify and analyze biopharmaceutical factors, mechanisms and pharmacokinetic parameters for bioavailability and bioequivalence.
C602.3	To estimate the effect of pharmacokinetic parameters and to create awareness on safety and efficacy of drug product.
C602.4	To summarize the concept multiple dosage regimens and classify various types of pharmacokinetic models.
C602.5	To apply compartment and non compartmental pharmacokinetic models for predicting linear and non linear pharmacokinetics.
C602.6	To recommend best multiple dosage regimens based on pharmacokinetics for maximizing patient compliance and therapeutic effectiveness.

Course Name	**:**	Pharmacognosy – II (Theory)
Year of Study	**:**	2018-19 Third Year, Sixth Semester
Course code	**:**	CB603T

C603.1	To understand the modern extraction techniques, identification and characterization of herbal drugs and phytoconstituents.
C603.2	To illustrate basic metabolic pathways and formation of various secondary metabolites through these pathways.
C603.3	To outline the systematic pharmacognostic study of various crude drugs such as alkaloids, glycosides, volatile oils, tannins and lavonoids.
C603.4	To improve the skills in isolation of phytochemical constituents both for laboratory and industrial skill.
C603.5	To analyze the secondary metabolites belongs to the class of terpenoids, glycosides and alkaloids.
C603.6	To evaluate phytochemical constituents by chromatographic methods and appraise, commercialization and industrialization of medicinal plants.

Course Name	**:**	Social and preventive pharmacy (Theory)
Year of Study	**:**	2018-19 Third Year, Sixth Semester
Course code	**:**	CB604T

C604.1	To understand the concept of health and health education.
C604.2	To create awareness about various preventive measures of stated communicable and non communicable diseases.
C604.3	To apply the knowledge of national health programmes mentioned in real world to serve the society.
C604.4	To elaborate various vaccines under national immunization programme and their schedule.
C604.5	To demonstrate the impact of socio-cultural factors and urbanization on health.
C604.6	To evaluate the health and pharmacy related problems in societal perspective.

Course Name	**:**	Pharmaceutical chemistry - V (Practical) [Medicinal Chemistry – II]**;**
Year of Study	**:**	2018-19 Third Year, Sixth Semester
Course code	**:**	CB605P

C605.1	To choose the requirements for performing synthesis of medicinal compounds
C605.2	To explain the principle and mechanism involved in drug synthesis
C605.3	To purify synthesized compounds and calculate the percentage yield
C605.4	To choose the requirements for performing analysis of selected drugs
C605.5	To judge the label claim of marketed formulations after performing assay.

Course Name	**:**	Biopharmaceutics and Pharmacokinetics (Practical)
Year of Study	**:**	2018-19 Third Year, Sixth Semester
Course code	**:**	CB606P

C606.1	To understand the basic concepts in biopharmaceutics, pharmacokinetics and their significance.
C606.2	To interpret the effect of surfactant, diluents, lubricant and polymorphism on rate of drug dissolution.
C606.3	To construct calibration curve of sulfamethoxazole in plasma.
C606.4	To determine absorption rate constant, $K_{E,}$ biological half life, mean residence time and mean absorption time for the given data.
C606.5	To estimate the extent of protein biding by equilibrium dialysis or dynamic dialysis methods.
C606.6	To deduce the basic pharmacokinetic parameters for the given data as per one compartment and two compartment model.

Course Name: Pharmacognosy – II (Practical)

Year of Study: 2018-19 Third Year, Sixth Semester

Course code: CB607P

C607.1	To remember and understand selected crude drugs.
C607.2	To understand the morphological and microscopical features of the crude drugs.
C607.3	To apply the knowledge of identifying selected crude drugs by chemical tests.
C607.4	To analyze the crude drugs by chromatographic techniques.
C607.5	To evaluate the crude drugs by morphological and microscopic characteristics.
C607.6	To examine isolation and detection of active principles from crude drugs.

IV / IV B.PHARMACY 7th SEMESTER

Course Name : Pharmacology (Theory)

Year of Study : 2018-19 Third Year, Seventh Semester

Course code : CB701T

CB701.1	To understand the principles and methods of bioassay and mechanism of action of diuretics and anti-diuretics.
CB701.2	To illustrate the mechanism of drugs acting on cardiovascular system.
CB701.3	To outline and summarize the drugs acting on endocrine system and their role in hormonal imbalance.
CB701.4	To analyze the basic principles of chemotherapy and distinguish mechanisms of antibiotics.
CB701.5	To explain and compare the mechanism of anti-mycobacterial, anti-fungal, anti-viral, anti-cancer and immunosuppressant drugs.
CB701.6	To elaborate the principles of toxicology, antidotes, clinical management of various poisoned patient and animal toxicology.

Course Name : Pharmaceutical Analysis-II (Theory)

Year of Study : 2018-19 Third Year, Seventh Semester

Course code : CB702T

CB702.1	To understand selected instrumental analytical techniques (spectroscopic and chromatographic methods) and differentiate with volumetric analysis.
CB702.2	To gain knowledge on interaction of EMR with matter and to build the analytical understanding at the level of atom, group and molecular structure of organic and inorganic compounds with different functional groups and their applications in pharmacy.
CB702.3	To maximize knowledge on characterization and estimation of ions by spectroscopical techniques
CB702.4	To simplify affinity of matter with stationary phase and mobile phase, physical and chemical properties of matter
CB702.5	To elaborate various principles, theory and instruments employed for the characterization and analysis of drugs.
CB702.6	To categorize different organic and inorganic compounds using suitable spectroscopic and chromatographic techniques.

Course Name	**:**	Novel drug delivery system (Theory)
Year of Study	**:**	4th B.Pharmacy 7th Semester
Course code	**:**	CB703T

CB703.1	To rationalize and understand fundamentals and polymers used in the design of any controlled drug delivery systems
CB703.2	To classify, formulate and evaluate control drug delivery systems for oral, mucosal, dermal, pulmonary and nasal routes.
CB703.3	To discuss and compare therapeutic effectiveness of novel drug delivery systems for oral, mucosal, dermal, pulmonary and nasal over conventional dosage forms.
CB703.4	To analyze the principles and fundamentals of drug targeting in the design of site-specific drug delivery systems.
CB703.5	To develop novel drug delivery systems or design devices for site-specific drug delivery systems viz., gastric, ocular and intra-uterine.
CB703.6	To predict the rate and maximize therapeutic compliance of site-specific drug delivery systems by modifying conventional dosage forms.

Course Name	**:**	Herbal Drug Technology (Theory)
Year of Study	**:**	2018-19 Third Year, Seventh Semester
Course code	**:**	CB704T

CB704.1	To recall the fundamental concepts of herbal raw materials and biodynamic agriculture techniques
CB704.2	To understand the concept of neutraceuticals and herbal food interactions.
CB704.3	To apply the knowledge for evaluation and preparation of herbal formulations.
CB704.4	To remember the regulatory guidelines for the assessment of herbal drugs and patenting.
CB704.5	To illustrate the scope and future prospects of the herbal drug industry.
CB704.6	To establish and follow the SOP's, infrastructure of industries as per GMP

Course Name :	Pharmacology-II (Practical)
Year of Study :	2018-19 Third Year, Seventh Semester
Course code :	CB705P
CB705.1	To learn about basic instruments, common laboratory animals used in experimental pharmacology and to organize animal house as per the CPCSEA guidelines.
CB705.2	To demonstrate various routes of administration, euthanasia in experimental animals, the effect of various drugs on rabbit eye and ciliary motility
CB705.3	To understand the dose response relationship, effect of drugs on DRC and PD_2 value
CB705.4	To analyze the effect of various drugs on isolated frog heart
CB705.5	To evaluate the drug concentrations by various bioassay methods using animal simulator software.
CB705.6	To predict various screening models for analgesic, anti-inflammatory and anticonvulsant activities
Course Name :	Pharmaceutical Analysis-II (Practical)
Year of Study :	2018-19 Third Year, Seventh Semester
Course code :	CB706P
CB706.1	To recall the principle involved in spectroscopy and importance of absorption maximum in the estimation of organic compounds.
CB706.2	To experiment with selected drugs by UV, Visible spectroscopy and flourimetry.
CB706.3	To estimate the amount of sodium and potassium ions by flame photometry
CB706.4	To characterize and quantify the organic compounds/amino acids/ plant pigments by using various chromatographic and spectroscopical techniques.
CB706.5	To analyze the various organic compounds using nepheloturbidimetry and potentiometry.
CB706.6	To maximize the knowledge on integration and interpretation of chromatograms and spectra.

IV / IV B.PHARMACY 8th SEMESTER

Course Name : Biostatistics and Research Methodology (Theory)
Year of Study : 2018-19 Third Year, Eighth Semester
Course code : CB801T

CB801.1	To understand the basic aspects of statistics such as central tendency, dispersion and correlation.
CB801.2	To make use of regression and probability while analyzing data by statistical methods.
CB801.3	To explain the need of research, research designs and their applications and the process of randomization and bias.
CB801.4	To assess the need of regression modeling and to build up the ability to use various statistical problems.
CB801.5	To elaborate design and analysis of experiments and response surface methodology.
CB801.6	To build the ability to perform various parametric and non parametric statistical tests and to draw graphs and plots based on type of data.

Course Name : Pharmaceutical Chemistry-V (Theory)
Year of Study : 2018-19 Third Year, Eighth Semester
Course code : CB802T

CB802.1	To recall the different classes of natural products and their properties.
CB802.2	To illustrate the isolation and extraction of natural products.
CB802.3	To apply the knowledge of chemistry including structural elucidation of compounds.
CB802.4	To analyze the stability of various classes of natural products.
CB802.5	To discuss the biological significance and applications of natural products.
CB802.6	To predict the synthesis and interrelationship of steroidal hormones.

Course Name :	ELECTIVE-I Pharmacovigilance (Theory)
Year of Study :	2018-19 Third Year, Eighth Semester
Course code :	CB803T
CB803.1	To understand the history of pharmacoivigilance, adverse drug reactions and basic terminologies in Pharmacovigilance.
CB803.2	To make use of various drug disease classifications, drug dictionaries and drug information resources in pharmacovigilance.
CB803.3	To explain various methods of pharmacovigilance and communication process during ADR reporting.
CB803.4	To appraise safety data generation and ICH guidelines in pharmacovigilance.
CB805.5	To evaluate drug and vaccine safety in special population and to appraise the process of haemovigilance and materiovigilance.
CB805.6	To build the ability to report adverse drug reactions through various ADR reporting forms.
Course Name :	ELECTIVE-II Pharmaceutical Regulatory Science (Theory)
Year of Study :	2018-19 Third Year, Eighth Semester
Course code :	CB804T
CB804.1	To understand the concepts of Regulatory science in pharmaceutical industry as well as to make use of regulatory guidelines, laws, acts, orange and purple book.
CB804.2	To recall the concepts of Drug discovery, development process, clinical studies and generic drug product development.
CB804.3	To perceive the regulatory approval process and timelines for IND, NDA and ANDA and to know about changes to an approved NDA/ ANDA.
CB804.4	To familiar with Regulatory authorities and agencies like India, USA, Europe, Australia, Japan and Canada.
CB804.5	To know the regulatory registration process of Indian drugs in overseas market which include to understand about technical documents like DMF, CTD, eCTD and ACTD.
CB804.6	To assimilate the process of clinical trials and pharmacovigilance as well as to understand obligations of GCP in clinical trials.

Course Name	**:**	Pharmaceutical Chemistry-V (Practical)
Year of Study	**:**	2018-19 Third Year, Eighth Semester
Course code	**:**	CB805P
CB805.1	To recall various qualitative and quantitative tests to check the quality of natural products and to learn how to isolate natural products.	
CB805.2	To gain knowledge on chemical reactions or chemistry involved in various qualitative and quantitative procedures or tests.	
CB805.3	To experiment with practice of isolation and characterization of natural products from plant materials.	
CB805.4	To analyze the quality of natural products by qualitative and quantitative analysis.	
CB805.5	To analyze fats and oils by pharmacopoeial methods.	
Course Name	**:**	Project
Year of Study	**:**	2018-19 Third Year, Eighth Semester
Course code	**:**	CB806
CB806.1	To recall and identify the societal issues related to health and pharmaceuticals and to report the aims and objectives of the project.	
CB806.2	To review and compare the literature on selected topic / problem / issue.	
CB806.3	To design a plan of work and execute it accordingly.	
CB806.4	To analyze and compile the results of the project.	
CB806.5	To justify the objectives and summarize the reports.	
CB806.6	To publish a paper or patent with acceptable limit of (<30%) plagiarism.	

Course Name : Practice School
Year of Study : 2018-19 Third Year, Eighth Semester
Course code : CB807

C807.1	To understand the importance of realistic learning through practice in various domains such as community pharmacy, drug testing and manufacturing, preclinical testing, clinical practice, patent filing, regulatory filing accounting, green audit and article writing.
C807.2	To get familiarize with the aspects of realistic practice in the domain of interest.
C807.3	To develop knowledge and skills related to practical learning in the domain of interest.
C807.4	To analyze the problems encountered during realistic practice and make use of theoretical knowledge to resolve those problems.
C807.5	To build up the ability to perform well in the domain of interest after becoming an employee/entrepreneur.

CAREERS IN PHARMACY

Pharmacy as a career option, which has always been in the forefront. Today sky is the limit for a pharma graduate. Depending on the qualification, talent and experience, there are numerous avenues for pharma professionals.

Hospital Pharmacist : Hospitals have a pharmacy department which are controlled and managed by a pharmacist. They undertake responsibility for stock control, storage, placing orders, labelling and financial budgeting and account-keeping for the dispensary.

Retail Pharmacist : The concept of pharma retailing is rapidly capturing the A and B class cities in India. These are organized retail chains under one banner and thus this calls for a good number of pharmacists to handle the entire show.

Drug Inspectors : They are employed by the state governments and they look after the day-today affairs of the pharma business. The job of a drug inspector includes the inspection of establishment where drugs, cosmetics, and medical devices are manufactured, handled, stored or sold to enforce legal standards of purity and grading.

Analytical Chemist : These are employed by labs which provides testing and validation about the pharma and related products.

Manufacturing Chemist : With a tremendous growth in the number of manufacturing units the demand for pharmacists is right on the top. Apart from the pharmaceutical units manufacturing chemists are also employed by allied industries such as nutraceuticals, food, cosmetics etc. The job involves to preparation of a pilot sample and see that production of a particular formulation line is right from the raw material to the end of packaging.

Medical Representatives : These are sales people who are brand ambassador for their respective companies (both national and multinational companies).

Research and Development : With India becoming a hub of R & D, this sector always looks at for the right pharma professionals. Further many more MNC's have made India as a hub for their R and D. The areas of research includes New Drug Discovery Research (NDDR), Process Development (P & D); Formulation & Development, (F & D) standardizaton of dosage etc.

Clinical Research : With many CRO's operations in India, clinical reserach is an industryitself. India is becoming a hub for clinical research; the demand for professionals in this field is growing rapidly. Thus, there will soon be a massive demand for clinical research professionals, making it an interesting career option with massive growth potential.

Product Management : Managing a brand is the responsibility of product management department. Pharma professionals enjoy an added advantage over scores others in terms of suitability for this job.

Medical Transcription : Medical transcription could be one of the speedy growing IT-enabled service in India also, with the rapid change in the outlook, of Indian healthcare and privatization of the insurance sector.

Pharma Publishing : This is becoming new entrepreneurship business for pharma professionals . This involves publishing of pharma magazine/News letters related to pharmacy topics.

Drug Regulatory : With the Indian companies going globally the role of drug regulatory department is increasing day-by-day. The job involves the preparation of drug dossier and its registration in other countries. Further knowledge of exports and imports also becomes handy in such cases. The job also involves travelling abroad for licensing and alliances.

Academics : With many colleges mushrooming all over India, teaching is a good option for those interested in academics. As per the A.I.C.T.E. norms the minimum entry-level qualification as lecturer is M.Pharma. This is a profession associated with job satisfaction and social status as teaching is considered to be noble profession. The higher posts in the hierarchy are Sr.Lecturer, Reader, Asst. Professor, Professor, Principal etc. The emoluments are satisfactory. Besides teaching academic-related opportunities involve positions on research posts and training programs.

AIMS AND OBJECTIVES OF B.PHARM COURSE

Aims :

Pharmacy graduates are required to learn and acquire adequate knowledge, necessary skills to practice the profession of pharmacy including thorough and exhaustive knowledge of synthesis and assay of Medicinal agents including mode of action, drug interactions and patient counseling and professional information exchange with Physicians and other paramedicos. The graduates are required to acquire an in-depth knowledge of formulation, storage and analysis of various pharmaceutical dosage forms including herbal medicines required for both large scale commercial production & research. The graduataes should understand the concept of Community Pharmacy and be able to participate in rural and urban health care projects of State and Central government. The graduate is also required to detail the physicians and community and market the medicinal agents for diagnosis, prevention and therapeutic purposes. The pharmacist should act as bridge between Physicians and Patients and strive for better health care.

Objectives :

The objectives are covered under three headings namely :

a. Knowledge and understanding
b. Skills and
c. Attitude

A. KNOWLEDGE & UNDERSTANDING :

The graduate should acquire the following during their four-year B.Pharm course

1. Adequate knowledge and scientific information regarding basic principles of Pharmaceutical chemistry, Pharmaceutics including cosmetics, Pharmacology and Pharmacognosy including Herbal drugs.
2. Adequate knowledge of practical aspects of synthesis, formulation and analysis of various pharmaceutical and Herbal medicinal agents.
3. Adequate knowledge of practical aspects of delivering a quality assured product as per pharmacopoeia, WHO and ISO standards.
4. Adequate knowledge of practical aspects of Pharmacological screening, biological standardization and *in-vivo* drug interactions.
5. Adequate knowledge of clinical studies for patient counseling leading to physical and social well being of patients.
6. Adequate knowledge of practical aspects of product detailing and marketing of Pharmaceutical products.

B. SKILLS :

A graduate should be able to demonstrate the following skills necessary for practice of a pharmacy.

1. Able to synthesize, purify, identify and analyze medicinal agents.
2. Able to formulate, store, dispense, analyze the prescriptions and/or manufacture the medicinal agents at commercial level.
3. Able to learn and apply the quality assurance principles including legal and ethical aspects involving drugs.
4. Able to extract, purify, identify and know the therapeutic value of herbal/crude/natural products.
5. Able to screen various medicinal agents using animal models for pharmacological activity.

C. ATTITUDES :

The graduate should develop the following attitudes during their four-year B.Pharm course.

1. Willing to apply the current knowledge of Pharmacy in the best interest of patients and the community.
2. Maintain a high standard of professional ethics in discharging professional obligations.
3. Continuously upgrade professional information and be conversant with latest advances in pharmacy field to serve the community better.
4. Willing to participate in continuing education programmes of PCI and AICTE to upgrade knowledge and professional skills.
5. To help and to participate in the implementation of National Health Programmes.

CHALAPAHTI INSTITUTE OF PHARMACEUTICAL SCIENCES (AUTONOMOUS)

Academic Rules & Regulations for B.Pharmacy Programme

(As Approved by the Academic Council of
Chalapathi Institute of Pharmaceutical Sciences)
(Applicable to the students admitted into the First year B.Pharmacy from the academic year 2016-2017 onwards)

Preamble: Chalapathi Institute of Pharmaceutical Sciences (CLPT) has been taking several initiatives towards academic excellence, quality improvement and administrative reforms. Keeping in view of this priority in addition with vision and mission of the institute, the process has been already initiated and achieved. The institution is approved by All India Council for Technical Education (AICTE), Pharmacy Council of India (PCI), Andhra Pradesh State Council for Higher Education (APSCHE), accreditated by National Assessment and Accreditation Council (NAAC), recognized by University Grants Commission (UGC) and Department of Scientific & Industrial Research (DSIR). The college has now taken one more step ahead to implement Credit based semester system (CBSS) from academic year 2016-17 onwards for B.Pharmacy programme.

Title: The academic rules and regulations shall be called "**Credit based semester system (CBSS)**" applicable to B. Pharmacy programme of Chalapathi Institute of Pharmaceutical Sciences, Chalapathi Nagar, Lam, Guntur – 522 034, Andhra Pradesh, India.

Scope, application and commencement: The academic regulations provided here in shall be applicable to B. Pharmacy (regular and lateral entry) programme of Chalapathi Institute of Pharmaceutical Sciences. The regulations include definitions of key terms, critical concepts, method of calculations, committees and the evaluation system. These regulations shall come into force with effect from the admissions commencing from 2016-2017 onwards.

Rationale for introduction of Credit based semester system :

- The Ministry of Human Resource Development (MHRD) of central and state governments has emphasized on the need for universities/ colleges to adopt measures to improve the quality of education.
- The need for enhanced learning opportunities, ability to match learner's scholastic needs and aspirations, improvement in educational quality and excellence, flexibility for learners to complete the programme in specified period of time, standardization and comparability of educational programmes.
- To develop a Credit based semester system (CBSS) in tune with global trends; the adoption of a sound grading system for reflecting learner performance.

DEFINITIONS:

Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

Credit based semester system (CBSS): Credit based semester system is a flexible system of learning that permits students to select from the prescribed elective courses.

Programme: 'Programme' means a set of the required number of semesters leading to the award of B.Pharmacy degree.

Course: Usually referred to, as "papers" is a component of a programme. All courses need not carry the same weightage. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ industrial training/viva-voce/ seminars/ group discussion/ soft skills/ technical skills/ entrepreneurship /assignments/ presentations etc., or a combination of some of these to meet the objectives/outcomes.

Semester: 'Semester' means a term consisting of a minimum of 630 contact periods distributed over 90 working days spread over 15 weeks of six-day duration each and seven contact periods with 50 minutes duration. Depending upon its duration, each academic year will be divided into two semesters. Semesters will be known as either odd Semester or even semester. The Semester from July to November will be semesters I or III, V or VII and similarly the semester from December to April will be semesters II or IV, VI or VIII.

Credit Based Semester System (CBSS): Under the CBSS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

Credits: Credit is a kind of weightage given based on marks weightage which is in a unit form. One credit is equivalent to 25 marks of weightage

Credit point (p): Credit point is the value obtained by multiplying the grade point (G) by the credit (C): $P = G \times C$.

Grade point (G): Grade point is an integer indicating the numerical equivalent of the letter grade.

Semester Grade Point Average (SGPA): Semester Grade Point Average (SGPA) is the value obtained by dividing the sum of credit points earned by a student in various courses taken together in a semester by the total number of credits earned by the student in that semester. SGPA shall be rounded off to two decimal places. SGPA indicates the comprehensive academic performance of a student in a semester.

Cumulative Grade Point Average (CGPA): Cumulative Grade Point Average (CGPA) is the value obtained by dividing the sum of credit points in all the courses earned by a student for the entire programme, by the total number of credits. CGPA shall be rounded off to two decimal places. CGPA indicates the comprehensive academic performance of a student in a programme.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O, A, B, C, D, E, F and AB.

Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

ACADEMIC REGULATIONS FOR B. PHARMACY (REGULAR)

Applicable for the students of B. Pharmacy (Regular) from the academic year 2016-17 onwards and for lateral entry students from the academic year 2017-2018 onwards.

1. Title and duration of the Programme:

- The course shall be called as the Degree course in Bachelor of Pharmacy, abbreviated as B.Pharmacy.
- The minimum period required to complete the programme is 4 years (8 semesters).
- The maximum period required to complete the programme is 8 years.
- For lateral entry students, the minimum period required to complete the programme is 3 years (6 semesters) and the maximum period is 6 years.
- After completion of maximum duration **NO EXTENSION** will be granted, they shall forfeit their seat in B.Pharmacy programme and their admission shall stand cancelled.

2. Admission to B.Pharmacy Programme:

- A candidate seeking admission into first year of B.Pharmacy degree programme should have passed intermediate examination conducted by the board of intermediate education, Andhra Pradesh with Bi.P.C or M.P.C. Any other equivalent examination recognized by Department of Technical Education/APSCHE/PCI/ AICTE/University and / or the government of Andhrapradesh from time to time.
- The selection is based on the rank secured by the candidate in the EAMCET examination conducted by A.P. State Council of Higher Education. The candidate shall also satisfy eligibility requirements stipulated by Department of Technical Education/APSCHE/PCI/ AICTE/University and / or the government of Andhrapradesh from time to time.
- **B.Pharmacy Lateral Entry (to third semester)**. A pass in D. Pharmacy course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act 1948. Students will be admitted into II B.Pharmacy programme by ECET convenor/University as per the rules and regulations laid by Department of Technical Education/APSCHE/PCI/ AICTE/University and / or the government of Andhra Pradesh from time to time.

3. Registration:

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the academic calendar. It is absolutely necessary for the student to register for courses in time.

4. Minimum instruction days:

The minimum instruction days for each semester shall be 90 days.

5. Examination system & evaluation:

The performance of the students in each semester shall be assessed subject-wise for a maximum of 100 marks each, for theory and practical. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded. The performance of a student in each course is assessed with sessional examinations on a continuous basis during the semester called Continuous Internal Assessment and a Semester End Examination (SEE) conducted at the end of the semester. Every student shall be evaluated for semester end examination by theory and practical subjects of three and four hours duration **(As per the Annexure - III)**.

6. Continuous Internal Evaluation (CIE):

6.1 Evaluation of theory subjects:

- For theory subjects the distribution shall be 30 marks for Continuous Internal Assessment (CIA) and 70 marks for the Semester End-Examination (SEE).
- For theory subjects, during the semester there shall be 2 sessional examinations. Each sessional examination shall consist of section-A (Objective Questions) for 5 marks, section-B (Short Answers) for 15 marks and section-C (Long Answers) for 10 marks with duration of 90 Minutes. (**Model Question Paper : Annexure - I**)
- First assignment should be submitted before the conduct of the first sessional examination, and the second assignment should be submitted before the conduct of the second sessional examination.
- The total marks secured by the student in each sessional examination for 30 marks will be considered and the average of two sessional examinations will be taken as the final marks secured by candidate**.**
- It is mandatory for the student to attend both the internal assessment examinations.
- There shall be a pre-final (open book) examination before every semester end examination.

6.2 Evaluation of practical subjects:

- For practical subjects there shall be a continuous internal evaluation during a semester for 30 marks. Out of 30 marks, day-to-day work in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 20 marks conducted by the respective laboratory teacher. (**Model Question Paper : Annexure - I**)
- The total marks secured by the student in each sessional examination for 30 marks shall be considered and the average of two sessional examinations shall be taken as the final marks secured by each candidate**.**

6.3 Evaluation of assignments / seminars / group discussion:

Assignments/Seminars/Group discussions shall be evaluated by internal examiner(s) for 50 (2 x 25) marks. There shall be no external examination. The evaluation pattern is given in **Annexure – II.**

7 Semester End Examination (SEE):

7.1 Evaluation of theory subjects:

- The semester end examination will be conducted for 70 marks, which consists of three parts viz. i). Section -A for 10 marks, ii). Section –B for 20 marks. iii) Section –C for 40 marks. (**Model Question Paper : Annexure - III**)
- The evaluation and question paper setting shall be entrusted to external examiners from the panels approved by the respective Boards of Studies.
- Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within the stipulated period by payment of the prescribed fee.

7.2 Evaluation of practical subjects:

- The semester end examination will be conducted for 70 marks which consists of three parts viz. i). Synopsis / spotters - 10 marks ii). Major experiment - 30 marks iii) Minor experiment – 20 marks iv) Viva-voce – 10 marks. (**Model Question Paper : Annexure - III**).
- The practical semester end examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed by the Principal from the panel of examiners recommended by the chairman, board of studies in respective branches.

7.3 Evaluation of project:

- Project work shall be evaluated for 100 marks, 30 marks for the continuous internal evaluation and 70 marks for the semester end examination.
- The continuous internal evaluation shall be on the basis of two seminars given by each student on the topic of the project. The semester end evaluation of project work shall be conducted at the end of the VIII semester by external and internal examiners.
- The dissertation work of the project shall be evaluated on the basis of the performance and presentation skills on parameters like abstract, objectives, general introduction, drug profile, review of literature, plan of work, methodology/experimental work and investigations, interpretation and analysis of data, results and discussion. (**Pattern of dissertation to be submitted is enclosed as Annexure - IV**).

8 Attendance requirements:

- A student is eligible to write the sessional / semester end xaminations only if he / she acquires a minimum of 80% of attendance in aggregate of all the subjects.
- Condonation for the shortage of attendance on an aggregate up to 10% (70% and above and below 80%) in each semester may be granted on medical grounds with a documentary evidence approved by the Principal. However in the case of the students, who participated in activities like N.S.S., N.C.C., inter-colligate tournaments, inter-university tournaments and any such other activities involving the representation of the college with prior approval from the Principal, the candidate may be deemed as attended to the college during the period solely for the purpose of the examination.
- A stipulated fee shall be payable towards condonation of shortage of attendance.
- Shortage of attendance below 70% in aggregate shall not be condoned under any circumstances and students are not eligible to write sessional / semester end examinations of that semester. Such students are detained and their registration for examination stands cancelled.

09 Grade points: Marks shall be awarded to indicate the performance of each student in each theory subject, practicals, assignments, seminars, group discussion, technical skills, elective course and project etc., based on % of marks obtained in CIA+SEE (continuous internal assessment + semester end examination, both taken together) and a corresponding letter grade shall be given.

- As a measure of the student's performance, a 10-point grading system shall be followed. The letter grades and corresponding marks secured are given in Table No. 2.

Table No. 2 : Grade and Grade Points

Marks secured	Letter Grade	Grade Point	Performance
90.00 – 100	O	9.0 to 10.0	Out Standing
80.00 – 89.99	A	8.0 to 8.9	Excellent
70.00 – 79.99	B	7.0 to 7.9	Good
60.00 – 69.99	C	6.0 to 6.9	Fair
50.00 – 59.99	D	5.0 to 5.9	Average
40.00 - 49.99	E	4.0 to 4.9	Pass
Less than 40	F	0.0	Fail
Absent	AB	0.0	Fail

- A letter grade does not imply any specific % of marks.
- A student earns Grade Point (GP) in each Subject basing on Letter grade obtained by him in that subject. Then the corresponding "Credit Points" (CP) are computed by multiplying the grade point with credits for that particular subject.

Credit Points (CP) = Grade Point (GP) x Credits for a subject

A student passes the subject only when he gets GP 5 (E Grade or above).

10 Grade point average:

Computation of SGPA and CGPA

The credit index can be used further for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which being important performance indices of the student. While SGPA is equal to the credit index for a semester divided by the total number of credits registered by the student in that semester, CGPA gives the sum total of credit indices of all the previous semesters divided by the total number of credits registered in all these semesters. Thus, the Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \sum CiGi / \sum Ci$$

Where Ci = number of credits for the subject i,
Gi = grade points obtained by the student in the subject.

Semester Grade Point Average (SGPA) is awarded to candidates considering all the subjects of the semester. Zero grade points are also included in this computation. SGPA is rounded off to TWO Decimal Places.

SGPA will be computed as follows;

$$\frac{\Sigma\ [(\text{subject credits})\ X\ (\text{Grade points})]\ (\text{for all Subjects passed in that semester})}{\Sigma\ [(\text{Subject } \textit{credits})]\ (\text{for all Subjects registered in that semester})}$$

To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the subjects taken in all the semesters completed up to the particular point of time. CGPA is rounded off to TWO Decimal Places.

CGPA will be computed as follows:

$$\frac{\Sigma\ [(\text{Subject } \textit{credits})\ X\ (\textit{Grade points})]\ (\text{for all Subjects passed upto that semester})}{\Sigma\ [(\text{Subject } \textit{credits})]\ (\text{for all Subjects registered until that semester})}$$

CGPA is thus computed from the I year first semester onwards, at the end of each Semester, as per the above formula. However, the SGPA of I year I semester itself may be taken as the CGPA.

11 Earning of credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range "O" to "E". Letter grade 'F' in any subject implies failure of the student in that subject and no credits earned.

12 Passing standards:

- A student shall be declared to have passed the examination in each semester if he obtains not less than 40 % marks in each theory and 40 % in each practical of the semester end examination in addition to 50 % aggregate including theory and practicals of internal and semester end examinations.
- After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned, SGPA and CGPA.

13 Conditions under which candidates are permitted to proceed to next higher class:

- A student not detained in the first semester of a year of study shall be promoted to second semester of that year of study.
- A student shall be eligible for promotion to II year of B.Pharmacy programme if he/she is not detained in the first and second semester of first year B.Pharmacy programme irrespective of the number of backlog subjects in I year B.Pharmacy.
- A student shall be eligible for promotion to III year of B.Pharmacy programme if he/she is not detained in IV semester of B.Pharmacy programme and has passed all but **three courses** of I year B.Pharmacy (including laboratory subjects).
- A student shall be eligible for promotion to IV year of B.Pharmacy programme if he/she is not detained in VI semester of B.Pharmacy programme and has passed all but **three courses** of II B.Pharmacy (including laboratory subjects) and all but **one courses** of I year B.Pharmacy (including laboratory subjects).

14 Award of B.Pharmacy degree:

A student shall be eligible for award of the B.Pharmacy degree if he/she fulfils the following conditions:

- Registered and successfully completed all the components prescribed in the programme of study to which he/she is admitted.
- Obtained CGPA greater than or equal to 5.0.
- Has no dues to the Institute, hostels, libraries, NCC/NSS etc.,
- No disciplinary action is pending against him/her.

15 Award of class: After a student has satisfied the requirements prescribed for the completion of the programme and is eligible for the award of B. Pharmacy degree, he/she shall be placed in one of the following three classes as given in the Table No. 4.

Table No. 4: CGPA required for award of class

The Class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	**:**	**CGPA of 7.50 and above**
First Class	**:**	**CGPA of 6.00 to 7.49**
Second Class	**:**	**CGPA of 5.00 to 5.99**

- The marks obtained in Continuous Internal Evaluation (CIA) and Semester end Examination (SEE) will not be shown in the memorandum of marks.

16 Consolidated grade card:

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four / three (Lateral Entry Students) years B. Pharmacy programme.

17 Award of rank / medals / prizes :

The rank shall be awarded based on the following:

- Ranks/ medals / prizes shall be awarded on the basis of final CGPA. However, candidates who fail in one or more subjects during the B.Pharmacy programme shall not be eligible for award of such ranks / medals / prizes.
- If two students get the same CGPA, the tie should be resolved by considering the number of times a student has obtained higher *SGPA;* But, if it is not resolved even at this stage, the number of times a student has obtained higher grades like O, A, B, etc., shall be taken into account in rank ordering of the students in a class

- The rank will be awarded only to those candidates who complete their degree within four academic years.
- For the purpose of awarding rank, the CGPA calculated based on the grades secured at the first attempt only shall be considered.

18 Withholding of results:

If the student has not paid the dues, if any, to the institute or if any indiscipline action is pending against him, the result of the student will be withheld. His/her degree will be withheld in such cases the matter will be referred to the Principal.

19 Transitory regulations:

- Discontinued or detained candidates are eligible for readmission as per the guidelines of university admission procedure.
- Students on transfer shall complete the prescribed courses of the concerned programme not covered earlier, however, he/she should take the remaining programme along with others.

20 Transcripts:

After successful completion of the total programme of study, a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee.

21 Improvement of class:

A candidate may be permitted to improve his performance in semester-end examination of any semester only after completing the entire eight semester programme of study by appearing again for the whole examinations of that semester only during four subsequent years after completion of the study of the entire course. Such an improvement can be availed only once for each one of the semester examinations of the entire course of study. When considered in its totality the better of the two performances as whole at the I, II, III, IV, V, VI, VII or VIII semesters as the case may be shall be taken into consideration for the purpose of awarding the grade. However, this facility shall not be availed of by a candidate who has taken the original degree certificate.

22 Improvement of Internal assessment: A student shall have the opportunity to improve his/her performance only once in the sessional examination component of the internal assessment. The conduct of the re-sessional examination shall be completed before the commencement of next semester end theory examinations by paying prescribed fee.

23 Supplementary examinations:

- In addition to the regular final examinations held at the end of each semester, supplementary final examinations will be conducted during the academic year. Candidates taking the regular / supplementary examinations as supplementary candidates may have to take more than one semester end examination per day. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period cannot be relaxed under any circumstances.
- A student eligible to appear in the semester end examination in any subject, but absent at it or failed (thereby failing to secure E-grade or above), may reappear for that subject at the supplementary as and when examination conducted. In such cases, his internal marks (CIA) assessed earlier for that subject will be carried over, and added to the marks to be obtained in the supplementary examinations, for evaluating his performance in that subject.

24 Instant examinations:

Candidates who fail in one theory subject of VIII semester can appear for instant supplementary examination conducted after declaration of the revaluation results of the VIII semester end examinations by paying prescribed fee.

25 Scribe/Reader/Interpreter:

- The facility of scribe/reader/interpreter shall be allowed for any persons who has physical disability of 40% or more, visually challenged, low vision, orthopedic disability (permanent or temporary) or with disability where the candidate cannot write the exams on his own hands, if desired by the candidate with prior approval from the Principal/Examination authority.
- Scribe/reader/interpreter should be from different discipline and approved by the Principal/Examination authority.

26 Graduation ceremony:

- The college shall have its own annual graduation ceremony for the award of degree to students completing the prescribed academic requirements in each case, in consultation with the university and by following the provisions in the Statute.
- The college shall institute prizes and awards/medals to meritorious students, for being given away annually.

27 Termination from the programme:

The admission of a student to the programme may be terminated and the student asked to leave the Institute in the following circumstances:

- The student fails to satisfy the requirements of the programme within the maximum period stipulated for that programme.
- The student fails to satisfy the norms of discipline/who indulge in ragging.

28 Conduct and discipline:

- Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.
- As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. This is monitored by anti-ragging committee and anti-ragging squad constituted by the college. Any form of ragging will be severely dealt with.
- The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures.
  - Lack of courtesy and decorum, indecent behavior anywhere within or outside the campus.
  - Wilful damage of college / individual property
  - Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
  - Mutilation or unauthorized possession of library books.
  - Watching of forbidden sites.
  - Noisy and unseemly behavior, disturbing studies of fellow students.
  - Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)
  - Usage of camera / cell phone in the campus
  - Plagiarism of any nature
- All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Principal.
- The principal shall deal with any academic problem, which is not covered under these rules and regulations. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

29 Grievance and redressal Committee:

Grievance and redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters.

30 Industrial Training:

The candidates have to undergo industrial training for one month (200 hours minimum) during the vacation after VI Semester examination or VIII Semester examination. The industrial training certificate should be submitted to the head of the department.

31 Amendments:

The regulations hereunder are subject to amendments as may be made by the academic council of the college from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the academic council.

32 General:

- Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the academic council is final.

33. MOOCs Courses: Students shall register for two MOOC courses, one in 7th Semester and the other one in 8th Semester either from the SWAYAM platform (MHRD) or from the university website and to allot four credits for each MOOC (2 X 4 = 8 credits) and submit the marks memorandum to the coordinator of MOOCs - CLPT (Autonomous).

34 Malpractices Rules:

S.No.	Nature of Malpractice	Punishment
	If the Candidate :	
01.	Writing erratic / irrelevant matters	Cancellation of paper
02	Writing obscene language / sketches	
03	Disclosing identity in any manner/writing their names and register number other than that provided in the answer-scripts and / or requesting for specific marks.	
04.	Leaving examination Hall without permission / not signing in the Attendance-sheet.	
05.	Possessing Printing / Handwritten Notes/ text-book / sizeable handwritten / printed text/ digitally displayed text	
06.	Copying or helping in copying/ Group copying/ communicate with any one inside or outside the hall or exchange answer books.	
07.	Invocation to Gods or any other marks of identification written anywhere in the answer book.	
08.	Possession of cell phones, programmable calculators, pen scanners, blue tooth equipment or any other equipment which may be used for any kind of malpractice.	
09.	Attempting to bribe/writing letter hinting at illegal gratification.	Cancellation of entire examinations of that semester
10.	Mutilating the answer book issued.	
11.	Misbehaving / Threatening Examination Official or Other Examinees / Smuggling out Question paper.	
12.	Receiving outside help.	Cancellation of entire examinations of that semester with debarment from appearing in any examination for 1 or 2 years excluding the current examination (or) rustication from the college.
13	Assaulting Examination Official	
14	Smuggling in/out answer script or attempting to do so	
15	Tampering answer book issued and replacement of pages	
16	Impersonation or helping others to impersonate.	

ANNEXURE - I

QUESTION PAPER PATTERN FOR CONTINUOUS INTERNAL ASSESSMENT

(Semester I to VIII)

Theory

Time : 90 Minutes **Total marks: 30**

SECTION – A

Answer all questions / All questions carry equal marks

(05 X 01 = 05 Marks)

1. Unit – I
2. Unit - II
3. Unit – III
4. Unit – I / II / III
5. Unit – I/ II / III

SECTION – B

Answer any five questions **(05 X 03 = 15 Marks)**

1. Unit – I
2. Unit - I
3. Unit – II
4. Unit – II
5. Unit – III
6. Unit – III

SECTION – C

Answer any two questions **(02 X 05 = 10 Marks)**

1. Unit – I
2. Unit – II
3. Unit – III

PRACTICALS

Time : 03 Hours **Total marks: 30**

1. Synopsis / Spotters - 02 Marks
2. Major Experiment - 10 Marks
3. Minor Experiment - 05 Marks
4. Viva-voce - 03 Marks
5. Attendance / Record - 10 Marks

ANNEXURE - II

Evaluation of Assignments / Seminars / Group discussion:

Assignments:

There shall be two assignments/semester, evaluated for **50 (2 X 25) marks** by Internal Examiner (s). The assignment should be a hand written document in A4 sheet with minimum of 15 pages.

The assignments of students are evaluated on following parameters

i) Content of the topic	: 10 Marks
ii) Presentation of facts, figures & Compilation	: 10 Marks
iii) References	: 05 Marks

Seminars:

There shall be two seminars/semester, evaluated for **50 (2 X 25) marks** by Internal Examiner(s).

The seminars of students are evaluated on following parameters

i)	Ideology	: 10 Marks
ii)	Presentation	: 10 Marks
iii)	Defense	: 05 Marks

Group discussion:

There shall be two group discussions/ semester, evaluated for **50 (2 X 25) marks** by Internal Examiner(s).

The group discussion is evaluated on following parameters

i)	Logical thinking & Reasoning Ability	: 10 Marks
ii)	Leadership skills & Communication Skills	: 10 Marks
iii)	Attitude	: 05 Marks

ANNEXURE - III

QUESTION PAPER PATTERN FOR SEMESTER END EXAMINATION

(Semester I to VIII)

Theory

Time : 03 Hours **Total marks: 70**

SECTION – A

Answer all questions / All questions carry equal marks 10X01 = 10 Marks

1. Unit – I
2. Unit - II
3. Unit – III
4. Unit – IV
5. Unit – V
6. Unit – VI
7. Unit – I / II / III
8. Unit – I / II / III
9. Unit – IV/ V / VI
10. Unit – IV/ V / VI

SECTION – B

Answer any five questions **05 X 04 = 20 Marks**

1. Unit – I
2. Unit – II
3. Unit – III
4. Unit – IV
5. Unit – V
6. Unit – VI
7. From any unit

SECTION – C

Answer any four questions **04 X 10 = 40 Marks**

1. Unit – I
2. Unit - II
3. Unit – III
4. Unit – IV
5. Unit – V
6. Unit – VI

PRACTICALS

Time : 04 Hours **Total marks: 70**

1. Synopsis/Spotters - 10 Marks
2. Major Experiment - 30 Marks
3. Minor Experiment - 20 Marks
4. Viva-voce - 10 Marks

ANNEXURE - IV

DRAFT FOR DISSERTATION / THESIS ORGANIZATION

The draft of the thesis/dissertation should be organized into following sections with subsections (if any).

- **Abstract**
- **Introduction**
- **Aim & Objectives**
- **Plan of Work**
- **Review of Literature**
- **Materials and Methods**
- **Observations and Results**
- **Discussion**
- **Summary and Conclusion**
- **References /Bibliography**
- **Appendices (Including publications and presentations)**

Refer the following guidelines to organize the draft and final electronic copy of the thesis/dissertation for B.Pharmacy programme.

A) Language:
Text language must be English.

B) Binding:
Dissertation shall be submitted as black/brown bound with colour laser print of front cover and back cover.

C) Front Cover:
Front cover shall bear clearly all information viz, dissertation title, name of candidate & mentor/ co-mentor if any, name of institute**,** year of submission etc., Format for front cover and spin is given herewith separately (**Annexure – VI**). The spin of thesis shall bear the name of the candidate, degree for which dissertation submitted, college and year of submission.

D) Paper:
It must be A4 size, printed on good quality white paper (Executive bond – 70 gsm) on one side of the paper only. Photographs and other special figures or tables may be printed on photographic quality paper.

E) Margins:
Left-hand margins should be 1.5" wide, to facilitate binding. All other margins should be well defined at approximately 1". Right-justification is necessary.

F) Font:
The main body of the text, a standard, easily legible, 12-point font is preferred (Times New Roman). Chapter titles and section headings may be in a different style and should stand out clearly from the text. Text styles and heading/sub heading styles should be consistent throughout the thesis. The thesis must be printed in black ink; printing should be laser or better quality.

Headings: 16 **Bold,** Sub Headings: 14 **Bold,** Body Text: 12

G) Page Numbers:
All pages must be numbered in sequence. The page numbers should be in lower case, Arabic numerals, right side at the bottom of the page, except for the title page, which is not numbered. Font size shall be 12-point and must be consistent throughout the text.

H) Line Spacing: 1.5 for main body text.

I) Order of Items:
The following should be the order of items in dissertation:

- Title Page
- Certificate from Head of Institute
- Certificate from Head of Department
- Certificate of the Guide/Mentor
- Certificate of Co-guide/Co-mentor; if any
- Certificate from Industry/research centre; if work carried at such place/s
- Declaration by the Candidate
- Acknowledgement
- Dedication Page (if any)
- Table of Contents
- List of Abbreviations
- List of Tables
- List of Figures
- Abstract
- Body of Thesis
- References
- Appendix (If any)

J) Title page:
The inside title page shall be the first sheet and shall contain all details as that of front cover page.

K) Certificates and Declaration by candidate:
All the applicable certificates and declaration by the candidate shall be as per format given by the institution.

L) Acknowledgement:

Any acknowledgement related to direct or indirect help/support etc., from the institute and outside the institute shall be mentioned but it should not be more than two pages, counter signed by the candidate.

M) Table of Contents:

The thesis must contain a complete table of contents. Individual entries (titles, headings, sub headings etc.,) that extend onto more than one line should be single-spaced; line spacing of 1.5 should be maintained between entries. For clarity, titles and sub headings should be in 14 point font, bold, regardless of their font size in the main body of the text. Page numbers listed in the table of content should be aligned at the centre of column.

N) List of Abbreviations, Figures and Tables:

Individual entries (titles, captions, etc.) that extend onto more than one line should be single spaced, but line spacing of 1.5 should be maintained between entries. It should follow the table of content, list of tables and figures in the order in which they occur in the text. The lists should include if any material inserted in a back pocket. All the standard abbreviation along with its full form shall be provided separately.

O) Abstract:

The thesis must contain an abstract. This should occupy a single page, and may be single spaced, if necessary. The abstract should contain the details like rationale, purpose, methodology, results, discussion, conclusion, significance of the work, societal influence and key words. There should be no illustrations or footnotes. Students are advised due to space limitations to shorten abstract to minimum 500 words.

P) Tables in body of thesis:

Tables should preferably show lines separating columns but not those separating rows except for the top row that shows column captions. Tables should be numbered consecutively in Arabic numerals and bear a brief title in bold face (font 14 bold), centrally aligned. Units of measurement should be abbreviated and placed below the column headings. Column headings or captions shall be in font 12 bold face. For units and symbols use of the International System of Units (SI) is recommended.

Q) Figures in body of thesis –

Figures including graphs, bar diagram, photographs etc, should be numbered consecutively in Arabic numerals. Figures should bear a brief title with font 14 bold face letters centrally aligned and below the figure. Graphs and bar graphs should preferably be prepared using Microsoft Excel and submitted as Excel graph pasted in Word or as that for figures. Photographs should be on glossy paper should bear a brief title with font 14 bold face letters centrally aligned and below the photograph.

R) Biological nomenclature

Names of plants, animals and bacteria should be in italics in entire dissertation including front cover and in references.

S) Observations and Result finding:

All findings shall be presented in tabular or graphical forms in the body of the thesis. The data should be statistically analyzed and the level of significance should be clearly stated. All Tables and figures must have a legend to make them self-explanatory.

T) Chemical reaction Scheme & Synthetic Protocol:

Chemical reaction scheme if any, shall be included within the text and given their own sequential numbering as scheme number (in sequence, using Arabic numerals - *i.e.* Scheme 1, 2, 3 *etc*.) or short title of scheme. ChemDraw, Chemsketch like preferred format for chemical structures should be used. Molecular structures are identified by Bold Arabic numerals assigned in order of presentation in the text. Once identified in the main text, compounds may be referred to by their name or by a defined abbreviation or by the bold Arabic numeral. Thesis must include synthetic experimental protocol, referring to amounts of reagents used. Standard abbreviations for reagents and solvents shall be used. Safety hazards and percent yields should be reported at the end of each protocol.

U) Spectral Data:

Spectral data of new compound or material under evaluation shall be submitted as figures, sequentially numbered as those other figures. High quality images of the spectrum shall be a part within the text or on a separate page.

V) Ethical Aspects:

Research misconduct as fabrication, falsification, or plagiarism, including misrepresentation of credentials, in proposing, performing, or reviewing research, or in reporting research work results shall be avoided. Investigators who use laboratory animals are obliged to follow humane procedures and shall obtain requisite permission prior to the initiation of such research work.

W) Discussion:

This section should follow observation & results, deal with the interpretation of results, convey how they helped to increase current understanding of the problem and should be logical. Unsupported hypothesis should be avoided. The Discussion should state the possibilities the results uncover, that need to be further explored. If results and discussion of results are combined under one title as Results and Discussion, observation section should be separate and shall follow materials and Methods.

X) References:

The references shall form the last section followed by 'Appendix' if any. It should contain list of works (Papers, Books, etc.) referred to in the body of the text. The numbering shall be done in numerals (e.g. 1, 2,) indicated as superscript along with the author's name & year in the text and shall appear in same sequence in the parenthesis. For any paper, name of author/s, title of paper, the name of journals in full form in *italic*, the volume number, the page number and the year of publication shall be written in parenthesis as per any existing standard format. For any book reference/s, the information shall contain the names of authors, name of chapter, title of book, publisher, page no. and the year of publication in parenthesis. For papers and books with joint authorship the names of all the authors shall be introduced in the same order. The author's name shall be the last name followed by initials. If bibliography is supplied it should be arranged in a logical order for each broad subject class and shall be arranged alphabetically.

Y) Appendices and other Supplementary Material:

Appendices may include certificates related to authentication of samples, evaluation of sample if carried out outside the institute etc., list of publication/presentation (if any), copyright permission letter (if any) etc.

Z) Electronic Format of thesis/dissertation:

Students must include entire dissertation in electronic format. A CD-ROM or DVD-ROM (read only) containing dissertation in pdf format should be submitted in a hard case and will go in the back pocket of the thesis. A description of the same including file names, formats, and a brief description of the contents, should be included as an appendix in the paper copy of the thesis. The CD/DVD-ROM must include both physical labels that list the name of candidate, Guide, institution and date.

Annexure - V

Title

Dissertation submitted to

Chalapathi Institute of Pharmaceutical Sciences, Lam, Guntur

In the Partial Fulfillment of the requirement

for the award of the Degree of

BACHELOR OF PHARMACY

Submitted By

Full Name of Candidate

Guide/ Mentor

Name of Guide/Mentor

Co-guide/Co-mentor

Name of Co-Guide/Co-Mentor

Name of College and Address

Year of Submission

Annexure - VI

Spin of Dissertation

B.Pharmacy
Name of the candidate **Name of the College and Address**
Year of Submission

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

I/IV B.PHARMACY 1st SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB101T	Pharmaceutics-I **(THEORY)**	4	1	0	5	4
CB102T	Pharmaceutical Chemistry-I **(Organic-I) (THEORY)**	4	1	0	5	4
CB103T	Human Anatomy and Physiology-I **(THEORY)**	4	0	0	4	4
CB104T	Computer Applications **(THEORY)**	3	0	0	3	4
CB105T	Integrated Grammer and Communication Skills **(THEORY)**	2	0	0	2	4
CB106T	Mathematics **(THEORY)**	2	1	0	3	4
	Biology **(THEORY)**	1	0	0	1	4
CB107P	Pharmaceutics-I **(PRACTICALS)**	0	0	6	6	4
CB108P	Pharmaceutical Chemistry - I **(Organic-I) (PRACTICALS)**	0	0	6	6	4
CB109P	Human Anatomy and Physiology-I **(PRACTICALS)**	0	0	4	4	4
CB110P	Computer Applications **(PRACTICALS)**	0	0	2	2	4
CB111P	Biology **(PRACTICALS)**	0	0	2	2	4
CB112	Assignments (2 x 25)	0	0	0	0	2
	Sports/Cultural/NSS	1	0	0	1	NC
	TOTAL	20$/19#	03$/02#	18$/20#	41	42$/46#

$ = Applicable ONLY for the Bi.P.C. Students
# = Applicable ONLY for the M.P.C. Students
L = Lecture T = Tutorial P = Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

I/IV B.PHARMACY 2nd SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB201T	Pharmaceutical Anlaysis-I **(THEORY)**	4	1	0	5	4
CB202T	Physical Pharmacy-I **(THEORY)**	4	1	0	5	4
CB203T	Human Anatomy and Physiology-II **(THEORY)**	4	0	0	4	4
CB204T	Pharmaceutical Chemistry-II **(Inorganic) (THEORY)**	3	0	0	3	4
CB205T	Professional ethics and human values **(THEORY)**	2	0	0	2	4
CB206T	Soft Skills **(THEORY)**	2	0	0	2	4
CB207P	Pharmaceutical Analysis-I **(PRACTICAL)**	0	0	6	6	4
CB208P	Physical Pharmacy-I **(PRACTICAL)**	0	0	6	6	4
CB209P	Human Anatomy and Physiology-II **(PRACTICAL)**	0	0	4	4	4
CB210	Assignments	0	0	0	0	2
	Sports/Cultural/NSS	1	0	0	1	NC
	TOTAL	20	02	16	38	38

L = Lecture T = Tutorial P = Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

II/IV B.PHARMACY 3RD SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB301T	Pharmaceutical Chemistry-III **(Organic-II) (THEORY)**	4	1	0	5	4
CB302T	Pharmaceutical Microbiology **(THEORY)**	4	1	0	5	4
CB303T	Physical Pharmacy - II **(THEORY)**	4	1	0	5	4
CB304T	Pharmaceutical Jurisprudence **(THEORY)**	4	1	0	5	4
CB305T	Environmental Sciences **(THEORY)**	2	0	0	2	4
CB306P	Pharmaceutical Chemistry-III **(Organic-II) (PRACTICALS)**	0	0	6	6	4
CB307P	Pharmaceutical Microbiology **(PRACTICALS)**	0	0	6	6	4
CB308P	Physical Pharmacy - II **(PRACTICALS)**	0	0	6	6	4
	Sports/Cultural/NSS	1	0	0	1	NC
	TOTAL	**19**	**4**	**18**	**41**	**32**

L : Lecture T : Tutorial P : Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

II/IV B.PHARMACY 4th SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB401T	Pharmaceutical Engineering **(THEORY)**	4	1	0	5	4
CB402T	Biochemistry **(THEORY)**	4	1	0	5	4
CB403T	Pharmaceutical Chemistry-IV (Medicinal Chemistry -I) **(THEORY)**	4	1	0	5	4
CB404T	Pharmacology- I **(THEORY)**	4	1	0	5	4
CB405T	Pathophysiology **(THEORY)**	4	1	0	5	4
CB406P	Pharmaceutical Engineering **(PRACTICALS)**	0	0	6	6	4
CB407P	Biochemistry **(PRACTICALS)**	0	0	6	6	4
	Group Discussion	1	0	0	1	NC
	Sports/Cultural/NSS	1	0	0	1	NC
	TOTAL	**22**	**05**	**12**	**39**	**28**

L = Lecture T = Tutorial P = Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

III/IV B.PHARMACY 5TH SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB501T	Pharmacognosy-I **(THEORY)**	4	1	0	5	4
CB502T	Pharmaceutics-II **(THEORY)**	4	1	0	5	4
CB503T	Pharmaceutical Biotechnology **(THEORY)**	4	1	0	5	4
CB504T	Pharmacy Practice **(THEORY)**	4	1	0	5	4
CB505T	Pharmaceutical Quality Assurance **(THEORY)**	4	1	0	5	4
CB506P	Pharmacognosy - I **(PRACTICALS)**	0	0	6	6	4
CB507P	Pharmaceutics-II **(PRACTICALS)**	0	0	6	6	4
	Seminars	1	0	0	1	NC
	Sports/Cultural/NSS	1	0	0	1	NC
	TOTAL	**22**	**05**	**12**	**39**	**28**

L : Lecture T : Tutorial P : Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

III/IV B.PHARMACY 6th SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB601T	Pharmaceutical Chemistry-V (Medicinal Chemistry-II) **(THEORY)**	4	1	0	5	4
CB602T	Biopharmaceutics and Pharmacokinetics **(THEORY)**	4	1	0	5	4
CB603T	Pharmacognosy-II **(THEORY)**	4	1	0	5	4
CB604T	Social and Preventive Pharmacy **(THEORY)**	4	1	0	5	4
CB605P	Pharmaceutical Chemistry-V (Medicinal Chemistry-II) **(PRACTICALS)**	0	0	6	6	4
CB606P	Biopharmaceutics and Pharmacokinetics **(PRACTICALS)**	0	0	6	6	4
CB607P	Pharmacognosy-II (**PRACTICALS**)	0	0	6	6	4
	Seminars	1	0	0	1	NC
	Sports / Cultural / NSS	1	0	0	1	NC
	TOTAL	**18**	**04**	**18**	**40**	**28**

L = Lecture T = Tutorial P = Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

IV/IV B.PHARMACY 7TH SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB701T	Pharmacology-II **(THEORY)**	4	1	0	5	4
CB702T	Pharmaceutical Analysis-II **(THEORY)**	4	1	0	5	4
CB703T	Novel Drug Delivery Systems **(THEORY)**	4	1	0	5	4
CB704T	Herbal Drug Technology **(THEORY)**	4	1	-	5	4
CB705P	Pharmacology-II **(PRACTICALS)**	0	0	6	6	4
CB706P	Pharmaceutical Analysis-II **(PRACTICALS)**	0	0	6	6	4
	Project	0	0	3	3	0
	Enterpreneurship skills/ technical skills	1	0	0	1	NC
	TOTAL	**17**	**04**	**15**	**36**	**24**

L = Lecture T = Tutorial P = Practical

SCHEME OF INSTRUCTION (SEMESTER SYSTEM)

IV/IV B.PHARMACY 8th SEMESTER

Subject Code	Subject	Scheme of Instructions (Periods per Week)				No. of Credits
		L	T	P	Total	
CB801T	Biostatistics and Research Methodology **(THEORY)**	4	1	0	5	4
CB802T	Pharmaceutical Chemistry-V (Chemistry of Natural Products) **(THEORY)**	4	1	0	5	4
CB803T	Elective-I **(THEORY)**	4	1	0	5	4
CB804P	Elective-II **(THEORY)**	4	1	0	5	4
CB805P	Pharmaceutical Chemistry-V (Chemistry of Natural Products) **(PRACTICALS)**	0	0	0	6	4
CB806	Project	12	0	0	12	4
CB807	Practice School	0	0	4	4	4
	TOTAL	**28**	**04**	**04**	**42**	**28**

MOOCs Courses: Students shall register for two MOOC courses, one in 7th Semester and the other one in 8th Semester either from the SWAYAM platform (MHRD) or from the university website and to allot four credits for each MOOC (2 X 4 = 8 credits) and submit the marks memorandum to the coordinator of MOOCs - CLPT (Autonomous).

L = Lecture T = Tutorial P = Practical

RULES & REGULATIONS FOR PREVENTION AND PROHIBITION OF RAGGING

The All India Council for Technical Education (AICTE), New Delhi vide its Notification No. 37-3/Legal/AICTE/2009, dated 25/03/2009 has taken a very serious view of ragging incidences in educational institutions and on Directions of the Hon'ble Supreme Court of India vide its Order dated 16/05/2007 has ordered strict implementation of following rules and regulations for Prevention and prohibition of Ragging in technical Institutions.

Various Types of Ragging:

The Hon'ble Supreme Court has, inter-alia, mentioned the following types of Ragging:

01. Ragging has several aspects with, among others, psychological, social, political, economic, cultural and academic dimensions.
02. Any act that prevents, disrupts of disturbs the regular academic activity of a student should be considered with in the academics related aspect of ragging; similarly, exploiting the services of a junior student for completing the academic tasks assigned to an individual or a group of seniors is also an aspect of academics related ragging prevalent in many institutions, par ticularly in the technical institutions.
03. Any act of financial extortion or forceful expenditure burden put on a junior student by senior students should be considered an aspect of ragging for ragging economic dimensions.
04. Any act of physical abuse including all variants of it; sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestured, causing bodily harm or any other danger to health or person can be put in the category of ragging with criminal dimensions.
05. Any act or abuse by spoken words, emails, snail-mails, blogs, public insults should be considered with in the psychological aspects of ragging. This aspect would also include deriving pervented pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to others; the absence of preparing 'freshers' in the run up to their admission to higher education and life in hostels also can be ascribed as a psychological aspect of ragging - coping skills in interaction with seniors or strangers can be imparted by parents as well. Any act that affects the mental health and self-confidence of students also can be described in terms of the psychological as pects of ragging.

06. The human rights perspective of ragging involves the injury caused to the fundamental right to human dignity through humiliation heaped on junior students by seniors; often resulting in the extreme step of suicide by the victims.

Actions to be taken against students for indulging and abetting in Ragging in technical institutions Universities including Deemed to be University imparting technical education:

01. The punishment to be meted out to the persons indulged in ragging has to be exemplary and justifiably harsh to act as a deterrent against recurrence of such incidents. The students who are found to be indulged in ragging should be debarred from taking admission in any technical institution in India.
02. Every single incident of ragging a First Information Report (FIR) must be filed without exception by the institutional authorities with the local police authorities.
03. Depending upon the nature and gravity of the offence as established by the Anti-Ragging Committee of the institution, the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:
    - i) Cancellation of admission
    - ii) Suspension from attending classes
    - iii) Withholding/withdrawing scholarship/fellowship and other benefits
    - iv) Debarring from appearing in any test / examination or other evaluation process.
    - v) Withholding results.
    - vi) Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
    - vii) Suspension/expulsion from the hostel.
    - viii) Rustication from the institution for period ranging from 1 to 4 semesters.
    - ix) Expulsion from the institution and consequent debarring from admission to any other institution.
    - x) Fine of Rupees 25,000/-
    - xi) **Collective punishment:** when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers.

04. The institutional authority shall intimate the incidents of ragging occurred in their premises along with actions taken to the Council immediately after occurrence of such incident and inform the status of the case from time to time.

05. Courts should make an effort to ensure that cases involving ragging are taken up on priority basis to send the correct message that ragging is not only to be discouraged but also to be dealt with sternness.

SETTING UP OF ANTI-RAGGING COMMITTEE, ANTI-RAGGING SQUAD AND THEIR FUNCTIONS

The Anti-Ragging Committee:

The anti-ragging committee shall be headed by the Head of the Institution and shall consist of representatives of Civil & Police administration, local media, non-government organizations involved in youth activities, faculty members, parents, students belonging to the freshers category as well as seniors and non-teaching staff. It shall monitor the Anti Ragging activities in the institution, consider the recommendations of the Anti-Ragging Squad and take appropriate decisions, including spelling out suitable punishments to those found guilty.

The Anti-Ragging Squad:

The Anti-Ragging Squad shall be nominated by the Head of the Institution with such representation as considered necessary and shall exclusively consists of members belonging to the various sections of the campus community. The squad shall have vigil, oversight and patrolling functions. It shall be kept mobile, alert and active at all times and shall be empowered to inspect places of potential ragging and make surprise raids on hostels and other hot spots. The squad shall investigate incidents of ragging and make recommentations to the Anti-Ragging Committee and shall work under the overall guidance of the Anti-Ragging Committee.

Chalapathi Institute of Pharmaceutical Sciences Constituted Anti-Ragging Committee and Anti-Ragging Squad with the following members to curb ragging and eve-teasing in the college premises and hostels.

ANTI-RAGGING COMMITTEE

S.No.	Name	Designation	Mobile
01.	Prof.Rama Rao Nadendla	Principal	9440101685
02.	Prof.K.N.Rajini Kanth	Professor	9490584053
03.	Sri.V.Pradeep Kumar	Librarian	9866647276
04.	Sri.P.Prachet	Asst. Professor	8099993114
05.	Sri.B.Venu Babu	Resident Warden Boys Hostel	9347160547
06.	Sri.P.Bhanu Prakash	Physical Director	9959577742
07.	Mrs.V.Pallavi	Asst. Professor	9441752983
08.	Mrs.J.Naga Lakshmi	Asst. Professor	9885808600
09.	Smt.P.Sarada Lakshmi	Resident Warden Girls Hostel	9849886239
10.	Smt.N.Rama Devi	Resident Warden Girls Hostel	7286037970
11.	Smt.Padma	Resident Warden Girls Hostel	7036619369
12.	Sri.P.Gopal Rao	Campus Incharge	8497990642
13.	Sri.Kosaraju Ravindra	Civil Member	9440808628
14.	Miss.K.Mounika	IV B.Pharmacy	9490258289
15.	Mr.B.Sai Ram Krishna	IV B.Pharmacy	6309115056
16.	Mr.M.Uday Kumar	II B.Pharmacy	9121812836
17.	Miss.Sahera Bhanu	II B.Pharmacy	7093689721

ANTI-RAGGING SQUAD

01.	Prof.K.N.Rajini Kanth	Professor	9490584053
02.	Mr.K.Vijay Kumar	Asst. Professor	8008825820
03.	Mr.D.Eswar Tony	Asst. Professor	9666627705
04.	Sri.P.Prachet	Asst. Professor	8099993114
05.	Sri.P.Bhanu Prakash	Physical Director	9959577742
06.	Mrs.V.Pallavi	Asst. Professor	9441752983
07	Mrs.J.Naga Lakshmi	Asst. Professor	9885808600
08.	Smt.P.Sarada Lakshmi	Resident Warden Girls Hostel	9849886239
09.	Smt.N.Rama Devi	Resident Warden Girls Hostel	7286037970
10	Smt.V.Padma	Resident Warden Girls Hostel	7036619369
11	Sri B.Venu Babu	Resident Warden Boys Hostel	9347160547

CB101T

I/IV B. PHARMACY-1st SEMESTER
PHARMACEUTICS-I
[Theory -75Hours]

Scope:
This course is designed to impart a fundamental knowledge of history of pharmacy, Pharmacopoeias, and on the preparatory pharmacy with arts and science of formulating different conventional dosage forms.

Learning objectives:
Upon completion of this course the student should be able to:

- Understand about pharmacy profession and the role of pharmacist.
- Understand the basics of the appropriate handling and use of various dosage forms.
- Understand the concepts of pharmaceutical calculations and metrology.
- Know the importance and principles involved in compounding of different pharmaceutical products.
- Explain the proper use and therapeutic advantages and disadvantages of dosage forms
- Understand the concept of packaging of different dosage forms.
- Know the concept of extraction techniques and compounding of galenicals.

Topic	Duration	References
Unit-1 Introduction to pharmaceutics	**12 hrs**	1. The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 1, 2 and 24. 2. Bentley's textbook of pharmaceutics. E.A. Rawlins. 8th edition, All India Traveller Bookseller, New Delhi, India, 2004, Ch. No. 20-22. 3. Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 1st Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 8.
1.1.Origin and history of pharmacy: Pharmacy education, areas of pharmacy profession, history and development of pharmaceutical industry in India.	02 hrs	
1.2.Development of Pharmacopoeias Pharmacopoeia-Definition, Significance, Monograph and its contents, History, Salient features and Latest editions of Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia, International Pharmacopoeia, European Pharmacopoeia.	04 hrs	

1.3.Metrology and Pharmaceutical calculations Weights and measures – imperial & metric system conversions, calculations involving volume and weight relation, percentage solutions, alligation method, proof spirit	06 hrs	
Unit-2 Concept of drug, dosage forms, excipients and packaging materials	**12 hrs**	1. Ansel's pharmaceutical dosage forms and drug delivery systems. Loyd V. Allen, Nicholas G. Popovich and H.C. Ansel. 9th Edition, 2010, Ch. No. 1. 2. Lachman, Liberman's, the theory and practice of Industrial Pharmacy. Roop K Khar, 4th Edition, CBS Publishers and distributors Pvt. Ltd., New Delhi, 2013, Ch. No. 2. 3. A textbook of professional pharmacy. N K Jain and S.N. Sharma, 5th Edition, Vallabh Prakashan, Delhi, 2007, Ch. No. 1, 2 and 13. 4. The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 51. 5. Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 1st Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 3.
2.1. Drug, dosage forms, excipients Drug-definition, sources of drugs; Dosage forms classification and definitions; Excipients-definition, ideal properties, types of excipients and uses of excipients.	05 hrs	
2.2. Packaging materials: Desirable features of container-types of containers; Study of glass, plastics, metal as materials for containers; use of paper as packaging material; Types of closures, rubber as a closure material and its evaluation; Importance of labeling and labelling information for various dosage forms; concept of general storage conditions and their related temperatures.	07 hrs	

Unit-3 Liquid dosage forms	**18** hrs	1. Lachman, Liberman's The theory and practice of Industrial Pharmacy. Roop K Khar, 4th Edition, CBS Publishers and distributors Pvt. Ltd., New Delhi, 2013, Ch. No. 17-18. 2. Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 1st Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 10-11. 3. Aulton's Pharmaceutics- The design and manufacture of medicines. Aulton and Taylor. 4th Edition, Churchill Livingston Elsevier, Philadelphia, USA, 2013, Ch. No. 26-27. 4. Bentley's textbook of pharmaceutics. E.A. Rawlins. 8th edition, All India Traveller Bookseller, New Delhi, India,2004, Ch. No. 18. 5. A textbook of professional pharmacy. N K Jain and S.N. Sharma, 5th Edition, Vallabh Prakashan, Delhi, 2007, Ch. No. 14-15. 6. Ansel's pharmaceutical dosage forms and drug delivery systems. Loyd V. Allen, Nicholas G. Popovich and H.C.Ansel. 9th Edition, 2010, Ch. No. 14.
3.1.Monophasic liquid dosage forms Definitions, classification of monophasic liquid dosage forms; waters used for pharmaceutical preparations; factors affecting drug solubility in liquids; Preparation and dispensing of liquid dosage forms in the following categories: **3.1.1 Liquids for internal administration:** Syrups: Simple syrup IP, compound ferrous phosphate syrup IP, orange syrup IP Elixirs: Paracetamol paediatric elixir IP, Terpin hydrate elixir USP Spirits: Aromatic spirit of ammonia IP Linctuses: codeine Linctus IP **3.1.2 Liquids for external administration:** 3.1.2.1 Liquids Applied on skin: Lotions: calamine lotion IP, Salicylic acid lotion BP Liniments: Turpentine liniment, soap liniment Collodion: Flexible collodion IP, pyroxylin collodion IP 3.1.2.2 Liquids Instilled into body cavities: Douches: Potassium permanganate douche Enemas: Soft soap enema Drops: Sodium bicarbonate ear drops, Ephedrine nasal drops Inhalations: Isoprenaline nasal spray 3.1.2.3 Liquids Used in the Mouth	08 hrs	

Gargles: Potassium chlorate and phenol gargle BPC Mouthwashes: Compound sodium chloride mouthwash BPC Throat paints: Compound iodine paint BPC **3.1.3 Aromatic waters as Medicated and Pharmaceutical aids** Chloroform water IP, concentrated peppermint water B.P.C, Concentrated cinnamon water BPC **3.1.4 Solutions for internal and external use:** Aqueous iodine solution IP, Strong iodine solutions, weak iodine solution IP, Strong ammonium acetate solution IP		
3.2 Biphasic liquid dosage forms **3.2.1 Suspensions:** Definition, advantages and disadvantages, ideal suspension, Purpose of suspension, classification of suspensions, suspending agents, Method of dispensing of suspensions containing diffusible solids, indiffusible solids, precipitate forming liquids, Preparation and dispensing of Magnesium hydroxide mixture BP, Paediatric chalk mixture BPC, Aluminium hydroxide gel IP; Concept of formulation and evaluation of dry powders for suspensions	05 hrs	
3.2.2 Emulsions: Definition, advantages, purpose, emulsion types, emulsifying agents and their selection, methods for preparation of emulsions by Dry gum, wet gum and bottle	05 hrs	

methods, tests for identification of emulsion type, instabilities of emulsion, official examples: Preparation and dispensing of Mineral oil emulsions.		
Unit-4 Solid dosage forms	**10** hrs	1. Aulton's Pharmaceutics- The design and manufacture of medicines. Aulton and Taylor. 4th Edition, Churchill Livingston Elsevier, Philadelphia, USA, 2013, Ch. No. 28. 2. Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 1st Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 12.
4.1.Powders Definition of powder, advantages and disadvantages, mixing of powders, problems encountered during mixing of powders, classification of powders, bulk powders for external and internal use, special powders and their dispensing. **4.2.Granules:** Definition of granules, advantages of granules; preparation of effervescent granules; packing and labeling of granules.	08 hrs 02 hrs	
Unit-5 Semisolid dosage forms	**14** hrs	1.Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 1st Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 13-14. 2.Bentley's textbook of pharmaceutics. E.A. Rawlins. 8th edition, All India Traveller Bookseller, New Delhi, India, 2004, Ch. No. 25-26. 3.Lachman, Lieberman's The theory and practice of Industrial Pharmacy. Roop K Khar, 4th Edition, CBS Publishers and distributors Pvt. Ltd., New Delhi, 2013, Ch. No. 19-20. 4.Ansel's pharmaceutical dosage forms and drug delivery systems. Loyd V. Allen, Nicholas G. Popovich and H.C. Ansel. 9th Edition, 2010, Ch. No. 10 and 12.
5.1.Suppositories-Suppositories definition, types of suppositories and their advantages, disadvantages; ideal requirements, types, advantages and disadvantages of suppository bases; methods of preparation of suppositories; displacement value and its calculations; evaluation of suppositories.	06 hrs	
5.2. Ointments, Creams, Pastes and Gels Definitions, advantages, disadvantages, Classification, formulation and compounding of ointments, creams, gels, pastes and study of the following preparations: Compound benzoic acid ointment, Lime cream, Cetrimide cream, Tragacanth lubricating gel, Unnas' paste, Lassar's Paste.	08 hrs	

Unit-6 Galenicals	**09 hrs**	1. A textbook of professional pharmacy. N K Jain and S.N. Sharma, 5th Edition, Vallabh Prakashan, Delhi, 2007, Ch. No. 7. 2. The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 39.
Principle of extraction, factors affecting extraction, Extraction process by maceration, percolation. Study of tinctures and extracts Study of following official preparations: Orange tincture IP, Benzoin tincture BPC, Bael liquid extract IP, Quillia liquid extract BPC.	09 hrs	

CB102T

I/IV B. PHARMACY-1st SEMESTER
Pharmaceutical Chemistry-I (Organic-I)
[Theory -75Hours]

Scope of the subject:

Pharmaceutical organic chemistry imparts knowledge on fundamental and basic concepts involved in molecular properties and chemical reactions that take place in organic compounds. This subject provides an understanding of electron displacement reactions, chemistry of reactive intermediates, structure, nomenclature, physical and chemical properties, isomerism, methods of preparation and reaction mechanisms involved in organic compounds. In addition to the theoretical concepts, the student will be familiarized with the basic practical knowledge relevant to the synthesis, characterization, purification and identification of organic compounds. The subject will make the student to gain knowledge, skills, good understanding of pharmaceutical organic chemistry and apply in the interdisciplinary subjects in next course levels.

Outcome of the subject:

At the end of the course the student will be able to:

- Gain knowledge on fundamental principles of organic chemistry
- Understand the nomenclature, structure and properties of organic compounds
- Understand the relationship between electronic structures and chemical properties
- Construct molecular models of organic compounds
- Understand various reactive intermediates and reaction mechanisms
- Gain adequate practical knowledge in synthesis, characterization and identification of organic compounds
- Learn how pharmaceutical chemistry contributes at the interface with pharmacy.

Unit No.	Topic	Duration (Hrs)	References
01	**Structure and properties of organic compounds:** a. Atomic, molecular orbitals, hybridization and electronic configuration b. Characteristic features of covalent bond, hydrogen bond and ionic bond	12 hrs	1. Organic chemistry, Robert Thornton Morrison and Robert Neilson Boyd, 6th edition, Dorling kindersley Pvt. Ltd., 2008, chapter 01.

	c. Polarity of bonds and molecules d. Inter and intra molecular forces e. Bond dissociation energy - homolysis and heterolysis f. Energy of activation g.Introduction to structural isomerism		2. Organic chemistry, I.L. Finar, vol-I, 6th edition, Pearson education Ltd., 2003, chapter 02. 3. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapters 01, 02 and 07.
02	**Nomenclature and types of organic reactions** a.. Nomenclature of aliphatic and aromatic organic compounds possessing various functional groups. b. Types of organic reactions and their mechanisms c. Reactive intermediates: Free radicals, carbocations, carbanions and carbenes. d. Electron displacement effects: inductive, electromeric and mesomeric effects. e. Resonance and hyperconjugation f. Protic and aprotic solvents.	10 hrs	1. Organic chemistry, I.L. Finar, vol-I, 6th edition, Pearson education Ltd., 2003, chapter 02. 2. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapters 04, 05 and 06.
03	**Hydrocarbons:** a. General methods to prepare alkanes, alkenes, alkynes and cycloalkanes. b. Free radical chain reactions of alkanes – mechanism, relative reactivity and stability. c. Orientation and reactivity of electrophilic addition reactions in alkenes: Markovnikov's rule, peroxide effect and ozonolysis. d. Addition of hydrogen halides to alkynes, polymerization reaction and acidity of alkynes.	15 hrs	1. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapters 08, 09, 10 and 12. 2. Organic chemistry, Robert Thornton Morrison and Robert Neilson Boyd ,6th edition, Dorling kindersley

	e. Bayer's strain theory and orbital picture of angle strain. f. Stability of conjugated dienes, mechanism of 1, 2 and 1, 4-additions with examples, effect of temperature.		Pvt. Ltd., 2008, chapters 03, 08, 09, 12 and 13. 3. Organic chemistry, T.W. Graham Solomons, Craig. B. Fryhle, 8th edition, John wiley & sons, Inc., 2004, chapter 04.
04	**Alcohols, Ethers and Alkyl halides:** a. General methods to prepare monohydric alcohols, ethers and alkyl halides. b. Brief account of absolute alcohol and rectified spirit. c. Characteristic reactions of alcohols, chemical tests to distinguish alcohols, dehydration of alcohols and Saytzeff's rule. d. Mechanism, orientation and reactivity of E2 and E1 reactions, oppenauer oxidation e. Cleavage of ethers by acids, mechanism of Williamson's synthesis. f. Nucleophilic aliphatic substitution: Mechanism, reactivity, stereochemistry, kinetics and factors influencing $S_N1$and S_N2 reactions.	12 hrs	1. Organic chemistry, Robert Thornton Morrison and Robert Neilson Boyd, 6th edition, Dorling kindersley Pvt. Ltd., 2008, chapters 05 and 06. 2.Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapters 13,14 and 15. 3. Organic chemistry, T.W. Graham Solomons, Craig. B. Fryhle, 8th edition, John wiley & sons, Inc., 2004, chapters 02 and 11.
05	**Carbonyl compounds**: a. Classification and general methods to prepare carbonyl compounds b. Nucleophilic addition in aldehydes and ketones, addition of sodium bisulphite, hydrogen cyanide, alcohols, grignard reagent and ammonia derivatives	12 hrs	1. Organic chemistry, Robert Thornton Morrison and Robert Neilson Boyd, 6th edition, Dorling kindersley Pvt. Ltd., 2008, chapters 18 and 27.

	c. Mechanism of aldol condensation, mixed aldol condensation, cannizaro's reaction, crossed cannizaro's reaction, reformatsky reaction, perkin reaction, benzoin condensation and knoevenagel reaction.		2. Organic chemistry, I.L. Finar, vol-I, 6th edition, Pearson education Ltd., 2003, chapters 08 and 12. 3. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapters 19 and 22.
06	**Carboxylic acids and acid derivatives**: a. General methods to prepare carboxylic acids, acid chlorides, acid amides, anhydrides and esters. b. Acidity of carboxylic acids, effect of substituents on acidity. Nucleophilic acyl substitution in carboxylic acid derivatives, conversion of acids to acid chlorides, amides, esters and anhydrides, HVZ reaction and claisen condensation reactions. c. Preparation and synthetic uses of acetoacetic and malonic esters.	14 hrs	1. Organic chemistry, Robert Thornton Morrison and Robert Neilson Boyd, 6th edition, Dorling kindersley Pvt. Ltd., 2008, chapters 19 and 20. 2. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapters 20 and 21.

Further readings:

1. Jerry March, Advanced organic chemistry. 4th edition, A Wiley Interscience publication, 2005.
2. Roger Macomber, Organic Chemistry, vol I & II, Viva books Pvt. Ltd., 2004.
3. Maitland Jones JR. Organic chemistry, 2nd edition, W.W. Norton & Company, 2000.
4. Paula yurkanis Bruice, Organic chemistry 3rd edition, Pearson publication Ltd., 2003.

CB103T

I / IV B. PHARMACY-1st SEMESTER
Human Anatomy and Physiology-I
[Theory -50Hours]

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both functional integrity of various systems and homoeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

1. Identify the various tissues and organs of different systems of human body.
2. Explain the gross morphology, structure and functions of various organs of the human body.
3. Appreciate coordinated working pattern of different organs of each system.
4. Describe the various homeostatic mechanisms and their imbalances.
5. Identify various tissues or organs using permanent slides, specimens or models.
6. Perform the various physiological experiments using simulator software.

Chapter / Topic	Duration (Hours)	References
UNIT - I	**8 hrs**	
1. INTRODUCTION TO THE HUMAN BODY — Definition and scope of anatomy and physiology, levels of structural organization, characteristics of the living human organism, basic life process, homeostasis and basic anatomical terminology. **2. CELLULAR LEVEL OF ORGANIZATION** — Structure and functions of cell — Transport across the plasma membrane — Cell division and its regulation, cell junctions — General principles of cell communication — Intracellular signaling pathway activation by extracellular signal molecule	2 hrs 6 hrs	Anatomy and physiology - Gerard J. Tortora; 2014 India edition; Wiley publications; Unit:1 & 3 (Chapter: 1- 5)

— Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine		
UNIT - II	**9 hrs**	
1. TISSUE LEVEL OF ORGANIZATION — Types of tissues and their origins, cell junctions, epithelial tissue, muscular tissue, nervous tissue, connective tissue, membranes, excitable cells and tissue repair. **2. MUSCULAR TISSUE & MUSCULAR SYSTEM** — Overview on muscular tissues, skeletal muscle tissue, mechanism of contraction and relaxation of skeletal muscle fibers, muscle metabolism, types of skeletal muscle fibers, cardiac muscle, smooth muscle, and regeneration of muscular tissue	6 hrs 3 hrs	1.Ross and wilson Anatomy and physiology in health and illness - Anne Waugh & Allison Grant; 10th edition; Churchill living stone publications. Chapter : 3. 2.Principles of anatomy and physiology - Gerard J. Tortora; 2014 Indian edition; Wiley publica-tions; Unit : 10.
UNIT - III	**8 hrs**	
1. INTEGUMENTARY SYSTEM & OTHER SPECIAL SENSES — Structure of the skin, accessory structures of the skin, types of skin, functions of the skin. maintaining homeostasis: skin wound healing — Olfaction: Sense of Smell, Gustation: Sense of taste, vision, hearing and equilibrium — Basic understanding on diseases related to skin, eye, ear, nose and tongue.	3 hrs 5 hrs	1. Principles of anatomy and physiology - Gerard J.Tortora; 2014 Indian edition; Wiley publications; Unit: 5 – 9.

2. SKELETAL SYSTEM & JOINTS — ***Bone tissue***: Functions of bone and the skeletal system, structure of bone, histology of bone tissue, blood and nerve supply of bone, bone's role in calcium homeostasis, exercise and bone tissue — ***The axial skeleton***: divisions of the skeletal system, types of bones, skull, hyoid bone, vertebral column, thorax — ***The appendicular skeleton***: Pectoral (shoulder) girdle, upper limb (extremity), pelvic (hip) girdle, comparison of female and male pelvis, lower limb (extremity) — ***Joints***: Joint classifications, fibrous joints, cartilaginous joints, synovial joints, types of movements at synovial joints, types of synovial joints — Basic understanding on diseases related to bones and joints		2. Ross and Wilson Anatomy and physiology in health and illness - Anne Waugh & Allison Grant; 10th edition, Churchill living stone publications. Chapter:16
UNIT – IV	**8 hrs**	
RESPIRATORY SYSTEM — Gross anatomy of respiratory system, pulmonary ventilation, lung volumes and capacities, exchange of oxygen and carbon dioxide, transport of oxygen and carbon dioxide, control of respiration, exercise and the respiratory system — Artificial respiration and resuscitation methods — Basic understanding on diseases related to respiratory system	8 hrs	1.Principles of anatomy and Physiology - Gerard J. Tortora; 2014 Indian edition Wiley publications; Unit : 23 2.Ross and Wilson Anatomy and physiology in health and illness - Anne Waugh & Allison Grant; 10th edition, Churchill living stone publications. Chapter: 10.

UNIT - V	9 hrs	
DIGESTIVE SYSTEM — Overview of the digestive system, layers of the GI tract, neural innervation of the GI tract, peritoneum, mouth, pharynx, esophagus, deglutition, stomach, pancreas, liver, gallbladder, small intestine and large intestine. — Acid production in the stomach, phases of digestion. — Basic understanding on diseases related to digestive system.	8 hrs	Principles of anatomy and physiology - Gerard J. Tortora; 2014 Indian edition; Wiley publications; Unit: 24.
UNIT - VI	**8 hrs**	
URINARY SYSTEM — Overview of kidney functions, anatomy and histology of the kidneys, overview of renal physiology, glomerular filtration, tubular reabsorption and tubular secretion, production of dilute and concentrated urine, evaluation of kidney function, urine transportation, storage and elimination — Fluid, electrolyte, and acid–base homeostasis: fluid compartments and fluid balance, electrolytes in body fluids, acid–base balance — Basic understanding on diseases related to urinary system.	6 hrs 2 hrs	Principles of anatomy and physiology - Gerard J.Tortora; 2014 Indian edition; Wiley publications; Unit: 26

CB104T

I/IV B. PHARMACY-1st SEMESTER
Computer Applications
[Theory – 50 Hours]

Scope of the subject:
Computer science has played a central role in many of the greatest technological innovations and developments. This subject deals with the introduction to computers, operating system and computer applications in Pharmaceutical studies.

Outcome of the subject:
At the end of the course the student will be able to:

- Know the basics of computer architecture.
- Understand the operation of computer software and high level languages.
- Acquire knowledge about the applications of computers in pharmacy.

Unit. No	Topic	Duration (Hours)	References
01	**Introduction to computers**: History of computers, characteristics and generations of computers, components of computer, input and output devices, memory devices, languages and classification of computers.	10 hrs	1. Computer fundamentals, Pradeep K.Sinha, Priti sinha, 3rd edition, BPB publishers: Chapter 1,2,4,5,7,11,12,20 2. Computer fundamentals and C programming, Pooja jain, S.Vikas publishers, 1st edition 2009; Unit 1, Chapter 1,2,3,4. 3. Computer eduation, Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit -1(13-63)
02	**Flow chart and algorithm development** Definition and properties of the algorithm, flowchart symbols and their uses, conversion of algorithm / flowchart to high level language.	08 hrs	1. Computer fundamentals -3rd edition Pradeep K.Sinha,priti sinha. Chapter 14,17,18.(ISBN – 81-7656-752-3)

	Operating system: Types and functions of operating system, files present in DOS, internal and external commands of DOS, UNIX and WINDOWS.		2. Computer fundamentals and C programming -Pooja jain, S.Vikas publishers, 1st edition 2009; Unit 2, Chapter 1(3-14), Chapter 2(23-36), Chapter 3 (59-84) Unit -3 (29-44). 3. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit -2,3,4 (13-63).
03	**Microsoft office:** Introduction to Microsoft Word-Screen elements, data handling, working with text, page setting, tables, adding graphics to document. Introduction to Microsoft Excel-Screen layout, creating and entering data in worksheet, formulas, functions and charts. Introduction to Microsoft PowerPoint-Layout, creating and viewing a presentation, customizing slides, adding graphics and effects to slides. Slide show.	08 hrs	1. Computer fundamentals and C programming, Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5: Chapter 1 (3-88) 2. Computer eduation, Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition; 2004,Unit 3 3. Computers and common science, Roger Hunt, John Shelley;Prentice-Hall India Pvt Ltd publishers:2002.

04	**Internet and networking**: Introduction and history, connecting to internet, world wide web and browser, E-mail and concept of LAN, MAN, WAN. Applications of computer networks in the field of education.	08 hrs	1.Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit -2,3,4 (13-63) (ISBN – 81-8316-018-2) 2. Computer fundamentals -3rd edition Pradeep K.Sinha,priti sinha. Chapter 14,17,18.(ISBN – 81-7656-752-3) 3. Computer fundamentals and C programming -Pooja jain, S.Vikas publishers, 1st edition 2009; Unit 4 Chapter 2 (41-91).
05	**Introduction to C-language**: Features and applications of C, character set, definitions and declarations of identifiers, variables, constants, keywords, data types, operators and their precedence ,expressions. Various types of standard input and output statements.	10 hrs	1.Programming in ANSI'C'-E.Balaguruswamy.4th edition;Mc Graw Hill company. 2. Computer fundamentals and C programming -Pooja jain, S.Vikas publishers, 1st edition 2009; Unit 4 Chapter 2 (41-91). 3. Statistical Methods and Computer applications-Department of Pharmacy. Pharma publications.

06	**Applications of C -language:** Decision making, branching and looping statements. Simple programs to solve pharmaceutical and statistical problems. Applications of computers in pharmaceutical studies and applications of computers in clinical studies.	06 hrs	1.Programming in ANSI'C'-E.Balaguruswamy.4th edition;Mc Graw Hill company (ISBN – 978-0-07-064822-7) 2. Computer fundamentals and C programming -Pooja jain, S.Vikas publishers, 1st edition 2009; Unit 4 Chapter 2 (41-91). 3. Statistical Methods and Computer applications-Department of Pharmacy. Pharma publications.

Further readings:

1. Introduction to computers by Peter Nortons;4rt edition, Tata Megrahill (ISBN – 0-07-044743-8)
2. Computers and common science – Roger Hunt, John Shelley;Prentice-Hall India Pvt Ltd publishers:2002 (ISBN – 81-203-0562-0)
3. Computers in pharmacy by Praveen S thakur, Rachna manchanda, Prathiba Nand; 3rd edition, Birla publications (ISBN – 81-86270-70-1)

CB105T

I/IV B. PHARMACY-1st SEMESTER
Integrated Grammar and Communication Skills
[Theory - 50Hours]

Objectives of the subject:

- To aid the students to develop their (RWLS), reading, writing, listening, and speaking abilities.
- To develop human refinement values and interpersonal skills.
- To learn and apply the knowledge of grammar wherever they communicate.
- To create general awareness about the importance of communication and soft skills in today's life.

Outcome of the subject:

- The students will develop good communication and soft skills after acquiring ample knowledge from their participation in - presentation skills, viva voce, JAM session, extempore, group discussion etc. They will be ready to face the corporate challenges of the outside world in their near future.
- The students will inculcate positive reading, writing, listening and speaking calibre and show excellent academic results in all other subjects too after gaining knowledge and practice from the four modules.
- Overall, the students will be empowered to face the corporate challenges and definitely their outcome -daring, dashing and dynamic.

Unit No.	Topic	Duration (Hours)	References
01	Importance of communication skills in corporate requirements, barriers to communication, effective communication skills, qualities of a speaker/listener, public speaking skills, evaluation graph on communication.	05 hrs	1.Communication and soft skills – By Anthony. 2.Communicative competence – By Varanasi Bhaskar Rao.
02	Human refinement values, daily communication and telephone etiquette, cultural values, duties and qualities of a student, interpersonal skills, kinesis, self-analyzing evaluation and the elements of discipline.	05 hrs	1.Communication and soft skills – By Anthony.

03	Integrated English grammar skills, syntax articles, complete version of parts of speech, role of tenses, direct –indirect speech, active and passive voice, degrees of comparison, question tags, transformation of tenses, punctuation pointers, professional letter writing skills and tongue twisters.	15 hrs	1.Spoken English – Eng-Eng-Telugu – By Anthony. 2.Essential of English grammar – By Raymond Murphy.
04	Vocabulary boosters - synonyms, antonyms, homonyms, homophones, eponyms, acronyms, idioms and phrases, prefixes and suffixes, usage of a good dictionary.	05 hrs	1. Shankar Narayana dictionary – Eng-Eng-Telugu – By Shankar Narayana.
05	Presentation skills, JAM session, extempore, speed reading skills, legible handwriting skills, topic/story writing skills, group interpersonal skills and RWLS (Reading, writing, listening and speaking skills)	15 hrs	1. Interview skills and group discussion – By Anthony. 2. How to win friends and influence people – By Dale Carnegie.
06	Success mantra-key to success formulas, success in examination, stress and time management tips, career orientation and the path to success.	05 hrs	1. A must for every student / person – By Anthony 2. The positive approach to stress – By Stephen Williams.

Further readings:

1. High School English Grammar and Composition – By Wren and Martin.
2. New Oxford Advanced Learner's Dictionary.

CB106T

I/IV B. PHARMACY-1st SEMESTER
Mathematics
[Theory - 50Hours]

Scope of the subject : Mathematics has always been the language of science and technology. With the society becoming scientific at a rapid pace, it becomes important to learn this subject. Mathematics develops the skills of reasoning, developing new ideas and formulating new approaches and finally drawing logical conclusions. This subject deals with the introduction to partial fractions, logarithms, matrices, analytical geometry, trigonometry, calculus and differential equations.

Outcome of the subject:

At the end of the course, the student will be able to:

- Understand the fundamental theory and their applications in pharmacy.
- Solve different types of problems with applied theorems related to calculus.
- Inculcate the principles and equation solving techniques of mathematics to pharmacy.

Unit. No	Topic	Duration (Hours)	References
01	**Algebra:** Partial fractions: Application of partial fraction in Pharmaceutical Sciences. Logarithms: Application of logarithms to solve Pharmaceutical problem. Matrices: Types, addition, multiplication of matrices and determinant of second and third order. Adjoint and inverse of non-singular matrix. Application of determinant to solve simultaneous equations by Cramer's rule.	10 hrs	1. Intermediate mathematics by Venkateswararao, N.Krishnamurthy, B.V.S.Sharma: 25th revised edition, 2003 vol 1 S Chand and Co Algebra 3. (ISBN – 81-219-0662-8) 2. Higher engineering mathematics by Dr. B.S.Grewal 40th edition: Kanna publishers, Unit 1(19-80) (ISBN – 81-7409-195-5) 3. Remedial mathematics –

			Dr.Riyaz Ahmad Khan; S Chand & Co: 2009, Unit -1 (ISBN - 81-219-3142-8) 4. Intermediate mathematics by V.Venkateswararao, .Krishnamurthy, B.V.S.Sharma vol 2. Unit – 3, 6. (ISBN – 81-219-1001-3).
02	**Analytical geometry:** Distance between two points, Area of a triangle, coordinates of a point dividing a given segment into a given ratio, locus. Equations to a straight line in point-slope form, slope-intercept form, perpendicular form, two point form, intercept form and symmetric form. Point of intersection of two straight lines, angle between two straight lines, condition of parallelism and perpendicularity of lines.	10 hrs	1. .Intermediate mathematics by V.Venkateswararao, Krishnamurthy, B.V.S.Sharma 25th revised edition,2003 vol 1 S Chand and Co 2D geometry (2,4) (ISBN – 81-219-0662-8) 2. Remedial mathematics – Dr.Riyaz Ahmad Khan (71-89):Unit - 3 (ISBN-81-219-3142-8)
03	**Trigonometry:** Fundamentals of trigonometry, trigonometric ratios and relation between Sin (A+B), Cos (A+B), Tan (A+B) only.	08 hrs	1.Intermediate mathematics by V.Venkateswararao, Krishnamurthy, B.V.S.Sharma 25th revised edition,2003

	Calculus: Limit of a function, derivative of a function, R.H. derivatives and L.H. derivatives.		vol 1 S Chand and Co 2D geometry (2,4) (ISBN – 81-219-0662-8) 2.Higher engineering mathematics by Dr. B.S.Grewal 40th edition Kanna publishers, Unit 2 (145-254). (ISBN – 81-7409-195-5)
04	**Differential Calculus:** Differentiation of a sum, product and quotient, composite functions, Implicit functions, parametric functions, logarithmic differentiation, differentiation of exponentials, trigonometric and inverse trigonometric functions and partial differentiation. Maxima and minima. Application of differentiation in life sciences.	08 hrs	1. Differential calculus by Shantinarayan & Dr.P.K Mittal: S Chand publishers: 15th edition:2010; Chapter 3,4,5,9,11.(ISBN – 81-219-0471-4) 2. Remedial mathematics – Dr.Riyaz Ahmad Khan; S Chand & Co: 2009, Unit -4,5 (ISBN -81-219-3142-8) 3. Higher engineering mathematics by Dr. B.S.Grewal 40th edition Kanna publishers, Unit 2 (145-254). (ISBN – 81-7409-195-5).

05	**Integral Calculus**: Integration as inverse process of differentiation. Integration by substitution, integration by parts, integration of algebraic functions and integration by areas. Definite integrals. Application of integration to find the area, volume, center of gravity etc.,	08 hrs	1. Integral calculus By Shantinarayan & Dr.P.K Mittal: S Chand publishers: 15th edition:2010, Chapter 1,2. (ISBN – 81 -219-0681-4) 2. Remedial mathematics – Dr.Riyaz Ahmad Khan; S Chand & Co: 2009, Unit -6 (ISBN - 81-219-3142-8) 3. Higher engineering mathematics by Dr. B.S.Grewal 40th edition Kanna publishers, Unit 2 (255-293). (ISBN – 81-7409-195-5) 4. Intermediate mathematics by V.Venkateswararao, .Krishnamurthy, B.V.S.Sharma vol 2. (539-632). (ISBN – 81-219-1001-3)
06	**Differential equations:** Formation of a differential equation, order and degree, solution of first order differential equations. Methods of solving ordinary differential equations: variables separable, homogenous and linear. Application of differential equations in solving pharmaceutical problems.	06 hrs	1. Higher engineering mathematics by Dr. B.S.Grewal 40th edition Kanna publishers, Unit 4 (464-511). (ISBN – 81-7409-195-5) 2. Intermediate mathematics by V.Venkateswararao, .Krishnamurthy, B.V.S.Sharma vol 2.(636-652) (ISBN – 81-219-1001-3) 3. Remedial

			mathematics – Dr.Riyaz Ahmad Khan; S Chand & Co: 2009, Unit -7 (ISBN - 81-219-3142-8)

Further readings:

2. Higher algebra by Hall and Knight:S Chand & Co:2003(ISBN – 81-219-0545-1)
3. Mathematics for students of pharmacy by S.S.Rangi S.Vikas &co.2007
4. Intermediate first year mathematics - telugu academy:2006.
5. Remedial mathematics - G.K.Ranganath;Himalaya Publishing house, 3rd edition;2012 (ISBN – 978-93-5051-593-8)
6. Remedial mathematics – Indrani Pramod Kelkar, J.Jagan mohan;Bitech Pharma Publications: 2010.
7. Differential calculus by santhinarayan:2001;S Chand & Co (ISBN – 81-219-0471-4)

CB106T

I / IV B. PHARMACY-1st SEMESTER
Biology
[Theory - 50Hours]

Scope of the Subject:

- The subject gives detailed study of natural sources such as plant and animal origin.
- Study of pharmaceutical biology gives basic foundation for the student for their subsequent study of Pharmacognosy.

Outcome of the subject:

Upon the completion of the subject student will be able to:

- Understand the nature of biological population.
- Introduce the learner towards the organizational and functional aspects of lower animals.
- Make the student thorough with variousnaturally occurring drugs and its history, sources, classification, distribution and thecharacters of the plants and animals.

Chapter / Topics	Duration (Hours)	References
SECTION – A (BOTANY)		
Unit – I	**8 hrs**	
➢ **ORIGIN AND DEVELOPMENT OF BOTANY**: ➢ ***Branches of Botany***: Morphology, cytology, embryology, palynology, taxonomy, physiology, palaeobotany, genetics, phytogeography, phycology**.** ➢ **CELL BIOLOGY** — ***Structure of plant cell***: Cell wall, protoplasm, cell membrane, cytoplasm, cell organelles (cell inclusions), nucleus, chromosomes, nucleic acids — ***Cell Division***: Mitosis, Meiosis	1 hrs 3 hrs 4 hrs	1. Intermediate first year botany - Dr.T.KailasnathSarma; Telugu akademi publications;Chapter No: 2, 23,25. 2. Pharamaceutical Biology- S.B.Gokhale; 5th edition; Niraliprakashan publications; Unit No: 4, 6.

➢ **INTERNAL ORGANIZATION OF PLANTS** — ***Tissues***: Meristematic tissues, meristems, permenant tissues, simple tissues parenchyma, collenchyma, sclerenchyma), complex tissues (xylem, phloem). — ***Plant Kingdom***: Introduction and classification of plant kingdom		
UNIT -II	**12 hrs**	
➢ **MORPHOLOGY OF PLANTS** — ***Root***: Types of root system and modifications of root systems — ***Stem***: Characteristics and functions of stem, Modifications of stem (aerial, subaerial, underground) — ***Leaf***: Parts of leaf, venation, types of leaves, phyllotaxy, heterophylly, modifications of leaf — ***Inflorescence***: Types of inflorescence racemose, cymose, hypanthodium**.** — ***Flower***: Structure and detailed description of a flower (perianth, aestivation, calyx, corolla, androecium, gynoecium) — ***Pollination***: Self and cross pollination, advantages and contrivances of cross pollination, self Pollination. — ***Fruits***: Types of fruits, Wiz: false fruits, true fruits, simple fruits, fleshy fruits, dry dehiscent fruits, dry indehiscent fruits, schizocarpic fruits, aggregate fruits, compound fruits	2 hrs 2 hrs 2 hrs 1 hr 1 hr 2 hrs 2 hrs	1. Intermediate first year botany - Dr.T.Kailasnath Sarma; Telugu akademi publications;Chapter No: 5 - 7, 9, 10, 12 - 15. 2. Pharamaceutical Biology- S.B.Gokhale; 5th edition; Niraliprakashan publications Unit No: 7.

Unit - III	9 hrs	
➢ **PLANT TAXONOMY** — ***Introduction to plant taxonomy***: Objectives of plant taxonomy, bentham and hooker's system of classification — ***Families***: Leguminosae (Fabaceae), Umbelliferae (Apiaceae), Solanaceae, Rutaceae ➢ **PLANT PHYSIOLOGY** — ***Photosynthesis***:Definition, mechanism of photosynthesis, factors influencing photosynthesis — ***Respiration***: Types of respiration, aerobic, anaerobic respiration and related cycles.	5 hrs 4 hrs	1.Botany- A.C.Dutta 6th edition; Oxford university press publications; Part-III, Chapter No: 11 2.Intermediate first year botany - Dr.T.Kailasnath Sarma; Telugu akademi publications;Chapter No: 18,20,21 3.Pharamaceutical Biology- S.B.Gokhale; 5th edition; NiraliPrakashan publications;Uni No:8.
SECTION – B (ZOOLOGY)		
Unit IV	**5 hrs**	
➢ **THE BASICS**: — Scope of zoology, basic principles, classification of the living world, differences between prokaryotic and eukaryotic cells. ➢ **ANIMAL ORGANISATION**: — Brief account of the structure of a generalized Animal cell, difference between animal cell and plant cell. — Animal tissues (Epithelial, Connective, Muscle and Nervous tissues)	2 hrs 3 hrs	1. Intermediate first year zoology -Y. Krishnanandam; Telugu akademi publications; 1st edition; Chapter No: 1, 3. 2. Pharamaceuticalbiology- S.B.Gokhale; 5th edition; Niraliprakashan publications; Unit No: 1-3

Unit - V	8 hrs	
➢ **LIFE CYCLES OF SOME ANIMAL PARASITES THAT CAUSE HUMAN DISEAS**E: — ***Amobeasis*** – Entamoeba histolytica (Protozoa) — ***Malaria*** – Plasmodium vivax (Protozoa) — ***Taeniasis*** and ***cysticercosis*** – Taeniasolium(Cestoda) — ***Filaria*** – Wuchereriabancrofti (Nematoda)	8 hrs	Intermediate first year zoology -Y. Krishnanandam; Telugu akademi publications; 1st edition; Chapter No:6.
Unit - VI	**8 hrs**	
➢ **ANATOMY AND PHYSIOLOGY OF FROG**: — Digestive system, Respiratory system, cardiovascular system, reproductive system.	8 hrs	Pharamaceutical Biology- S.B.Gokhale; 5th edition; Niraliprakashan publications; Unit No: 4

Further References:

1. Invertebrate zoology – E.L.Jordan and P.S.Verma; 2000 edition, S.Chand&^ company Ltd., publications
2. Biological Science – D.J. Taylor; 3rd edition, Cambridge publications.
3. ABC of biology – B.B.Arora; 1st edition, Modern publications

I/IV B.PHARMACY (1st SEMESTER)
PHARMACEUTICS - I
[PRACTICAL: 75 Hours]

SCOPE:

1 The practical session of pharmaceutics will introduce the student to impart the knowledge and skills of formulation, evaluation, packing and labelling of given categories of dosage forms.
2 The laboratory session will facilitate the student to apply pharmaceutical calculations in the science and practice of pharmaceutical compounding.

Objectives:

Upon completion of practical course in pharmaceutics-I, the student will get an understanding on the following aspects,

1. Weighing of solids and measuring of liquids used in the compounding
2. Understand to apply the theoretical concepts for designing of dosage forms.
3. Concepts of packing and labelling of various dosage forms.
4. Principles and procedures used in preparation of several dosage forms.
5. Evaluation of dosage forms wherever applicable and evaluation of materials used in pharmaceutical packaging.

Chapter / Topics		Duration (Hrs)	References
Introduction to practical pharmaceutics			
A)	Practice exercise on calculating density, specific gravity, reducing and enlarging formula.		The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 11
B)	Preparation of labels for different dosage forms		Pharmaceutical packaging technology K Jain, 2nd edition, Pharma Med press, India, Ch.No.14
C)	Referring and collecting of suggested monographs(drug /excipients) from official Pharmacopoeias - IP/USP/BP.	3 hrs	Indian pharmacopoeia, United states pharmacopoeia and British pharmacopoeia
LIST OF EXPERIMENTS **The students shall prepare, evaluate and dispense the following classes of dosage forms**			

S. No	Title of the Experiment	Duration (Hrs)	Reference
I	**Monophasic liquid dosage forms** Evaluation parameters: Clarity, color, odour, consistency , pH, specific gravity and any other tests specified with respect to individual experiment		
Aromatic waters			
1.	Chloroform water IP	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 774.
2.	Concentrated cinnamon water BPC		The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 196.
Solutions			
3.	Strong solution of ammonium acetate IP*	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 765.
4.	Cresol with soap solution IP*	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 1468.
5.	Surgical chlorinated soda solution IP*	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 770.

6.	Weak iodine solution (Iodine tincture) IP	3 hrs	Indian Pharmacopoeia 2014. Indian Pharma-copoeia Commission, Government of India, Ministry of Health and Family Welfare.Pg.No. 336
Syrups			
7.	Simple syrup USP	3 hrs	USP/NF the United States Pharmacopoeia. XXVI Edition. National formulary publication of US Pharmacopoeia, USA. Pg. No. 2314.
8.	Ferrous phosphate syrup IP*		Indian Pharmacopoeia 1996. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 614-615.
Elixirs			
9.	Paracetamol paediatric elixir BPC	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 640.
Linctus			
10.	Simple Linctus		Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 1986.
Throat paints			
11.	Compound iodine paint BPC*	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 1211.
Drops			
12.	Sodium bicarbonate eardrops BPC		The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 818.

Mouthwashes and Gargles			
13.	Phenol gargle BPC	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 1096.
14.	Zinc sulphate and Zinc chloride mouthwash BPC		The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 1192.
Liniments			
15.	Camphor liniment BPC	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 179.
16.	White liniment BPC*		The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 1141.
II	**Biphasic liquid dosage forms**		
Suspensions Evaluation parameters: Appearance, color, odour, consistency , pH, sedimentation parameters			
17.	Calamine lotion IP*	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 1239.
18.	Magnesium hydroxide suspension BP*	3 hrs	British Pharmacopoeia 2005. Stationary office Medicine and Healthcare Product Regulatory Agency (MHRA), UK. Pg. No. 2559.
19.	Aluminium hydroxide gel IP*	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 1021.

Emulsions Evaluation parameters: Appearance, color, odour, consistency , pH, Identification of type of emulsion by dilution test or dye test			
20.	Liquid paraffin emulsion IP *	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 2436.
21.	Benzyl benzoate application IP*	3 hrs	Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 3489.
III	**Solid dosage forms**		
Powders Evaluation parameters: uniformity of weight, color, identification of aggregation			
22.	Zinc oxide dusting powder BPC	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 1000.
23.	Oral rehydration salts IP*		Indian Pharmacopoeia 2014. Indian Pharmacopoeia Commission, Government of India, Ministry of Health and Family Welfare. Pg. No. 2371.
Granules : Evaluation parameters: uniformity of weight, color, angle of repose, identification of aggregation, effervescence time.			
24.	Effervescent sodium phosphate granules USP *	3 hrs	USP/NF the United States Pharmacopoeia. XXVI Edition. National formulary publication of US Pharmacopoeia, USA. Pg. No. 1075.
IV	**Semisolid dosage forms** Evaluation parameters- ointments and creams: uniformity of weight, appearance, pH, identification of insoluble particles and aggregates, spreadability Evaluation parameters- suppositories: uniformity of size, shape, weight of suppositories, softening time		

25.	Simple ointment BPC	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 642.
26.	Compound benzoic acid ointment BPC*		The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 89.
27.	Cetrimide cream BPC*	3 hrs	The Pharmaceutical Codex. 11th edition, 1979, The Pharmaceutical Press, London, Pg. No. 156.
28.	Glycerinated gelatin suppositories USP*	3 hrs	USP/NF the United States Pharmacopoeia. XXVI Edition. National formulary publication of US Pharmacopoeia, USA.
V	**Tinctures**		
29.	Lemon tincture IP	3 hrs	A practical handbook on pharmaceutical dosage forms-I. D.K. Jain. 1st Edition, Nirali Prakashan, New Delhi, 2014, Ch. No. 18.
VI	**Evaluation of packaging materials**		
30.	Evaluation of glass container by water attack test	3 hrs	Dispensing for pharmaceutical students. Cooper and Gunn's. S.J. Carter. 12th Edition. CBS Publishers, New Delhi, Ch. No. 21; Pg. No. 371.
31.	Evaluation of corrugated board as a material used in pharmaceutical packaging	3 hrs	Dispensing for pharmaceutical students. Cooper and Gunn's. S.J. Carter. 12th Edition. CBS Publishers, New Delhi, Ch. No. 21; Pg. No. 375.

***Major experiments**

I/IV B.PHARMACY (1st SEMESTER)
Pharmaceutical Chemistry-I (Organic-I)
(PRACTICAL: 75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1	Laboratory safety guidelines	3 hrs	Vogel's textbook of practical organic chemistry. 5th edition, Pearson education Ltd., 2004.
2	Introduction to equipment and Glassware	3 hrs	Vogel's textbook of practical organic chemistry. 5th edition, Pearson education Ltd., 2004.
3	Atomic models of organic compounds	3 hrs	Organic chemistry, Robert Thornton Morrison and Robert Neilson Boyd, 6th edition, Dorling kindersleyPvt.Ltd, 2008.
4	Introduction to Laboratory Techniques		1. Vogel's textbook of practical organic chemistry.5th edition, Pearson education Ltd., 2004. 2. FG. Mann, BC. Saunders, Practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.
	A. Study of different filtration techniques	3 hrs	
	B. Demonstration of crystallization techniques	3 hrs	
	C. Determination of melting point	3 hrs	
	D. Determination of boiling point	3 hrs	
	E. Determination of mixed melting point	3 hrs	
5	Differentiation between parafinic and olefinic hydrocarbons	3 hrs	FG. Mann, BC. Saunders, Practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.
6	Synthesis and characterization of dibromocinnamic acid from cinnamic acid by electrophilic addition reaction	3 hrs	Vogel's textbook of practical organic chemistry. 5th edition, Pearson education Ltd., 2004.
7	Synthesis and characterization of benzoic acid from benzamide by acid hydrolysis	3 hrs	F G. Mann, BC. Saunders, practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.

8	Synthesis and characterization of dibenzylidene acetone from benzaldehyde by condensation reaction	3 hrs	1. Vogel's textbook of practical organic chemistry. 5th edition, Pearson education Ltd., 2004. 2. FG. Mann, BC. Saunders, Practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.
9	Synthesis and characterization of cinnamic acid from benzaldehyde by perkin reaction	3 hrs	Vogel's textbook of practical organic chemistry. 5th edition, Pearson education Ltd., 2004.
10	Identification of organic compounds by preliminary qualitative tests (minimum 01 compound from each category)	6 hrs	FG. Mann, BC. Saunders, Practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.
11	Detection of special elements	3 hrs	FG. Mann, BC. Saunders, practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.
12	Systematic qualitative analysis of organic compounds (minimum 01 compound from each functional group) excluding water soluble compounds and compounds containing morethan one functional group	24 hrs	FG. Mann, BC. Saunders, practical organic chemistry, 4th edition, Orient Longman Ltd., 2001.
13	Identification of primary (1°), secondary (2°) and tertiary (3°) alcohols by using Lucas reagent	3 hrs	Vogel's textbook of practical organic chemistry. 5th edition, Pearson education Ltd., 2004.

I/IV B.PHARMACY (1st SEMESTER)
Human Anatomy and Physiology-I
(Practical :50 Hours)

Expt. No.	Name of the Experiment	Duration (Hrs)	References
1	Study of compound microscope.	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal, 11th edition. B.S.Shah prakashan publications; Section- I, Exp. No: 1
2	Study of tissues	6 hrs	Ross and Wilson Anatomy and physiology in health and illness - Anne waugh & Allison grant; Churchill livingstone publications; 10th edition; Section- I, Exp. No: 3
3	Study of skeletal system	9 hrs	Practical anatomy and physiology - Dr R.K Goyal, 11th edition. B.S.Shah prakashan publications; Section- II, Exp. No: 4
4	Study of nervous system with the help of models, charts and specimens.	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal, 11th edition, B.S.Shah prakashan publications; Section- II
5	Study of digestive system with the help of models, charts and specimens.	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal,11th edition, B.S.Shah prakashan publications; Section- II
6	Study of respiratory system with the help of models, charts and specimens.	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal, 11th edition, B.S.Shah prakashan publications; Section- II
7	Study of cardiovascular system with the help of models, charts and specimens.	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal,11th edition, B.S.Shah prakashan publications; Section- II

8	Study of urinary system with the help of models, charts and specimens	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal,11th edition, B.S.Shah prakashan publications; Section- II
9	Study of reproductive systems with the help of models, charts and specimens	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal,11th edition, B.S.Shah prakashan publications; Section- II
10	Study of special senses (Skin, Eye, Ear, Nose, Tongue) with the help of models, charts and specimens	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal,11th edition, B.S.Shah prakashan publications; Section- II
11	Determination of tidal volume & vital capacity	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal; 11th edition. B.S.Shah prakashan publications; Section- I, Exp No: 10
Simulated physiological experiments using Physio Ex software			
12	Renal system physiology – glomerular filtration*	3 hrs	Physio Ex software
13	Renal system physiology – urine formation*	3 hrs	Physio Ex software
14	Histology of tissues*	3 hrs	Physio Ex software

I/IV B.PHARMACY (1st SEMESTER)
Computer Application
(PRACTICAL: 50 Hours)

S. No.	Name of the Experiment	Duration (Hours)	References
1	Application of internal DOS commands.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-2:Chapter 2 (23-36) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit 2 (ISBN–81-8316-018-2)
2	Application of external DOS commands.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-2:Chapter 2 (23-36) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit 2 (ISBN – 81-8316-018-2)
3	Preparation of a document in MS – word.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5:Chapter 1 (3-88) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004,Unit 3(ISBN – 81-8316-018-2)

4	Preparation of curriculum vitae (CV) in MS-word.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5 (3-88). 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit - 3, (ISBN – 81-8316-018-2)
5	Creating a cover page using M.S Word	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5 (3-88) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit - 3 .(ISBN – 81-8316-018-2)
6	Creating a simple news letter using M.S Word	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5 (3-88) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit - 3, (ISBN – 81-8316-018-2)
7	Creating PPT using template in MS-power point.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5 (89-133) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit – 3 (ISBN – 81-8316-018-2)

8	Formatting slides in MS-power point.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5:Chapter-2 (89-133) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit -3(ISBN–81-8316-018-2)
9	Animating a slide show in MS-power point.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009:Unit-5:Chapter 2 (89-133) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit – 3 (ISBN – 81-8316-018-2)
10	Presentation and visualization of 2D, 3D bar charts in MS-excel	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009: Unit-5: Chapter 3 (143-184) 2. Fundamentals of Biostatistics – Khan and khanum,Ukaaz publications, 2nd edition; 2004:Chapter 3. 3. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit - 3 (ISBN – 81-8316-018-2)
11	Presentation and visualization of 2D, 3D Pie charts using MS excel.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009: Unit-5: Chapter 3 (143-184) 2. Fundamentals of Biostatistics – Khan and khanum,Ukaaz publications, 2nd edition; 2004:Chapter 3. 3. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd: 5th edition; 2004,Unit - 3(ISBN–81-8316-018-2)

12	Algorithm and flow chart for solving a problem.	3 hrs	Computer fundamentals -3rd edition by Pradeep K.Sinha, priti sinha, BPB publishers: 3rd edition.
13	Components of internet, E-mail and search for web sites.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009: Unit-3: Chapter 1, (29-44) 2. Computer eduation – Prof.Lalini Varanasi, Prof.V.Sudhakar, Dr.T.Mrunalini: Neelkamal Publications Pvt Ltd:5th edition;2004, Unit-4(ISBN–81-8316-018-2)
14	'C' programming using simple statements.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009: Unit-4: Chapter 2 (41-91)
15	'C' programming using expressions and data types.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009: Unit-4: Chapter 2 (41-91).
16	Scientific problem solving using decision making and looping in 'C' language.	3 hrs	1. Computer fundamentals and C programming -Pooja jain. S.Vikas publishers, 1st edition; 2009: Unit-4: Chapter 2 (41-91)

Further readings:

1. Pharmaceutical Statistics-T.E.Gopala Krishna murthy, P.Srinivasa babu, P.Seshagiri rao;2014: Pharma Med press (ISBN – 978-81-7800-330-6)
2. Biostatistics and computer science; Y.I Shah, Dr.A R Pradkar, M.G Dhayagude; Nirali Prakasan;8th edition: 2007
3. Computers and common science – Roger Hunt, John Shelley;Prentice-Hall India Pvt Ltd publishers:2002 (ISBN – 81-203-0562-0)
4. Biostatistics by K.Visweswara rao; 2nd edition, Jaypee publications: 2007 (ISBN – 81-8448-055-5)

I/IV B.PHARMACY (1st SEMESTER)
Biology (Practical : 50 Hours]

S.No.	Experiment No.	Duration (Hrs)	Reference
1	Introduction to biology experiments	2 hrs	Practical Botany – D.Subramanyam; 1st edition; Universal Publishing house; Part-A.
2	Introduction of Microscope and its handling	3 hrs	Practical Botany – D.Subramanyam; 1st edition; Universal publishing house; Part – B
3	Study of a. Stem modifications b. Root modifications c. Leaf modifications	9 hrs	Practical Botany – D.Subramanyam; 1st edition; Universal publishing house; Part – A Exp No: 2, 3, 4.
4	Histological description of Monocot and Dicot plants.	18 hrs	Practical Botany – D.Subramanyam; 1st edition; Universal publishing house; Part- B
5	Taxonomical study of the following: a. Leguminosae (Fabaceae) b. Umbelliferae (Apiaceae) c. Solanaceae d. Rutaceae	6 hrs	1. Practical Botany– D.Subramanyam; 1st edition; Universal publishing house; Part-A 2. Pharamaceutical Biology- S.B.Gokhale; 5th edition; NiraliPrakashan; Chapter No:7
6	Study of following systems of frog using Prodissector frog software: a. Digestive system b. Respiratory system c. Cardiovascular system d. Nervous system	6 hrs	Prodissector frog software
7	Study of animal specimens	6 hrs	Practical Zoology- E.Chakrapani; Vikram Publishers; 1st edition; Unit. No:2, 3.
Assignment: Prepare and submit the herbarium consists of minimum 15 locally available species of plants having medicinal values.			

I B.PHARMACY
2nd SEMESTER

CB201T

I/IV B. PHARMACY-2nd SEMESTER
PHARMACEUTICAL ANLAYSIS-I
[THEORY -75Hours]

Scope of the subject:

Pharmaceutical analysis deals with various principles and techniques involved in volumetric and gravimetric analysis which include sampling, methods of analysis, errors in analysis and statistical treatment of data. This subject also provides some basic knowledge on electro analytical methods, Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP).

Outcome of the subject:

At the end of the course the student will be able to:

- Gain knowledge on stoichiometric calculations involved in pharmaceutical analysis.
- Understand the concepts involved in quantitative analysis of drugs.
- Perform experiments to determine moisture content and alcohol content in pharmaceuticals.
- Gain knowledge on electro analytical techniques.

Unit. No	Topic	Duration (Hours)	References
01	**Introduction to pharmaceutical analysis:** 1.1 Introduction to pharmaceutical analysis, different types of analysis and sampling of solids and liquids. 1.2 Balances and weighing, calibration of weights, glassware and interconversions of weights and measures. 1.3 Stoichiometric calculations and analytical problems 1.4 Sources of errors and their rectification.	11 hrs	1.Pharmaceutical analysis, P. C. Kamboj, Vol -I, 2nd edition, Vallabh publications, 2007, chapter 4. 2. Practical pharmaceutical chemistry, A. H. Beckett, J. B. Stenlake, 4th edition, Vol-I, CBS publisher's, 2007, chapter 4. 3.Vogel's: Text book of quantitative chemical analysis, 6th edition, Pearson education, 2008, chapter 10 and 11.

02	**Fundamentals of volumetric analysis:** **2.1** Titration, titrant, titrand, equivalence point, end point, indicators, primary standard and secondary standard substances and their ideal properties **2.2** Concept of acids and bases, acid base titrations, common ion effect and buffers. General principles, theory and applications of acidimetry and alkalimetry. A study of neutralization curves and theory of acid base indicators.	12 hrs	1.Pharmaceutical analysis, P. C. Kamboj, Vol -I, 2nd edition, Vallabh publications, 2007, chapter 3. 2. Vogel's: Text book of quantitative chemical analysis, 6th edition, Pearson education, 2008, chapter 10 3. Pharmaceutical analysis, Dr. A. V. Kasture, 14th edition, Vol-I, Nirali prakasan, 2010, chapter 6.
03	**3.1 Precipitation titrations:** Theory of precipitation, solubility product, methods involved in precipitation titrations– mohr's method, volhard's method and fajan's method. Different indicators used in precipitation titration **3.2 Gravimetric methods:** Principle and techniques involved in gravimetric analysis. Typical methods involving precipitation, co-precipitation, post-precipitation, digestion, precipitating reagents and applications of gravimetric analysis.	12 hrs	1.Pharmaceutical analysis, P. C. Kamboj, Vol -I, 2nd edition, Vallabh publications, 2007, chapter 6 and 11. 2.Vogel's: Text book of quantitative chemical analysis, 6th edition, Pearson education, 2008, chapter 10 and 11. 3.Quantitative analysis by R.A.Day and A.L.Underwood. 6th edition, Prentice hall of India, 2006, chapter 06, 07 and 09.
04	**4.1**. **Non-aqueous titrations**: Classification of solvents used in non-aqueous titrations, differentiating and leveling effects, indicators used and applications of non aqueous titrations.	18 hrs	1.Pharmaceutical analysis, P. C. Kamboj, Vol -I, 2nd edition, Vallabh publications, 2007, chapter 8, 9 and 10.

	4.2 Complexometric titrations: Principle, chelating agents, EDTA titrations, indicators, masking agents, demasking agents and applications of complexometric titrations. **4.3 Redox titrations:** Concept of oxidation and reduction, types of redox titrations. Principles of cerimetry, permanganometry, iodimetry and iodometry. Applications of redox titrations		2. Vogel's: Text book of quantitative chemical analysis, 6th edition, Pearson education, 2008, chapter 10. 3. Quantitative analysis by R.A.Day and A.L.Underwood. 6th edition, Prentice hall of India, 2006, chapter 08, 10 and 11.
05	**5.1** Determination of moisture content and alcohol content in pharmaceuticals **5.2** Introduction, importance of GMP and GLP in pharmaceutical analysis. **5.3** Principles of gas analysis, estimation of oxygen, nitrogen dioxide and carbon dioxide in mixtures containing different gasses.	12 hrs	1.Pharmaceutical analysis, P. C. Kamboj, Vol -I, 2nd edition, Vallabh publications, 2007, chapter 14. 2. How to practice GLP, P. P. Sharma, Vandana publications, 2000, Chapter 03, 06 and 07. 3. Good manufacturing practices for pharmaceuticals, Sidney H. Willig, Marcel Dekker, 2005 4. Indian Pharmacopoeia, Vol-II, 3rd edition, The controller of publications, Delhi, 1985, 1996, Appendices-3.

06	**Electroanalytical techniques:** **6.1 Potentiometry:** Reference electrodes, indicator electrodes, measurement of potential and pH, potentiometric titrations and methods of detecting end point **6.2 Conductometry:** Basic concepts, different types of conductometric titrations and applications in pharmaceutical analysis.	10 hrs	1.Pharmaceutical analysis, A. V. Kasture, Vol-I, 14th edition, Nirali prakashan, 2010, chapter 18 and 19 2.Practical pharmaceutical chemistry, A. H. Beckett, J. B. Stenlake, 4th edition, Vol-II, CBS publisher's, 2007, chapter 5.

Further Readings:

1) Instrumental methods of chemical analysis, B. K. Sharma, 27th edition, Geol publishing house, 2011.
2) Indian Pharmacopoeia-1985, 3rd edition, The controller of publications, Delhi,.
3) Indian Pharmacopoeia- 1996, 4th edition, The controller of publications, Delhi, 1985.

CB202T

I/IV B. PHARMACY-2nd SEMESTER
PHYSICAL PHARMACY-I
[THEORY -75Hours]

Scope: This subject is concerned with the fundamental, physical and chemical properties of matter or substances. It deals with physico-chemical principles in the practice of pharmacy. It will be helpful to improve an already existing dosage form or to formulate a new dosage form and it is of immense help in advanced study.

Objectives: At the end of the course, the student will be able to

- Understand the properties of different states of matter and the nature of intra and intermolecular forces that are involved in stabilizing molecular and physical structures.
- Understand the basic principles of thermodynamics and its pharmaceutical applications.
- Understand the various physical properties of drug molecules and their determination
- Compare and contrast the colligative properties of electrolytic solutions and concentrated solutions of non electrolytes
- Understand the concepts of ionic and acid base equilibria, tonicity and their importance in pharmaceutical systems and can be able to calculate buffer capacity

Topic	Durat-ion	References
Unit: 01	**14** hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2011, Ch. No. 2. 2. Elements of Physical Chemistry. Peter Atkins and Julio de Paula. 4th Edition, Oxford university press, New Delhi, India, 2005, Ch. No. 1. 3. Essential Chemistry, Raymond Chang. 1st Edition, McGraw Hill, New York, USA,1996, Ch. No. 11
i) Molecular interactions: Typesof binding forces between molecules, factors influencing intermolecular forces.	**2** hrs	
ii) States of matter Gaseous state- Ideal gas law, kinetic molecular theory of gases, Vanderwaals equation of real gases. Liquid state- Principle of liquefaction, methods of liquefaction, vapour pressure, boiling point andsupercritical fluids. Solid state-Crystal structure, polymorphism, liquid crystals.	**8** hrs	

iii) Physical transformation of pure substance: Gibbs phase rule, phase boundaries. Phase diagrams- Liquid-liquid phase diagrams, liquid-solid phase diagrams and eutectic mixtures.	**4** hrs	4. Remington- The science and practice of Pharmacy. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, 2013, Ch. No. 26 and 28. 5. Cooper and Gunn's Turorial Pharmacy. S.J. Carter. 1st Edition, CBS Pubishers and distributors, New Delhi, India, 2005, Ch. No. 3. 6. Polymorphism in Pharmaceutical Solids. Harry G. Brittain, 1st Edition, Marcel Dekker, Inc. New York, USA, 1999,Ch. No. 1. 7. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. 2014;Ch.No.2-6.
Unit: 02	**13** hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2011, Ch. No. 4. 2. Essential Chemistry, Raymond Chang. 1st Edition, McGraw Hill, New York, USA,1996,Ch. No. 12. 3. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi.2014;Ch. No. 10.
Physical properties of drug molecules: Additive and constitutive property, dielectric constant, induced polarization, dipole moment, refractive index, molar refraction, surface tension, optical rotation, cotton effect andviscosity-factors influencing viscosity, Ostwald's viscometer. Applications of physical properties of drug molecules.		
Unit: 03	**07** hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2011, Ch. No. 3.
Thermodynamics and the macroscopic description of physical systems: Basic definitions of thermodynamics. First law of thermodynamics - Internal energy, enthalpy of a system, relation between ΔH and ΔE.		

Thermochemistry-Enthalpy, heat expression of chemical reaction. Second law of thermodynamics - Need for second law, spontaneous processes, concept of entropy. Third law of thermodynamics - Free energy functions and its applications.		2. Elements of Physical Chemistry. Peter Atkins and Julio de Paula. 4th Edition, Oxford university press, New Delhi, India, 2005, Ch. No. 2-5. 3. Essential Chemistry, Raymond Chang. 1st Edition, McGraw Hill, New York, USA, 1996, Ch. No. 19. 4. Remington- The science and practice of Pharmacy. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, 2013, Ch. No. 27.
Unit: 04	**14** hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2011, Ch. No. 5-6. 2. Remington- The science and practice of Pharmacy. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, 2013, Ch. No. 30. 3. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. 2014; Ch. No. 11-13.
Solutions of electrolytes and non electrolytes: Theories of electrolytes, concentration expressions, ideal and real solutions, Raoult's law and its deviations, colligative properties, molecular weight determination, problems involving in molecular weight determination, properties of solutions of electrolytes, Arrhenius theory, modern theory of strong electrolytes, Debye-Huckel theory and other coefficients for expressing colligative properties.		
Unit: 05	**15** hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2011, Ch. No. 7-8. 2. Essential Chemistry, Raymond Chang. 1st Edition, McGraw Hill, New York, USA, 1996, Ch. No. 17.
Acid-base equilibria: Modern theories of acids and bases, ionization of water, ionization of weakly acidic and basic substances,Sorensen's pH scale, pH determination (electrometric). Concept of common ion effect and acidity constant.Application of pH in pharmacy,	**07** hrs	

Buffers: Definition, buffer equation, buffer capacity, pharmaceutical buffers, biological buffers, buffered isotonic solutions, methods of adjusting tonicity and pH.	**08** hrs	3. Encyclopedia of pharmaceutical technology. James Swarbrick and James C. Bolan. 2nd Edition, Marcel Dekker Inc, New York, 2002, Vol. 3. 4. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. 2014; Ch. No. 14-17.
Unit: 06	**12** hrs	1. Patrick J. Sinko. Martin's Physical Pharmacy and pharamceuitcal Sciences. 5th Edition. Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No. 8. 2. Elements of Physical Chemistry. Peter Atkins and Julio de Paula. 4th Edition, Oxford university press, New Delhi, India, 2005,Ch. No. 9 and 20. 3. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. 2014; Ch. No. 22. 4. Essentials of physical chemistry. B.S. Bahl and ArunBahl. 1st Edition. S. Chand and company Ltd.,
Electromotive Forces and Oxidation-Reduction Systems: Electro-chemical cells, determination of electromotive force, types of electrodes, measurement of electro motive force and electrode potentials.	**08** hrs	
Photochemistry: Consequences of light absorption, Jablenski diagram, Beer-Lambert's law, Quantum efficiency andapplications of photochemistry.	**04** hrs	

CB203T

I/IV B. PHARMACY-2nd SEMESTER
HUMAN ANATOMY AND PHYSIOLOGY-II
[THEORY -50Hours]

Scope of the subject:

- Emphasis spaced on the processes that control and regulate the physiological activities in the body.
- Study of human anatomy and physiology also prepares the students for their subsequent study of pathophysiology and pharmacology.

Outcome of the subject:

Upon the completion of the subject student will be able to

- Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.
- Appreciate coordinated working pattern of different organs of each system.
- Perform various physiological experiments such as blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, ECG, heart rate pulse.
- Perform the various physiological experiments using simulator software.

Chapter/ Topic	Duration	References
UNIT – I	**10** hrs	
CENTRAL NERVOUS SYSTEM — ***Nervous tissue***: Overview of the nervous system, histology of nervous tissue, organization and classification of the nervous system, basic knowledge on electrophysiology and action potential, signal transmission at synapses, neurotransmitters, regeneration and repair of nervous tissue. — ***Spinal cord and spinal nerves***: Spinal cord anatomy, spinal nerves, spinal cord physiology and reflex arc. — ***Brain and cranial nerves***: Brain organization, protection and blood supply, cerebrospinal fluid, cerebrum, diencephalon, brain stem, cerebellum, functional organization of the cerebral cortex, reticular activating system and cranial nerves. — Basic understanding on diseases related to central nervous system.	3 hrs 2 hrs 4 hrs 1 hr	1.Principles of anatomy and Physiology - Gerard J. Tortora. 2014 Indian edition Wiley publications; Unit: 12 – 16 2.Ross and Wilson Anatomy and physiology in health and illness - Anne Waugh & Allison Grant; 10th edition, Churchill living stone publications; Chapter : 7

UNIT-II	**6** hrs	
PERIPHERAL NERVOUS SYSTEM: — ***Autonomic nervous system***: Comparison of somatic and autonomic nervous systems, anatomy of autonomic motor pathways, ANS neurotransmitters and receptors, physiology of the ANS, integration and control of autonomic functions. — ***Sensory and integrative systems***: Classification of sensory receptors, somatic sensations, integrative functions of the cerebrum (wakefulness and sleep, learning and memory) — Basic understanding on diseases related to peripheral nervous system.	3 hrs 2 hrs 1 hr	1. Principles of anatomy and Physiology - Gerard J. Tortora. 2014 Indian edition Wiley publications Unit: 12 – 16 2. Ross and Wilson anatomy and physiology in health and illness - Anne Waugh & Allison Grant; 10th edition, Churchill living stone publications; Chapter : 7
UNIT - III	**8** hrs	
HEMOPOIETIC AND LYMPHATIC SYSTEM: — ***The Blood***: Composition and functions of blood, formation of blood cells, red blood cells, white blood cells, platelets, hemostasis, blood groups and blood types. — ***Lymphatic system and immunity***: lymphatic system structure and function, innate immunity, adaptive immunity, cell-mediated immunity, antibody-mediated immunity — Basic understanding on diseases related to haemopoietic and lymphatic system.	5 hrs 2 hrs 1 hrs	Principles of anatomy and Physiology - Gerard J. Tortora. 2014 Indian edition Wiley publications; Unit: 12 – 16

UNIT-IV	**10** hrs	
CARDIOVASCULAR SYSTEM — ***Heart***: Anatomy of the heart, heart valves and their functions, circulation of blood, control of the heart beat by nerves, cardiac muscle tissue, special excitatory and conductive system of the heart, cardiac output, cardiac cycle, ECG, exercise and the heart. — ***Blood vessels and hemodynamics***: Structure and function of blood vessels, capillary exchange, factors affecting blood flow, control of blood pressure and blood flow — Basic understanding on diseases related to cardiovascular system.	6 hrs 3 hrs 1 hr	Principles of anatomy and physiology - Gerard J. Tortora 2014; Indian edition Wiley publications; Unit: 19 -22

UNIT - V	**8** hrs	
ENDOCRINE SYSTEM — Definition of hormone, endocrine glands, hormone activity, mechanisms of hormone action, control of hormone secretion, hypothalamus and pituitary gland, thyroid gland, parathyroid glands, adrenal glands, pancreatic islets, ovaries and testes, pineal gland, thymus, hormones produced by other endocrine glands, growth factors and the stress response. — Basic understanding on diseases related to endocrine system.	7 hrs 1 hr	Principles of anatomy and physiology - Gerard J. Tortora. 2014 Indian edition Wiley publications; Unit : 18

UNIT - VI	**8** hrs	
1. REPRODUCTIVE SYSTEM — Anatomy of male and female reproductive organs, functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, ooegenesis, pregnancy and parturition. — Basic understanding on diseases related to reproductive system. **2. INTRODUCTION TO GENETICS** — Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.	5 hrs 1 hr 2 hrs	Ross and Wilson Anatomy and physiology in health and illness - Anne Waugh & Allison Grant; 10th edition; Churchill livingstone publications; Chapter:18.

CB204T

I/IV B. PHARMACY-2nd SEMESTER
PHARMACEUTICAL CHEMISTRY-II (INORGANIC)
[THEORY -50Hours]

Scope of the subject:

Pharmaceutical inorganic chemistry deals with the study of impurities in pharmaceuticals and their limit tests. This subject provides basic knowledge on classification, methods of preparation, assay, tests for purity and medicinal uses of various classes of inorganic compounds. A study of major intra and extracellular electrolytes and applications of radiopharmaceuticals in medicine is included in the subject.

Outcome of the subject:

At the end of the course, the student will be able to:

- Understand the various sources of impurities in pharmaceuticals.
- Learn the monograph analysis of official inorganic compounds
- Gain knowledge on methods employed for quantification of impurities.
- Understand the medicinal importance of inorganic compounds.

Unit. No	Topic	Duration (Hours)	References
01	**Impurities in pharmaceuticals and limit tests**: a) Sources and effect of impurities in pharmaceutical substances. b) Limit test: Introduction, types, specificity and sensitivity in limit tests. c) General principles and procedure involved in limit test for chloride, sulphate, iron, arsenic and heavy metals. d) Modified limit tests for chlorides and sulphates.	09 hrs	1. Practical pharmaceutical chemistry, A. H. Beckett, J. B. Stenlake, 4th edition, Vol-I, CBS publisher's, 2007, chapter 1. 2. Pharmaceutical chemistry- inorganic, G. R. Chatwal, Vol-I, Himalaya publishing house, 2006, chapter 8 and 9. 3. Text book of pharmaceutical chemistry-I (inorganic), Mohammed ali, CBS publishers, 2003, chapter 15 and 16.

02	A study of classification, methods of preparation (compounds superscripted with asterisk*), tests for purity, assay and medicinal uses of the compounds belonging to the following classes.		
	Gastrointestinal agents: a) Acidifying agents: Diluted hydrochloric acid and *ammonium chloride. b) Antacids: Antacid therapy, ideal properties of antacids, antacid products- sodium bicarbonate, *aluminium hydroxide gel, calcium carbonate, *milk of magnesia and combination antacid preparations c) Protectives and adsorbents: Kaolin and activated charcoal d) Saline catharitics: *Sodium phosphate and sodium potassium tartarate.	10 hrs	1. Pharmaceutical chemistry- inorganic, G.R.Chatwal, Vol-I, Himalaya publishing house, 2006, chapter 8. 2. Text book of pharmaceutical chemistry-I (inorganic), Mohammed ali, CBS publishers, 2003, chapter 4. 3. Pharmaceutical inorganic chemistry, V. Alagarsamy, PharmaMed press, 2014, chapter 6.
03	A study of classification, methods of preparation (compounds superscripted with asterisk*), tests for purity, assay and medicinal uses of the compounds belonging to the following classes.		
	3.1 Topical agents: a) Antimicrobial agents: *Chlorinated lime, *potassium permanganate, silver nitrate, *boric acid and *zinc undecylenate b) Astringents: *Alum, zinc sulphate c) Protectives and adsorbents: Purified talc, calamine, titanium dioxide **3.2 Dental products:** a) Anti-caries agents and dentifrices: *sodium fluoride and *dibasic calcium phosphate. b) Desensitising agents: Zinc chloride.	11 hrs	1. Pharmaceutical chemistry- inorganic, G.R.Chatwal, Vol-I, Himalaya publishing house, 2006, chapter 9 and 10. 2. Text book of pharmaceutical chemistry-I (inorganic), Mohammed ali, CBS publishers, 2003, chapter 5 and 6. 3. Inorganic medicinal and pharmaceutical chemistry, Block, Roche, Sonie, Wilson, Varghese publishers, 2000, chapter 3 and 4.

04	A study of classification, methods of preparation (compounds superscripted with asterisk*), tests for purity, assay and medicinal uses of the compounds belonging to the following classes.		
	4.1 Respiratory stimulants: Aromatic spirit of ammonia, dilute ammonia solution. **4.2 Expectorants and emetics:** *Potassium iodide and *copper sulphate. **4.3 Antidotes:** Sodium nitrite and *sodium thiosulphate **.** **4.4 Antioxidants:** Hypo phosphorus acid and *sodium metabisulphite	07 hrs	1. Inorganic medicinal and pharmaceutical chemistry, Block, Roche, Sonie, Wilson, Varghese publishers, 2000, chapter 4 and 12. 2. Pharmaceutical inorganic chemistry, V. Alagarsamy, PharmaMed press, 2014, chapter 6. 3. Pharmaceutical chemistry- inorganic, G.R.Chatwal, Vol-I, Himalaya publishing house, 2006, chapter 7 and 12.
05	**Major intra and extracellular electrolytes:** a) Electrolytes used in replacement therapy: Sodium chloride, potassium chloride and calcium gluconate. b) Electrolyte combination therapy: Compound sodium lactate injection and compound sodium chloride injection. c) Oral rehydration salts	07 hrs	1. Pharmaceutical chemistry- inorganic, G.R.Chatwal, Vol-I, Himalaya publishing house, 2006, chapter 13. 2. Pharmaceutical inorganic chemistry, V. Alagarsamy, PharmaMed press, 2014, chapter 6. 3. Inorganic medicinal and pharmaceutical chemistry, Block, Roche, Sonie, Wilson, Varghese publishers, 2000, chapter 5.

06	**Radiopharmaceuticals:** a) Radioisotopes: Definition, types and production of radioisotopes. b) Applications of radioisotopes c) Official radio active pharmaceuticals: cyanocobalamine (^{57}Co), ferric citrate (^{59}Fe) injection, gold (^{198}Au) injection, sodium iodide (^{131}I) solution and sodium phosphate (^{32}P) solution **d)** Radio opaque contrast media: Barium sulphate.	06 hrs	1. Pharmaceutical chemistry- inorganic, G.R.Chatwal, Vol-I, Himalaya publishing house, 2006, chapter 17. 2. Pharmaceutical inorganic chemistry, V. Alagarsamy, PharmaMed press, 2014, chapter 7. 3. Inorganic medicinal and pharmaceutical chemistry, Block, Roche, Sonie, Wilson, Varghese publishers, 2000, chapter 11.

Further References:

1. Remington: The science and practice of pharmacy, Alfonso R Gennaro, Vol-I, Lippin cott williams and wilkins, 20th edition, 2000.
2. Bentley and driver's text book of pharmaceutical chemistry, L. M. Atherden, 8th edition, Oxford medical publications, 2004, Part-II.
3. Pharmaceutical analysis, P. Parimoo, CBS publisher's, 2004.
4. Indian Pharmacopoeia-1985, 3rd edition, The controller of publications, Delhi.
5. Indian Pharmacopoeia-1996, 4th edition, The controller of publications, Delhi.

CB205T

I/IV B. PHARMACY-2nd SEMESTER
PROFESSIONAL ETHICS AND HUMAN VALUES
[THEORY -50Hours]

Scope of the subject:

1. To bring awareness among pharmacy graduates on ethics and human values.
2. To understand the ethical theories and their application to work ethics.
3. To know various codes of ethics used by professional bodies.
4. To understand the concepts of corruption and its measures.
5. To learn about professional responsibility as a pharmacist.

Outcomes of the subject:

The student will be able to:

a) Develop awareness on ethics and human values
b) Become morally and socially responsible.
c) Motivate others on moral values.

Unit No.	Topic	Duration (Hours)	References
01	**Human Values:** Morals, Values and ethics – Integrity – Work ethics – Service learning, Civic virtue, Respect for others, Living peacefully – Caring, Sharing, Honesty, Courage, Valuing time, Co-operations, Commitment, Empathy, Self confidence, Character and Spirituality.	06 hrs	R.S.Naagarazan Professional ethics and Human values Edition I, New Age International Pvt.Ltd., Edition -1, Chapter – 1
02	**Introduction to professional ethics, corruption and its measures:** Need of ethics in pharmacy, changing times, RPSGB guidance, ethical norms, moral relativism, facts and values, ethical theories and concepts. Corruption in public life, economic impact of corruption, payments that equate supply and demand; bribes as incentive payments, bribes to reduce costs, organized crime and corruption. Anti-corruption measures – *Anti Corruption Bureau (ACB),* Central Vigilance Commission (CVC),	07 hrs	Joy Wingfield and David Badcott, Pharmacy ethics and decision making, Pharmaceurical press, Edition I, Chapter – 1.

	Central Bureau of Investigation (CBI), lok-adalats, Ombudsman, Comptroller and auditor general (CAG) and Right to information.		
03	**Moral concepts and reasoning in pharmacy:** Moral issues, rational inquires, moral autonomy, moral reasoning and pharmacist, moral development theories, justice and human rights, trust and truthfulness and moral dilemmas.	07 hrs	1.R.S.Naagarazan Professional ethics and Human values Edition I, New Age International Pvt.Ltd., Edition -1, Chapter – 2 2.Joy Wingfield and David Badcott, Pharmacy ethics and decision making, Pharmaceurical press, Edition I, Chapter – 4.
04	**Professionalism and Industrial ethics:** Pharmacy and professionalism, ethical basis in professionalism and accountability, industrial ethics, Pharmacist in different clusters with different ethical issues - ethical issues in clinical pharmacy practice, community pharmacy and manufacturing of pharmaceutical products.	07 hrs	1. Joy Wingfield and David Badcott, Pharmacy ethics and decision making, Pharmaceurical press, Edition I, Chapter – 4. 2. R.S.Naagarazan Professional ethics and Human values Edition I, New Age International Pvt.Ltd., Edition - 1Chapter – 2
05	**Professional societies and various pharmaceutical associations:** Indian Pharmaceutical Congress Association, Indian Pharmaceutical Association, Indian Hospital Pharmacists Association, Indian Pharmacy Graduates Association, Association of Pharmaceutical Teachers of India, The All India Drug Control Officers Confederation, Indian Society for Technical Education, National Pharmaceutical Pricing Authority and Other allied professional societies/ associations	06 hrs	1. Professional Pharmacy – M.L. Schroff 2. Harikishan singh: History of Pharmacy in India and related aspects, volume I, II and III Pharmacopoeias and formularies, 1st edition, Vallbh Prakashan, 2005.

06	**Social pharmacy and code of pharmaceutical ethics:** The Concept and context of social pharmacy, principles of ethics, Morality, ethical codes, Pharmaceutical Ethics in relation to job, trade, profession and medical profession. Pharmacist oath.	07 hrs	1. N.K.Jain, Forensic Pharmacy, Eight edition, 2014, 484-492. 2. B.M.Mithal, A Text book of Forensic Pharmacy, Valla prakasan, 10th Edition.Chapter-14

Further Readings:

1. NK Jain, Health Education and Community Pharmacy by, CBS, Publ. And Distributors New Delhi.
2. R.M Metha, Dispensing Pharmacy
3. Pharmacoethics: A problem based approach by G. Vidya Sagar
4. Gupta AK, Health Education and Community Pharmacy, CBS, Publ. and Distributors, New Delhi.

CB206T

I/IV B. PHARMACY-2nd SEMESTER
SOFT SKILLS
[THEORY -50Hours]

Scope of the subject:

- To develop personality development values and interpersonal skills.
- To learn and apply the knowledge of disciplinary method wherever they go.
- To build a good character and be the perfect citizen of the society.

Outcome of the subject:

- The students will develop positive attitude, required etiquette, respecting elders and render their college responsibilities in an active and disciplined manner.
- The students will not involve in any indisciplinary activities like ragging, eve-teasing, skipping the classes, bullying after participation in soft skills classes.
- Overall, the students will be enlightened with lot of positive thoughts, refinement tips, etiquette, change in attitude, behavioral approach and will reflect a dignified approach in college / anywhere in life.

Unit No.	Chapter/Topic	Durat-ion	References
01	Human values, cultural values, self-analyzing evaluation and the principles of discipline.	05 hrs	1. A must for every student / person – By Anthony 2. The positive way to change your life – By Norman Vincent Peale
02	Reflection of perfection, positive/negative traits, behavioral approach, making good impression, respect to elders and management.	05 hrs	1. A must for every student / person – By Anthony 2. Personal and emotional competence – By Varanasi Bhaskar Rao.
03	Telephone, letter writing and e-mail etiquettes, obey and follow principles and team discipline.	10 hrs	1. High School English Grammar and Composition – By Wren and Martin. 2. Communication and Soft Skills – By Anthony.
04	Interpersonal skills, body language, effective communication skills, college community service, team games and successful completion of projects.	15 hrs	1. Communication and Soft Skills – By Anthony. 2. Communication Skills – By Nageswara Rao.

0 5	Developing leadership values, participation, sacrifice, confidence, role-model, motivating, planning, co-ordination, decision making, negotiation, time management and mentoring.	08 hrs	1. Communication and Soft Skills – By Anthony. 2. The positive way to change your life – By Norman Vincent Peale
06	Developing the concept of creativity, features of creative person, creative methods – evolution, synthesis, revolution, reapplication, resources and creating new horizons.	07 hrs	1. Communication and Soft Skills – By Anthony. 2. Think and Grow Rich – By Napolean Hill.

Further Readings:

1. Seven Habits of Highly Effective People – Stephen R.Covey
2. How to win friends and influence people – Dale Carnegie

CB207P

I/IV B. PHARMACY-2nd SEMESTER
PHARMACEUTICAL ANALYSIS-I
(PACTICAL: 75Hours)

TOPIC	PRACTICAL	Durat-ion (Hrs)	References
Calibration of apparatus	01. Calibration of weights. 02. Calibration of pipette. 03. Calibration of volumetric flasks. 04. Calibration of burette. 05. Standardization of hydrochloric acid. 06. Standardization of sodium hydroxide. 07. Standardization of cerric ammonium sulphate. 08. Standardization of potassium permanganate 09. Standardization of ethylene diamine tetra acetic acid 10. Standardization of perchloric acid.	15 hrs	1. Pharmaceutical analysis by P.C.Kamboj, 2007, vol-I, 2nd edition, Vallabh publications, unit 02. 2. Practical pharmaceutical chemistry by Beckett AH, Stenlake JB, 4th edition, S.k.Jain,2005, unit-01,03 and 04
Limit test	11. Limit test for iron 12. Limit test for arsenic 13. Limit test for lead 14. Modified Limit test for chlorides and sulphates for colored compounds	15 hrs	1. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-II.
Acid-base titrations*	15. Assay of ammonium chloride 16. Assay of zinc oxide 17. Assay of borax.	9 hrs	1. Indian Pharmacopoeia, 2007, Govt. of India, Ministry of health and family welfare, vol-I.

			2. Bentley and Drivers, Text book of pharmaceutical chemistry, 8th edition, 2004, oxford university. 3. Indian Pharmacopoeia, 2007, Govt. of India, Ministry of health and family welfare, vol-II.
Precipitation titrations*	18. Assay of sodium chloride by Volhard's method.	3 hrs	1. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-III.
Redox titrations*	19. Assay of hydrogen peroxide. 20. Assay of ferrous sulphate by cerimetry. 21. Assay of copper sulphate by iodometry.	9 hrs	1. Indian Pharmacopoeia, 2007, Govt. of India, Ministry of health and family welfare, vol-I. 2. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-II.
Complexometric titrations*	22. Assay of calcium gluconate by complexometry.	3 hrs	1. Indian Pharmacopoeia, 2007, Govt. of India, Ministry of health and family welfare, vol-II
Non-aqueous titrations	23. Assay of sodium acetate by non-aqueous titration	3 hrs	1. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-III
Gravimetric analysis	24. Gravimetric estimation of barium as barium sulphate	3 hrs	1. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-II

Test for purity	25. Tests for purity • Presence of iodates in potassium iodide • Adsorption power of heavy kaolin • Acid neutralizing capacity of aluminum hydroxide gel	3 hrs	1. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-II and vol-III
Preparations	26. Preparation of potash alum 27. Preparation of calcium lactate	6 hrs	1. Bentley and Drivers, Text book of pharmaceutical chemistry, 8th edition, oxford university. 2. Indian Pharmacopoeia, 2014, Govt. of India, Ministry of health and family welfare, vol-II.
Electro analytical techniques	28. Perform strong acid-base titration potentiometrically using auto titrator. 29. Perform weak acid-base titration using conductometer. 30. Predict the moisture content of pharmaceutical formulations by K.F.Titrimetry.	6 hrs	Practical Pharmaceutical chemistry- A.H. Beckett, J.B.Stenlake, 4th ed., CBS publishers & distributors Pvt. Ltd., 2007. Chapter. No: 9.

CB208P

I/IV B. PHARMACY-2nd SEMESTER
PHYSICAL PHARMACY-I
(PRACTICAL -75 Hours)

Expt. No.	Name of the Experiment	Duration (Hrs)	References
1.	Calibration of specific gravity bottle.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 3.
2.	Determining the density of sucrose solution at different concentrations.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 3.
3.	Determination of surface tension – drop number method.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 5. 2. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi.Ch. No.10.
3.	Determination of surface tension – drop weight method.	3 hrs	1. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No.10.
4.	Determination of interfacial tension – drop number method.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 5.
5.	Construction of phase diagram of phenol – water system.*	6 hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition. Lippincott Williams and Wilkins, New Delhi, India; 2010; Ch. No. 2.
6.	Effect of sodium chloride on critical solution temperature of phenol – water system.*	6 hrs	1. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 6.

7.	Effect of ethanol on critical solution temperature of phenol – water system.*	6 hrs	1. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 6.
8.	Determination of aqueous solubility of benzoic acid by volumetric method.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 6.
9.	Cryoscopic constant of camphor.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 2. 2. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 12.
10.	Molecular weight determination by rast-camphor method.	3 hrs	
11.	Determination of viscosity of a liquid – Ostwald viscometer.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 4.
12.	Effect of temperature on viscosity.*	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 4.
13.	Effect of excipient concentration on viscosity.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 4.
14.	Handling and Calibration of pH meter.	3 hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 5th Edition. Lippincott Williams and Wilkins, New Delhi, India;2010; Ch. No. 8. 2. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 15.
15.	Determination of pKa of benzoic acid by – half neutralization method.*	3 hrs	1. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 14.

16.	Determination of pKa of acetic acid by graphical method.*	3 hrs	1. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 16.
17.	Determination of buffer capacity of Pharmaceutical buffer.	3 hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition. Lippincott Williams and Wilkins, New Delhi, India;2010; Ch. No. 8.
18.	Determination of electromotive force by potentiometric titration.*	3 hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 5th Edition. Lippincott Williams and Wilkins, New Delhi, India;2010; Ch. No. 8.
19.	Determination of optical rotation by polarimeter.	3 hrs	1. Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko. 6th Edition. Lippincott Williams and Wilkins, New Delhi, India;2010; Ch. No. 4.
20.	Determination of refractive index by Abbe's refractometer.	3 hrs	1. Practical physical pharmacy. R.S. Gaud, 1st Edition, CBS Publishers, New Delhi. Ch. No. 11. 2. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 10.
21.	Effect of dielectric constant of solvent on solubility of salicylic acid.	3 hrs	1. Essential of physical pharmacy. C.V.S. Subrahmanyam, 1st Edition, VallabhPrakashan, New Delhi. Ch. No. 10.

Major experiments

CB209P

I/IV B. PHARMACY-2nd SEMESTER
HUMAN ANATOMY AND PHYSIOLOGY-II
(PRACTICAL: 50 Hours)

Expt. No.	Name of the Experiment	Duration (Hrs)	References
1	Recording of human heart rate & pulse rate	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal; 11th edition B.S.Shah prakashan publications; Section- I, Exp. No: 9
2	Measurement of blood pressure	3 hrs	Practical anatomy and physiology - Dr R.K. Goyal; 11th edition. B.S.Shah prakashan publications; Section- I, Exp. No: 9
3	Effect of posture and muscular exercise on blood pressure	3 hrs	A text book of practical physiology - CL Ghai , 6th edition; Jaypee publications; Section-II, Chapter No:7
4	Recording of human body temperature and Body Mass Index (BMI)	3 hrs	A text book of practical physiology - CL Ghai, 6th edition, Jaypee publications; Section-I; Expt. No: 8
5	Determination of blood group	2 hrs	Practical anatomy and physiology - Dr R.K. Goyal; 11th edition. B.S.Shah prakashan publications, Section- I, Exp No: 18
6	Determination of bleeding time	1 hr	Practical anatomy and physiology - Dr R.K. Goyal, 11th edition. B.S.Shah prakashan publications; Section- I, Exp No: 19

7	Determination of clotting time	2 hrs	Practical anatomy and physiology - Dr R.K. Goyal, 11th edition. B.S.Shah prakashan publications; Section- I, Exp No: 19
8	Estimation of hemoglobin	3 hrs	A text book of practical physiology - CL Ghai , 6th edition , Jaypee publications; Section- I, Exp No: 7
9	Estimation of erythrocyte sedimentation rate (ESR)	3 hrs	A text book of practical physiology - CL Ghai , 6th edition ; Jaypee publications; Section- I, Exp No: 17
10	Determination of red blood corpuscles (RBC) count*	6 hrs	A text book of practical physiology - CL Ghai, 6th edition; Jaypee publications; Section- I, Exp No: 08
11	Determination of white blood corpuscles (WBC) count*	6 hrs	A text book of practical physiology - CL Ghai , 6th edition; Jaypee publications; Section- I, Exp No: 11
12	Determination of differential leukocyte count (DLC)*	6 hrs	A text book of practical physiology - CL Ghai , 6th edition , Jaypee publications; Section- I, Exp No: 12
13	Determination of platelet count	3 hrs	A text book of practical physiology - CL Ghai; 6th edition; Jaypee publications; Section- I, Exp No: 19
14	Simulated physiological experiments using Physio Ex software* - Blood analysis	6 hrs	Physio Ex software*

II B.PHARMACY
3rd SEMESTER

CB301T

II/IV B. PHARMACY-3rd SEMESTER
PHARMACEUTICAL CHEMISTRY-III (ORGANIC-II)
[THEORY -75 Hours]

Scope :

Pharmaceutical chemistry-II deals with the study of aromatic compounds like aryl halides, phenols, amines, diazonium salts and α, β-unsaturated carbonyl compounds and their characteristic reactions. Student acquires basic knowledge on the principles of stereochemistry and its importance in understanding reaction mechanisms, which is further essential to understand the chemistry and biological actions of medicinal compounds obtained from natural and synthetic process. Synthetic applications of various reagents and some of the rearrangement reactions are emphasized in the course. Heterocyclic compounds form the basis of several medicinally active compounds and understanding their applications is dealt with in this subject. Special synthetic techniques which are employed in modern day chemistry have been introduced in the course.

Objective :

At the end of the course the student will be able to:

- Understand the link between organic molecules and their transformation to drugs
- Write the structure and nomenclature of drug molecules possessing heterocyclic rings.
- Easily write the synthetic schemes by utilizing the knowledge of reagents and rearrangement reactions
- Employ the special techniques used in drug synthesis.
- Gain basic understanding on stereochemistry of organic compounds

Chapter/Topic	Duration (hrs)	References
UNIT-I **Chemistry of aromatic compounds:** a. Aromaticity, structure, stability and mechanism of electrophilic aromatic substitution reactions of benzene b. Orientation and reactivity of electrophilic substitution reactions in substituted benzenes	**14 hrs**	1. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapter-16, 17, 22, 23 and 24. 2. Pharmaceutical organic chemistry, part-1, Chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, 1st edition, Vallabh publication, 2005, chapter-2, 3.

c. Preparation and reactions of aryl halides, amines, diazonium salts, phenols and α, β-unsaturated carbonyl compounds d. Haworth's synthesis, properties and reactions of naphthalene, anthracene and phenanthrene		3. Organic chemistry, Robert Thornton Morrison, Robert Neilson Boyd, 6th edition, Dorling Kindersley (India) Pvt. Ltd. 2008, chapter-14, 15, 16, 22, 23, 24, 26 and 27. 4. Organic chemistry, IL. Finar, 6th edition, volume-I, Pearson education Pvt. Ltd, 2003, chapter-20, 21, 23, 24, 26 and 29. 5. A text book of organic chemistry, O P Agarwal, 5th edition, Disha publication, 2008, chapter-7,8,9,13,16,19 and 20.
UNIT-II **Chemistry of heterocyclic compounds:** a. Nomenclature of heterocyclic rings-monocyclic, bicyclic, tricyclic and spiro heterocyclic rings b. Preparation, properties and reactions of pyrrole, imidazole, pyridine, benzimidazole, quinoline and isoquinoline c. Structure and medicinal uses of diazepam, morphine, mepyramine, propranolol, tolnaftate, menadione, naphazoline, phenindione, metronidazole, carbimazole, nicotinic acid, nikethamide, isoniazid, benzhexol, piperazine, diethylcarbamazine, pyrimethamine, sulphadiazine chloroquine,	**17 hrs**	1. Heterocyclic chemistry-I, principles of three and four membered heterocycles, RR Gupta, M Kumar and V Gupta, volume-I, Springer (India) Private Limited, 1998, chapter-1,2 and 3. 2. Heterocyclic chemistry, Raj K Bansal, 4th edition, New age international (P) Limited, 2007, chapter-5, 6, 7, 8 and 10. 3. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapter-25. 4. The Merck index-an encyclo-paedia of chemicals, drugs and biologicals, Maryadele J O Neil, 15th edition, Royal society of chemistry publishing, 2013. 5. An introduction to the chemistry of heterocyclic compounds, R Morrin Acheson, 3rd edition, Wiley-interscience publication, 2008,chapter-III,V,VI, VII. 6. Organic chemistry, IL Finar, 6th edition, Dorling Kindersley (India) Pvt. Ltd, volume-I, chapter-30, volume-II chapter-12. 7. Organic chemistry, Robert Thornton Morrison, Robert Neilson Boyd, 6th edition, Dorling Kindersley (India) Pvt. Ltd. 2008,

		chapter-30. 8. Organic chemistry reactions and reagents, O P Agrawal, 44th edition, Krishna Prakashan media (P) Ltd, 2008, chapter-19. 9. Pharmaceutical organic chemistry, part-1, Chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, 1st edition, Vallabh publication, 2005, chapter-7.
UNIT-III **Organic synthesis reagents:** Preparation and applications of N-bromo succinimide, Lead tetra acetate, Lithium aluminium hydride, diazomethane, aluminium isopropoxide, osmium tetroxide, sodium borohydride and N,N-dicyclohexylcarbodimide.	**09 hrs**	1. Organic reaction mechanisms, V K Ahluwalia, Rakesh kumar Parashar, 3rd edition, Narosa publishing house, Pvt. Ltd. 2007, chapter-5. 2. Organic chemistry reactions and reagents, O P Agrawal, 44th edition, Krishna Prakashan media (P) Ltd, 2008, chapter-21. 3. Advanced organic chemistry reaction mechanisms, Reinhard Bruckner, Reed Elsevier (India) Pvt. Ltd, 2005, 4. Organic reactions, stereo-chemistry and mechanism, P S Kalsi, 4th edition, New age International publishers, 2007, chapter-5.
UNIT-IV **Stereochemistry:** a. Important definitions in stereochemistry, optical activity measurement and resolution of racemate b. Optical isomerism, geometrical isomerism and conformational isomerism-nomenclature and determination of configuration c. Relative and absolute configuration- principles of configuration determination	**15 hrs**	1. Organic chemistry, IL. Finar, 5th edition, volume-II, Dorling Kindersley(India) Pvt. Ltd. 2008, chapter-2,4,5 and volume-I, chapter- 17and 19 2. A text book of organic chemistry, O P Agarwal, 5th edition, Disha publication, 2008, chapter-3. 3. Organic chemistry, Robert Thornton Morrison, Robert Neilson Boyd, 6th edition, Dorling Kindersley(India) Pvt. Ltd. 2008, chapter-4 and 32. 4. Organic reactions, stereochemistry and mechanism, P S Kalsi, 4th edition, New age International publishers, 2007, chapter-2 and 3

d. Stereochemistry of alicylic compounds and biphenyls (atropisomerism and absolute stereochemistry). e. Asymmetric Synthesis and its applications		5. Organic chemistry reactions and reagents, O P Agrawal, 44th edition, Krishna Prakashan media (p) Ltd, 2008, chapter-6, 7 and 8. 6. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapter-7 and 12. 7. Pharmaceutical organic chemistry, part-1, Chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, 1st edition, Vallabh publication, 2005, chapter-5.
UNIT-V **Rearrangement reactions:** a. Fries, Benzilic acid, Beckmann, Hofmann, Schimdt, Hydroperoxide, Witting, Claisen rearrangements; b. Claisen Schmidt condensation, Mannich and Phillips reaction c. Clemmensen, Wolff kishner reductions d. Baeyer-villiger, Jones, Oppenauer and sarett oxidation	**12 hrs**	1. Organic reaction mechanisms, V K Ahluwalia, Rakesh kumar Parashar, 3rd edition, Narosa publishing house, Pvt. Ltd. 2007, chapter-6. 2. Organic chemistry reactions and reagents, O P Agrawal, 44 edition, Krishna prakashan media (P) Ltd. 2008, chapter-16 and 20. 3. Advanced organic chemistry reaction mechanisms, Reinhard Bruckner, Reed Elsevier (India) Pvt. Ltd, 2005, chapter- 11. 4. Organic reactions, stereochemistry and mechanism, P S Kalsi, 4th edition, New age International publishers, 2007, chapter-4 and 6. 5. Advanced organic chemistry reactions and mechanisms, Maya Shankar Singh, Pearson education (Singapore) Pvt.Ltd,2005, chapter-7 6. Pharmaceutical organic chemistry, part-1, Chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, 1st edition, Vallabh publication, 2005, chapter-4.

UNIT-VI **Special techniques for synthesis of organic compounds:** a. Principles of green chemistry b. Principle and instrumentation of microwave technique c. Principle and instrumentation of ultra sonication d. Phase transfer catalysts types and few phase transfer catalysis reactions e. Definition, types, merits and few applications of ionic liquids.	**08 hrs**	1. New trends in green chemistry, V K Ahluwalia, M Kidwai, Anamaya Publishers, 2004, chapter-3, 4, 5, 6, 7, 8, 9, 10 and 14. 2. Organic synthesis special techniques, V K Ahluwalia and Renu Aggarwal, 2nd edition, Narosa publishing house Pvt. Ltd. 2006, chapter-1, 3, 4 and 6. 3. Principles of pharmaceutical organic chemistry, Rama Rao Nadendla, Pharma Med Press, 2014, chapter-27.

Further readings:

1.Advanced organic chemistry –reactions, mechanisms, and structure, Jerry March, 4th edition, John-Wiley and Sons, Replica press Pvt. Ltd, 1992.

2.Organic chemistry, Maitland Jones Jr, 2nd edition, W. W. Norton and company Ltd, 2000.

3.Organic chemistry, Paula Yurkanis Bruice, 3rd edition, Pearson education (Singapore) Pvt. Ltd, 2003.

4.Organic chemistry structure and reactivity, Seyhan N Ege, 3rd edition, AITBS publishers and distributors, 2000.

5.Organic chemistry, T.W.Graham Solomons, Craig B Fryhle, 8th edition, John Wiley and Sons, Inc. 2004.

CB 302 T

II/IV B. PHARMACY-3rd SEMESTER
PHARMACEUTICAL MICROBIOLOGY
[THEORY -75 Hours]

Scope :

Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc..

Objectives:

Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterlization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Chapter / Topic	Duration (hrs)	References
UNIT-I Introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).	**12 hrs**	1. Prescott's Microbiology. J.M.Willey, L.M.Sherwood, C.J.Woolverton, 8th Edition, McGraw Hill international, 2011, Chapter-1,2 and 17. 2. Microbiology .M.J. Pelezar, G.R.E.C.S.Chan, N.R.Kries. 5th Edition, Tata McGraw.Hill publishers, 2002, Chapters-1, 2, 3, 5, 6, 7 and 8.
UNIT-II Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy. Identification of bacteria using staining techniques (simple,	**12 hrs**	1. Prescott's Microbiology. J.M.Willey, L.M.Sherwood, C.J.Woolverton, 8th Edition, McGraw Hill International, 2011, Chapter-2 and 3. 2. Microbiology .M.J. Pelezar, J.R.E.C.S.Chan,

Gram's &Acid fast staining) and biochemical tests (IMViC).		N.R.Kries. 5th Edition, Tata McGraw Hill publishers, 2002, Chapters-4 and 5.
UNIT-III Study of principle, procedure, merits, demerits and applications of physical, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Equipments employed in large scale sterilization. Sterility indicators. Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.	**13 hrs**	1. Cooper & Gunn's. Dispensing for pharmaceutical students. S.J.Carter, 12th edition, CBS Publishers, 2005, chapter 22, 26, 23, 28 and 25. 2. Bentley's text book of Pharmaceutics, E.A.Rawlins 8th edition, All India Traveller Book Seller, 2004, Chapter 29. 3. Indian Pharmacopoeia 2004. The Indian Pharmacopoeia commission, Ghaziabad, Vol.1, Chapter 2.
UNIT-IV Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	**13 hrs**	1. Prescott's Microbiology. J.M.Willey, L.M.Sherwood, C.J.Woolverton, 8th Edition, McGraw Hill international-2011, Chapter-24 and 25 2. Microbiology .M.J. Pelezar, J.R.E.C.S.Chan, N.R.Kries. 5th Edition, Tata McGraw Hill publishers. 2002, Chapters-17, 20 and 21. 3. Pharmaceutical Biotechnology, S.P.Vyas, V.K.Dixit. CBS Published,2007, Chapter 8
UNIT-V Classification and mode of action of disinfectants. Chemical and Gaseous sterilizing agents. Factors influencing disinfection, antiseptics and their evaluation for bacteriostatic and bactericidal actions. Evaluation of bactericidal & Bacteriostatic properties.	**13 hrs**	1. Cooper & Gunn's. Dispensing for pharmaceutical students. S.J.Carter.12th edition, CBS Publishers, 2005, Chapter 27. 2. Remington, The science and practice of Pharmacy, Pharmaceutical Press Published, 22 edition, 2006, Chapter 41.

Designing of aseptic area, laminar air flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.		3. Cooper & Gunn's. Tutorial Pharmacy. S.J.Carter, 6th edition, CBS publishers, 2005, Chapter 29 and 30.
UNIT -VI Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic. Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.	**12 hrs**	3. Indian Pharmacopoeia 2004. The Indian Pharmacopoeia commission, Ghaziabad, Vol.1, Chapter 2. 2. Cooper & Gunn's. Tutorial Pharmacy. S.J.Carter, 6th edition, CBS publishers, 2005, Chapter 31.

CB303T

II/IV B. PHARMACY-3rd SEMESTER
PHYSICAL PHARMACY-II
[THEORY -75 Hours]

Scope:

Physical pharmaceutics is a pharmaceutical material science that is concerned with the physical and chemical principles of materials that go into the formulation of dosage forms. A strong foundation in this subject helps in selecting the right kind of materials.

Objectives:

Upon completion of the course student shall be able;

1.To know various methods in solubilisation of drugs.
2.To understand different order and rate of reactions
3.To know how the quality of drug substance or drug product varies under the influence of environmental factors such as humidity, temperature and light.
4.To gain the knowledge of interfacial phenomena, characteristics of colloids and small particles which are fundamental in stabilisation of pharmaceutical dispersions
5.To understand the importance of viscosity and rheological behaviour in stabilization of drug products.

Topic	Duration (hrs)	References
UNIT-I **Solubility and distribution phenomena:** Solubility expressions, solubility, solute – solvent interactions, solubility of gases in liquids, liquids in liquids, solid in liquids and distribution of solutes in immiscible solvents. Nearest distribution law Enhancing solubility – pH control, complexation, combin-ation of pH and complexation, cosolvents, salt formation and surfactants.	**10 hrs**	1.Martin's Physical Pharmacy and pharmaceutical Sciences. Patrick J. Sinko. 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007; Ch. No. 10. 2.Encyclopedia of Pharmaceutical technology. James Swarbrick and James C. Boylan. 2nd Edition, Mercel Dekker Inc, New York, USA, Vol. 3, 2002, Pg. No. 2458 – 2480. 3.The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, 2013, Vol 1, Ch. No.33.

Diffusion Phenomena: Fick's first law and second law explanation, limitations and applications.	**02 hrs**	4.Encyclopedia of Pharmaceutical Technology. James Swarbrick and James C. Boylan. 2nd Edition, Mercel Dekker Inc, New York, USA, Vol. 1, 2002, Pg. No. 531-558.
Complexation: Types of complexes, factors affecting complexation, analysis of complexes and benefits of complexation.	**08 hrs**	
UNIT-II **Chemical Kinetics and stability testing:** **Chemical Kinetics:** Rates and molecularity of a reaction, determination of order of reaction and factors influencing rate of reactions. Simple numerical problems.	**06** hrs	1.Martin's Physical Pharmacy and pharmaceutical Sciences. Patrick J. Sinko. 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No. 15. 2.The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 32. 3.Stability of drugs and dosage forms. Sumie Yoshioka and Valentino J. Stella. 1st Edition, Springer (India) Pvt. Ltd., New Delhi, India, 2006, Ch. No.6 4.Pharmaceutical stress testing- Predicting drug degradation. Steven W. Baertschi. 1st Edition, Taylor & Francis group, Florida, USA, 2008, Ch. No.3. 5.Handbook of Stability Testing in Pharmaceutical Development. Kim Huynh-Ba. 1st Edition, Springer, New York, USA, 2009, Ch. No.6.
Stability Testing: Decomposition of medicinal agents. Methods and principles of stabilization. Accelerated stability testing as per ICH guidelines.	**06** hrs	
UNIT-III **Interfacial phenomenon:** Liquid interfaces, measurement of surface and interfacial tension, surfactants in pharmaceutical products and systems. Water sorption of drugs and dosage forms, adsorption isotherms, electrical properties of interfaces, importance of zeta potential.	**10 hrs**	1.Martin's Physical Pharmacy and pharmaceutical Sciences. Patrick J. Sinko. 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No. 16. 2.The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 34.

		3.Bentley's textbook of pharmaceutics. E.A. Rawlins. 8th edition, All India Traveller Bookseller, New Delhi, India, 2004, Ch. No.4. 4.Encyclopedia of Pharmaceutical Technology. James Swarbrick and James C. Boylan. 2nd Edition, Marcel Dekker Inc, New York, USA, Vol. 3, 2002, Pg. No. 2970-2987.
UNIT-IV **Dispersed systems** **Colloids and macromolecular systems:** Definition, types, preparation, purification and stabilization of colloids. Properties of colloids like optical properties, kinetic properties, electrical properties and Donnan membrane phenomenon. **Coarse dispersions:** ***Suspensions*** - Interfacial properties of suspensions, settling in suspensions and formulation of suspensions. ***Emulsions*** - Theories of emulsification, physical stability of emulsions and preservation of emulsions.	**13 hrs**	1.The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No.35. 2.Martin's Physical Pharmacy and pharmaceutical Sciences. Patrick J. Sinko. 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No.18. 3.The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 36. 4.Aulton's Pharmaceutics- The design and manufacture of medicines. Aulton and Taylor. 3rd Edition, Churchill Livingston Elsevier, Philadelphia, USA, 2009, Ch. No.6 5.Pharmaceutical Emulsions and Suspensions. Francoise Nielloud. 1st Edition, Informa healthcare, New York, USA, Ch. No.1.
UNIT-V **Rheology:** Newtonian and non-Newtonian systems. Thixotropy and determination of rheological properties (single and multipoint viscometers). Rheological considerations of suspensions, emulsions, micro-emulsions and multiple emulsions.	**10 hrs**	1.Martin's Physical Pharmacy and pharmaceutical Sciences. Patrick J. Sinko. 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No. 20.

		2.The science and practice of Pharmacy. Remington. 22nd Edition, Pharmaceutical Press, Philadelphia, USA, Vol 1, 2013, Ch. No. 37. 3.Aulton's Pharmaceutics- The design and manufacture of medicines. Aulton and Taylor. 3rd Edition, Churchill Livingston Elsevier, Philadelphia, USA, 2009, Ch. No.4
UNIT-VI **Micromeritics and powder rheology** **a) Micromeritics:** Particle size and size distribution, methods of determination of particle size, particle shapes and surface area. **b) Powder rheology:** Factors influencing the flow of solids, flow enhancers (glidants), measurement of flow properties, bulk density, true density, packing properties and powder rheometers. Influence of powder rheology on quality of solid dosage forms.	**10 hrs**	1.Martin's Physical Pharmacy and pharmaceutical Sciences. Patrick J. Sinko. 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No. 19 2.Encyclopedia of Pharmaceutical Technology. James Swarbrick and James C. Boylan. 2nd Edition, Marcel Dekker Inc, New York, USA, Vol. 2, 2002, Pg. No. 1264-1286.

CB304T

II/IV B. PHARMACY-3rd SEMESTER
PHARMACEUTICAL JURISPRUDENCE
[THEORY -50 Hours]

Scope:
This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Objectives:
Upon completion of the course, the student shall be able to understand:
1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Chapter/Topic	Duration (hrs)	References
UNIT-I **Pharmaceutical Legislations –** A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee **Code of Pharmaceutical ethics** Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath	**5 hrs**	a) A textbook of forensic pharmacy, N.K. Jain, 8th edition, Vallabh prakashan, 2015, chapter 2 and 29 b) Textbook of forensic pharmacy, C.K.Kokate, 2nd edition, PharmaMed press, 2014, chapter – 2 & 3 c) Textbook of forensic pharmacy, Guru Prasad Mohanta, 1st Edition 2013, CBS publishers, chapter 1.
UNIT -II **Drugs and Cosmetics Act, 1940 and its rules 1945:** Objectives, Legal definitions, schedules to the act and rules, Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit, offences and penalties**.** Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, conditions for grant of license and	**10 hrs**	a) A textbook of forensic pharmacy, N.K. Jain, 8th edition, Vallabh prakashan, 2015, chapter 5 b) A textbook of forensic pharmacy, B.M.Mithal, 10th edition, Vallabh prakashan, 2007, chapter 6

conditions of license for manufacture of drugs, manufacture of drugs for examination, test and analysis, manufacture of new drug, loan license and repacking license.		c) Forensic pharmacy, Dr. B.S.Kuchekar, 7th edition, Nirali prakashan, 2009, chapter- 5
UNIT-III **Drugs and Cosmetics Act, 1940 and its rules 1945.** Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA), Sale of Drugs – Wholesale, retail sale and restricted license, offences and penalties. Labeling & packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Administration of the act and rules – Drugs Technical Advisory Board, Central Drugs Laboratory, Drugs Consultative Committee, Government analysts, Licensing authorities, Controlling authorities and Drugs Inspectors.	**10 hrs**	a) A textbook of forensic pharmacy, N.K. Jain, 8th edition, Vallabh prakashan, 2015, chapter 5 b) A textbook of forensic pharmacy, B.M.Mithal, 10th edition, Vallabh prakashan, 2007, chapter 6 c) Forensic pharmacy, Dr. B.S.Kuchekar, 7th edition, Nirali prakashan, 2009, chapter- 5
UNIT-IV **Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of pharmacists, Offences and penalties **Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture in bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary preparations, Offences and penalties.	**8 hrs**	a) A textbook of forensic pharmacy, N.K. Jain, 8th edition, Vallabh prakashan, 2015, chapter 3 & 7 b) A textbook of forensic pharmacy, B.M.Mithal, 10th edition, Vallabh prakashan, 2007, chapter 3 & 5 c) Textbook of forensic pharmacy, C.K.Kokate, 2nd edition, PharmaMed press, 2014, chapter – 4.
UNIT-V **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and functions of Narcotic & Psychotropic Consultative Committee, National fund	**07 hrs**	a) A textbook of forensic pharmacy, N.K. Jain, 8th edition, Vallabh prakashan, 2015, chapter 7, 8 and 12

for Controlling Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and penalties. **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of exempted advertisements, Offences and penalties **Medical Termination of Pregnancy Act**		b) A textbook of forensic pharmacy, B.M.Mithal, 10th edition, Vallabh prakashan, 2007, chapter 4, 7 and 12 c) Textbook of forensic pharmacy, Guru Prasad Mohanta, 1st Edition 2013, CBS publishers, chapter 8.
UNIT-VI **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)- 2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM) **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of animals, Performance of experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties. **Introduction to Intellectual Property Rights (IPR)** **Right to Information Act.**	**10 hrs**	a) A textbook of forensic pharmacy, N.K. Jain, 8th edition, Vallabh prakashan, 2005, chapter 10, 14, 15 and 28. b) Textbook of forensic pharmacy, C.K.Kokate, 2nd edition, PharmaMed press, 2014, chapter – 21. c) Textbook of forensic pharmacy, Guru Prasad Mohanta, 1st Edition 2013, CBS publishers, chapter 5. d) Forensic pharmacy, Dr. B.S.Kuchekar, 7th edition, Nirali prakashan, 2009, chapter- 16

CB305T

II/IV B. PHARMACY-3rd SEMESTER
ENVIRONMENTAL SCIENCES
[THEORY -50 Hours]

Scope:

Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives:

Upon completion of the course the student shall be able to**:**

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Topic	**Duration (Hours)**	**References**
UNIT-I • Definition, scope and importance • Measuring and defining environment development : indicators	**05 hrs**	1.Introduction to Environmental sciences by Y.Anjaneyulu. 2. Environmental sciences by Dr.U.Sai jyothi
UNIT-II The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.	**10 hrs**	1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore 2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

UNIT-III Ecosystems • Concept of an ecosystem. • Structure and function of an ecosystem. • Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	**10 hrs**	1.Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia Jaico Publ. House, Mumbai, 1196p
UNIT-IV Environmental Pollution: Air pollution; Water pollution; Soil pollution.	**10 hrs**	1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p 2. Clark R.S., Marine Pollution, Clanderson Press Oxford
UNIT-V • Value of bio-diversity-consumptive and productive use, social, ethical, aesthetic and option values. • Bio-geographical classification of India-India as a mega diversity habitat. • Threats to biodiversity-Hot spots, habitat loss, poaching of wildlife, loss of species, seeds, etc.. • Conservation of bio-diversity, In-situ and Ex-situ conservation.	**10 hrs**	1. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
UNIT-VI • Drinking water, Sanitation and public health. • Water scarcity and Ground water depletion • Rain water harvesting, cloud seeding and watershed management.	**05 hrs**	1. De A.K., Environmental Chemistry, Wiley Eastern Ltd. 2. Down of Earth, Centre for Science and Environment

CB306P

II/IV B. PHARMACY-3rd SEMESTER
PHARMACEUTICAL CHEMISTRY-III (Organic-II)
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1.	Systematic qualitative analysis of five water insoluble un reactive organic binary mixtures.*	**39 hrs**	1. Vogel's textbook of practical organic chemistry, Brain S Furniss, Antony J Hannaford, Peter W.G. Smith and Austin R Tatchell, 5th edition, Pearson education Pvt. Ltd, 2004, chapter-9. 2. Practical organic chemistry, FG Mann, BC Saunders, 4th edition, Orient Longman Ltd, 2001, part-I and III.
2	Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.	**3 hrs**	Practical organic chemistry by F.G.Mann and B.C.Saunders, 4th edition, page No. 108.
3	2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline.	**3 hrs**	Practical organic chemistry by F.G.Mann and B.C.Saunders, 4th edition, page No. 165.
4	Acetanilide by halogenation (Bromination) reaction.	**6 hrs**	Text book of practical organic chemistry by VOGEL's, 5th edition, page No. 918.
5	5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid /Nitro benzene by nitration reaction.	**6 hrs**	Text book of practical organic chemistry by VOGEL's, 5th edition, page No. 855.
6	Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.	**3 hrs**	home.miracosta.edu/dlr/211exp3.htm.
7	1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.	**3 hrs**	Text book of practical organic chemistry by VOGEL's, 5th edition, page No. 948.

8	Benzil from Benzoin by oxidation reaction.	**3 hrs**	Practical organic chemistry by F.G.Mann and B.C.Saunders, 4th edition, page No. 234.
9	Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction.	**3 hrs**	Practical organic chemistry by F.G.Mann and B.C.Saunders, 4th edition, page No. 231.
10	Cinnammic acid from Benzaldehyde by Perkin reaction.	**3 hrs**	Text book of practical organic chemistry by VOGEL's, 5th edition, page No. 1038.
11	*P*-Iodo benzoic acid from *P*-amino benzoic acid.	**3 hrs**	Systematic lab experiments in organic chemistry by Arun Sethi, page No. 777

CB307P

II/IV B. PHARMACY-3rd SEMESTER
PHARMACEUTICAL MICROBIOLOGY
[PRACTICALS -75 Hours]

Sl. No	Practical	Duration (hrs)	References
01	General rules. Introduction and study of **different equipments BOD Incubator, Laminar flow, aseptic hood, deep freezer, refrigerator, microscopes, and processing**	**6 hrs**	1Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson Education (Singapore) Ltd., India, 2004, Ch. No. 01
02	**Sterilization techniques:** Sterilization by autoclaving and preparation of nutrient medium for bacteria and fungi	**6 hrs**	1. Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson Education (Singapore) Ltd., India, 2004, Ch. No. 04,09.
03	Sterilization of glassware by dry heat- hot air oven, red hot, flaming, gases.	**3 hrs**	
04	**Microscopic observation and identification :** Simple staining	**3 hrs**	1. Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson Education (Singapore) Ltd., India, 2004, Ch. No. 03
05	Gram staining**	**3 hrs**	
06	Acid-fast staining **	**3 hrs**	
07	Negative Staining	**3 hrs**	
08	Spore Staining	**3 hrs**	
09	Microscopic observation of fungi	**3 hrs**	
10	**Study of Bacterial motility:** Hanging drop technique.**	**1 hr**	1.Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson Education (Singapore) Ltd., India, 2004, Ch. No. 02
11	**Isolation and quantification of microbes:** Asceptic culture transfer technique	**1 hr**	1.Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson

12	Isolation of pure cultures by streak plate method;	**3 hrs**	Education (Singapore) Ltd., India, 2004, Ch. No. 01
13	Viable count of microbes by serial dilution method.**	**3 hrs**	
14	Bacteriological analysis of water	**3 hrs**	1. Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson Education (Singapore) Ltd., India, 2004, Ch. No. 09
15	**Test for sterility** Test for sterility of sterile products	**3 hrs**	1.Indian pharmacopoeia 2014.Indian pharmacopoeia commission Ghaziabad, Vol 1 Ch. No.2
16	Test for sterility of non sterile products	**3 hrs**	1.Indian pharmacopoeia 2014.Indian pharmacopoeia commission Ghaziabad, Vol 1 Ch. No.2
17	**Microbiological assays**. Microbiological assay of penicillin by disc plate method	**3 hrs**	1. Indian pharmacopoeia 2014.Indian pharma-copoeia commission Ghaziabad, Vol 1 Ch. No.2
18	Microbiological assay of penicillin by cup plate method	**3 hrs**	1.Indian pharmacopoeia 2014.Indian pharma-copoeia commission Ghaziabad, Vol 1 Ch. No.2
19	Microbiological assay of tetracycline by turbidometric method.	**3 hrs**	1.Indian pharmacopoeia 2014.Indian pharma-copoeia commission Ghaziabad, Vol 1 Ch. No.2
20	**Biochemical characterization of microbes** IMViC tests**: Indole test	**3 hrs**	1. Microbiology: A Laboratory Manual. Cappuccino Sherman. 6th Edition, Pearson Education (Singapore) Ltd., India, 2004, Ch. No. 05
21	Methyl red test;	**3 hrs**	
22	Voges Proskauer test	**3 hrs**	
23	Citrate utilization test.	**3 hrs**	

II/IV B. PHARMACY-3rd SEMESTER
PHYSICAL PHARMACY-II
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1	Determination of particle size, particle size distribution using sieving method	**6 hrs**	Practical manual of Pharmaceutical Engineering by P.S.Sona, University Science Press, 1st Edition-2015, Pg.No.69 – 72
2	Determination of particle size, particle size distribution using microscopic method	**9 hrs**	Laboratory manual of physical Pharmaceutics by C.V.S.Subrahmanyam, Vallabh Prakasam Publications, Pg.No. 54 – 65
3	Determination of bulk density, true density and porosity	**6 hrs**	1.Laboratory manual of Physical Pharmaceutics. C.V.S. Subrahmanyam, 1st Edition, Vallabh Prakashan, 2006, Experiment No.7. 2.Lachman, Liberman's The theory and practice of Industrial Pharmacy, Roop K Khar, 4th Edition, CBS Publishers and distributors Pvt. Ltd., 2013, Ch. No. 9.
4	Determination of the angle of repose and influence of glidant on angle of repose	**6 hrs**	Laboratory manual of Physical Pharmaceutics. C.V.S. Subrahmanyam, 1st edition, Vallabh Prakashan, 2006, Experiment No.7.
5	Determination of viscosity of liquid using Ostwald's viscometer	**6 hrs**	Laboratory Manual of Physical Pharmacy C.V.S.Subrah-manyam, page No. 8 - 14
6	Determination of sedimentation volume with effect of different suspending agents.	**6 hrs**	Martins Physical Pharmacy and Pharmaceutical Sciences. 5th Edition, Wolters Kluwer Health (India) Pvt. Ltd. 2007, Pg.No.501 – 503
7	Determination of sedimentation volume with effect of different concentrations of suspending agent	**6 hrs**	Laboratory manual of Physical Pharmaceutics. C.V.S. Subrahmanyam, 1st Edition, Vallabh Prakashan, 2006, Experiment No. 19.

8	Determination of viscosity of semisolid by using Brookfield viscometer	**6 hrs**	Martins Physical Pharmacy and Pharmaceutical Sciences. 5th Edition, Wolters Kluwer Health (India) Pvt. Ltd. 2007, Pg.No. 574 – 576
9	Determination of reaction rate constant first order.	**6 hrs**	1.Text book of physical pharmaceutics. C.V.S. Subrahmanyan. 2nd Edition, Vallabh Prakashan, 2014, Ch. No. 1. 2.Martin's Physical Pharmacy and pharamceuitcal Sciences. Patrick J. Sinko, 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No. 15.
10	Determination of reaction rate constant second order	**6 hrs**	Laboratory manual of Physical Pharmaceutics. C.V.S. Subrahmanyam, 1st Edition, Vallabh Prakashan, 2006, Pg.No.41 – 45
11	Accelerated stability studies	**12 hrs**	1.Text book of physical pharmaceutics. C.V.S. Subrahmanyan. 2nd Edition, Vallabh Prakashan, 2014, Ch. No. 2. 2.Martin's Physical Pharmacy and pharmaceuitcal Sciences. Patrick J. Sinko, 5th Edition, Lippincott Williams and Wilkins, New Delhi, India, 2007, Ch. No.15.

II B.PHARMACY
4th SEMESTER

CB401T

II/IV B. PHARMACY- 4th SEMESTER
PHARMACEUTICAL ENGINEERING
[THEORY -75 Hours]

Scope:

This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives:

Upon completion of the course student shall be able:

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry our various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in pharmaceutical industries.

Chapter/Topic	Duration (hrs)	References
UNIT-I **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotameter.	**6 hrs**	1.Introduction to chemical engineering. Walter L. Badger and Julius T. Banchero. 11th Edition, Tata Mc Graw Hill publishing ltd., New Delhi, India, 2004, Ch. No. 3, 4 and 16.
UNIT-II **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill. **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Bag filter & elutriation tank.	**12 hrs**	1.Introduction to chemical engineering. Walter L. Badger and Julius T. Banchero. 11th Edition, Tata Mc Graw Hill publishing ltd., New Delhi, India, 2004, Ch. No. 14. 2.Cooper and Gunn's Turorial Pharmacy. S.J. Carter. 6th Edition, CBS Pubishers and distributors, New Delhi, India, 2005, Ch.No. 16 3.Aulton's Phamaceutics-The design and manufacture of medicines. Aulton and Taylor. 3rd Edition, Churchill Livingstone Elsevier, Philadelphia, USA, 2009, Ch. No. 10-11

UNIT-III **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator. **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation	**16 hrs**	1. Introduction to chemical engineering. Walter L. Badger and Julius T. Banchero. 11th Edition, Tata Mc Graw Hill publishing Ltd., New Delhi, India, 2004, Ch. No. 4. 2. Pharmaceutical engineering: Unit operations I. C.V.S. Subrahmanyam. 2nd Edition, Vallabh prakashan, New Delhi, 2011, Ch. No. 5. 3. Chemical Engineers Handbook. Robert H. Perry and Cecil H. Chilton. 5th Edition, Mc Graw Hill Kogakusha, Toko, Japan, 1973, Ch. No. 9-11. 4. Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 6th Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 12.
UNIT-IV **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.	**14 hrs**	1. Introduction to chemical engineering. Walter L. Badger and Julius T. Banchero. 11th Edition, Tata Mc Graw Hill publishing ltd., New Delhi, India, 2004, Ch. No. 13 2. Cooper and Gunn's Turorial Pharmacy. S.J. Carter. 6th Edition, CBS Pubishers and distributors, New Delhi, India, 2005, Ch. No. 18

Mixing: Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetarymixers, Propellers, Turbines, Paddles & Silverson Emulsifier		3. Aulton's Phamaceutics- The design and manufacture of medicines. Aulton and Taylor. 3rd Edition, Churchill Livingstone Elsevier, Philadelphia, USA, 2009, Ch. No. 12 4. Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 6th Edition, CBS Publishers and distributors, Delhi, India, 2005, Ch. No. 24. 5. Introduction to chemical engineering. Walter L.Badger and Julius T. Banchero. 11th Edition, Tata Mc Graw Hill publishing ltd., New Delhi, India, 2004, Ch. No. 10.
UNIT-V **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Catridge filter, membrane filters and Seidtz filter. **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.	**14 hrs**	1.Pharmaceutical engineering. K. Samba-murthy. 2nd Edition, New age international Pvt. Ltd., New Delhi, 2005,Ch.No.12. 2.Pharmaceutical engineering: Unit operations II. C.V.S. Subrahmanyam. 2nd Edition, vallabh prakashan, New Delhi, 2011, Ch. No. 8. 3.Cooper and Gunn's Tutorial Pharmacy. S.J. Carter. 6th Edition, CBS Publishers and distributors, New Delhi, India, 2005, Ch. No. 20. 4.Introduction to chemical engineering. Walter L. Badger and Julius T. Ban-chero. 11th Edition, Tata Mc Graw Hill publishing ltd., New Delhi, India, 2004,Ch. No. 12.

UNIT-VI **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basics of material handling systems.	**13 hrs**	1.Cooper and Gunn's Turorial Pharmacy. S.J. Carter. 6th Edition, CBS Pubishers and distributors, New Delhi, India, 2005, Ch. No. 25. 2.Aulton's Phamaceutics- The design and manufacture of medicines. Aulton and Taylor. 3rd Edition, Churchill Livingstone Elsevier, Philadelphia, USA, 2009, Ch. No. 45 3.Chemical Engineers Handbook. Robert H. Perry and Cecil H. Chilton. 5th Edition, Mc Graw Hill Kogakusha, Toko, Japan, 1973, Ch. No. 23

CB402T

II/IV B. PHARMACY-4th SEMESTER
BIOCHEMISTRY
[THEORY -75 Hours]

Scope:
Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives:
Upon completion of course student shell able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Chapter/Topic	Duration (hrs)	References
UNIT-I **Biomolecules** Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins. **Bioenergetics** Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential. Energy rich compounds; classification; biological significances of ATP and cyclic AMP	**10 hrs**	1.Biochemistry, U Satyanarayana and U Chakrapani, 4th edition, Elsevier & books and allied Pvt. Ltd, 2013, chapter-1, 2, 3, 4 and 5 2. A text book of biochemistry, AV S S Rama Rao, 9th edition, UBS publishers & distributers, 2004, chapter-15. 3. Fundamentals of biochemistry, AC Deb, 10th edition, New central book agency Pvt. Ltd, 2011, chapter-11.

UNIT-II **Carbohydrate metabolism** Glycolysis – Pathway, energetics and significance, Citric acid cycle- Pathway, energetics and significance HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency Glycogen metabolism Pathways and glycogen storage diseases (GSD) Gluconeogenesis- Pathway and its significance Hormonal regulation of blood glucose level and Diabetes mellitus **Biological oxidation** Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate Phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers Level.	**14 hrs**	1. A text book of biochemistry, AV S S Rama Rao, 9th edition, UBS publishers & distributers, 2004, chapter-3, 15 and 16. 2. Biochemistry, U Satyanarayana and U Chakrapani, 4th edition, Elsevier & books and allied Pvt. Ltd, 2013, chapter-2, 11 and 13. 3. Fundamentals of biochemistry, AC Deb, 10th edition, New central book agency Pvt. Ltd, 2011, chapter 3, 12, 17, 19 and 33. 4. Medical biochemistry, N Mallikarjuna Rao, revised 2nd edition, New age international Pvt. Ltd, publishers, 2007, chapter-5, 9 and 11.
UNIT-III **Lipid metabolism** β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis. De novo synthesis of fatty acids (Palmitic acid) Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity. **Amino acid metabolism** General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkaptonuria, tyrosinemia)	**16 hrs**	1. A text book of biochemistry, AV S S Rama Rao, 9th edition, UBS publishers & distributers, 2004, chapter-4, 5, 17, 24 and 26 2. Biochemistry, U Satyanarayana and U Chakrapani, 4th edition, Elsevier & books and allied Pvt. Ltd, 2013, chapter-3, 4, 10, 14 and 15. 3. Fundamentals of biochemistry, AC Deb, 10th edition, New central book agency Pvt. Ltd, 2011, chapter-4, 5, 6, 9, 18, 20 and 33.

Synthesis and significance of biological substances 5-HT, melatonin, dopamine, noradrenaline, adrenaline Catabolism of heme; hyperbilirubinemia and jaundice		4. Medical biochemistry, N Mallikarjuna Rao, revised 2nd edition, New age international Pvt. Ltd, publishers, 2007, chapter-3, 6, 10 and 12.
UNIT-IV **Nucleic acid metabolism and genetic information transfer** Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout disease. Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi conservative model) Transcription or RNA synthesis Genetic code, Translation or Protein synthesis and inhibitors	**10 hrs**	1. A text book of biochemistry, AV S S Rama Rao, 9th edition, UBS publishers & distributers, 2004, chapter-6,18,19 and 24. 2. Biochemistry, U Satyanarayana and U Chakrapani, 4th edition, Elsevier & books and allied Pvt. Ltd, 2013, chapter-5,17,24 and 25 3. Fundamentals of biochemistry, AC Deb, 10th edition, New central book agency Pvt. Ltd, 2011, chapter-7, 8, 23, 25, 26 and 33. 4. Medical biochemistry, N Mallikarjuna Rao, revised 2nd edition, New age international Pvt. Ltd, publishers, 2007, chapter-14, 15, 16, 17 and 18.
UNIT-V **Enzymes** Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes –Structure and biochemical functions	**12 hrs**	1. Biochemistry, U Satyanarayana and U Chakrapani, 4th edition, Elsevier & books and allied Pvt. Ltd, 2013, chapter-6,7 and 18 2. A text book of biochemistry, AV S S Rama Rao, 9th edition, UBS publishers & distributers, 2004, chapter-9 and 11.

		3. Fundamentals of biochemistry, AC Deb, 10th edition, New central book agency Pvt. Ltd, 2011, chapter-10, 15 and 27. 4. Medical biochemistry, N Mallikarjuna Rao, revised 2nd edition, New age international Pvt. Ltd., publishers, 2007, chapter-4, 23 and 24. 5. Text book of medical biochemistry, S Rama-krishnan, R Rajan, 2nd edition, Orient Longman Ltd, 1998, chapter-7.
UNIT-VI **Clinical biochemistry:** a. Laboratory analysis of body fluids. b. Principle involved and qualitative, quantitative analysis of following constituents: 1. Urine analysis- urea, uric acid, creatinine, glucose, proteins and bile pigments 2. Blood analysis-Sodium, Potassium, Calcium, Total Proteins, SGPT, SGOT, ALP and Bilirubin, Glucose, Creatinine, Lipid profile tests (Total cholesterol, HDL, LDL and Triglycerides).	**13 hrs**	1. Biochemistry, U Satyanarayana and U Chakrapani, 4th edition, Elsevier & books and allied Pvt. Ltd, 2013, chapter-22, 20 and appendix-IV. 2. Medical Laboratory technology, Kanai L Mukherjee, 1st edition, volume –III, Tata MC Graw-Hill publishing company Ltd, 2002, chapter- 33 and 34. 3. Practical clinical biochemistry, Harold Varley, 4th edition, CBS Publishers & Distributers, 2004, chapter-1, 3, 4, 5, 18, 7 and 9. 4. A text book of biochemistry, AV S S Rama Rao, 9th edition, UBS publishers & distributers, 2004, chapter-32 and 31.

		5. A text book of biochemistry, SP Singh, 3rd edition, CBS Publishers & Distributers, 2004, chapter-21 6. Fundamentals of biochemistry, AC Deb, 10th edition, New central book agency Pvt. Ltd, 2011, chapter-37 and 47. 4. Medical biochemistry, N Mallikarjuna Rao, revised 2nd edition, New age international Pvt. Ltd, publishers, 2007, chapter- 33.

FURTHER READINGS:

1. Text book of biochemistry for medical students, D M Vasudevan, Sreekumari S, Kannan vaidyanathan, 6th edition, Jaypee brothers medical publishers Pvt. Ltd, 2011.
2. Horper's Biochemistry, Robert K Murray, Daryl K Granner, Peter A Mayers and Victor W Rodwell, 25th edition, MC Graw Hill, 2002.
3. Lehninger's principles of biochemistry, David L Nelson, Michael M Cox, 3rd edition, Macmillan worth publishers, 2003.
4. Text book of biochemistry with clinical correlations, Thomas M Devlin, 4th edition, A John Wiley & Sons INC., publication, 1997.
5. Text book of biochemistry, Edward Staunton West, Wilbert R Todd, Howard S Mason and John T Van Bruggen, 4th edition, Oxford & IBH publishing Co. Pvt. Ltd, 1974.

CB403T

II/IV B. PHARMACY-4th SEMESTER
PHARMACEUTICAL CHEMISTRY-IV (MEDICINAL CHEMISTRY – I)
[THEORY -75 Hours]

Scope:

Medicinal chemistry is a comprehensive subject which encompasses discovery, development of newer drug molecules and provides pharmacy students with a thorough understanding of chemistry, mechanism of action, structure activity relationships, physicochemical properties and therapeutic uses of drugs. The subject also emphasis on modern techniques of drug design which include molecular modeling, quantitative structure activity relationship (QSAR), combinatorial chemistry and computer aided drug design (CADD).

Objective :

At the end of the course the student will be able to:

- Understand the concepts of drug design and drug development
- Learn the importance of physicochemical properties in relation to biological activity
- Gain knowledge on chemistry and therapeutic uses of drugs
- Interpret the relationship between structure and biological activity

Topic	Duration (hrs)	References
UNIT-I **General approaches to drug discovery:** a) Lead discovery; lead optimization, structural modification to increase potency-homologation, chain-branching, ring-chain transformation. b) Combinatorial chemistry-solid phase synthesis, liquid phase synthesis and applications. c) Computer-aided drug design-molecular docking approaches and applications.	**10 hrs**	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed press, 2013, chapter 04 and 06. 2. The organic chemistry of drug design and drug action, Richard B. Silverman, 2nd edition, Academic press, chapter-02. 3. An introduction to medicinal chemistry, Graham L. Patrick, 3rd edition, Oxford university press, Part B-12 and Part C-13 and 14. 4. Principles of medicinal chemistry, S.S.Kadam, vol-I, Nirali Prakashan, 18th edition, 2009, chapter 20.

UNIT-II **General approaches to drug development and retrosynthesis:** a) Physicochemical properties of drug molecules in relation to biological activity-solubility, partition coefficient, acid-base properties and steric aspects. b) QSAR studies -electronic and steric parameters, hansch analysis c) Basic rules of disconnection and synthon approach for the synthesis of following drugs - promethazine, cyclizine, epinephrine, ephedrine, propranolol, chlorpromazine and imipramine.	**12 hrs**	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed press, 2013, chapter 03 and 04 2. The organic chemistry of drug design and drug action, Richard B. Silverman, 2nd edition, Academic press, chapter-02 3. An introduction to medicinal chemistry, Graham L. Patrick, 3rd edition, Oxford university press, Part B-9 and 10.
UNIT-III **Drugs acting on CNS:** A study of the following classes of drugs including introduction, chemical classification, mechanism of action, structure activity relationships and therapeutic uses. (synthesis of compounds specified against each class has to be studied) a) General anesthetics- halothane, thiopental b) Anxiolytics and hypnotics- phenobarbital, diazepam c) Antiepileptics- phenytoin, carbamazepine d) Antipsychotics-haloperidol, fluphenazine e) Antidepressants- amitryptaline, fluoxetine	**15 hrs**	01.Wilson and Grisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry by John H.Block, John M.Beale, 7th edition, Lippincott Williams & Wilkins, 2004, Chapter 14 and 15. 02.Medicinal and pharmaceutical chemistry, Harkishan singh, 2nd edition, 2008, chapter 12 and 13. 03. A text book of medicinal chemistry, vol-I and II, 3rd edition SG publisher, 2006, chapter 06, 07, 08, 09 and 11.
UNIT-IV **Drugs acting on ANS and PNS:** A study of the following classes of drugs including introduction, chemical classification, mechanism of action, structure activity relationships and therapeutic uses. (synthesis of compounds specified against each	**18 hrs**	01. Wilson and Grisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry by John H.Block, John M.Beale, 7th edition, Lippincott Williams & Wilkins, 2004, Chapter 17

class has to be studied) a) Cholinergic agonists- carbachol, methacholine b) Cholinergic antagonists- tropicamide, dicyclomine c) Adrenergic agonists- salbutamol, methyldopa d) Adrenergic antagonists- phenoxybenzamine, atenolol e) Local anesthetics- procaine, lidocaine		02. Medicinal and pharmaceutical chemistry, Harkishan singh, 2nd edition, 2008, chapter 07, 16,17 and 18 03. A text book of medicinal chemistry, vol-I and II, 3rd edition SG publisher, 2006, chapter 05, 19 and 21
UNIT-V **Opioid analgesics and NSAIDS:** a) Classification of opioid agonists, antagonists, mixed agonists and antagonists. b) Structure, properties, mode of action, SAR and therapeutic uses of morphine. c) Structure and therapeutic uses of pentazocine, codeine, nalorphine, naltrexone and dextromethorphan d) Classification of NSAIDS and their mode of action e) SAR of aryl and heteryl alkanoic acid derivatives, oxicams and anthranilic acid derivatives. f) Synthesis and therapeutic uses of diclofenac, ibuprofen, indomethacin and mefenamic acid	**10 hrs**	01. An introduction to medicinal chemistry, Graham L. Patrick, 3rd edition, Oxford university press, Part .D-21 02. Wilson and Grisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry by John H.Block, John M.Beale, 7th edition, Lippincott Williams & Wilkins, 2004, Chapter 22 03. A text book of medicinal chemistry, S.N.Pandeya, vol-I and II, 3rd edition SG publisher, 2006, chapter 13 and 16
UNIT-VI **Antihistamines and diagnostic agents:** a) Classification, SAR and mechanism of action of H_1-antagonists b) Synthesis and therapeutic uses of diphenhydramine, chlorpheniramine, cetirizine c) Dual acting antihistamines- ketotifen	**10 hrs**	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed press, 2013, chapter 26. 2. Principles of medicinal chemistry, S. S. Kadam, Vol-I, Nirali Prakashan, 18th edition, 20 09, chapter 17. 3. An introduction to medicinal chemistry, Graham L. Patrick, 3rd edition, Oxford university press, Part D-22.

d) Structure, mechanism of action and therapeutic uses of H_2-antagonists and proton pump inhibitors-ranitidine, famotidine, omeprazole and pantoprazole e) Synthesis and diagnostic applications of iopanoic acid, diatriazoic acid, fluorescein and metyrapone		4. A text book of medicinal chemistry, S.N.Pandeya, vol-I and II, 3rd edition SG publisher, 2006, chapter 15.

CB404T

II/IV B. PHARMACY-4th SEMESTER
PHARMACOLOGY - I
[THEORY -50 Hours]

Scope:

The main purpose of the subject is to understand what drugs do the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contradictions and routes of administration of different classes of drugs.

Objectives:

Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs.
2. Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Chapter/Topics	Duration	References
UNIT-I **General Pharmacology** **Introduction to Pharmacology** — Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. **Pharmacokinetics** — Membrane transport, absorption, distribution, metabolism and excretion of drugs, enzyme induction, enzyme inhibition, kinetics of elimination, Structural Activity Relationship.	**3 hrs** **3 hrs**	1. Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; Chapter No.: 1 – 4 2. Pharmacology – H.P Rang & M.M Dale; 6th edition; Churchill livingstone publishers; Chapter No.:3, 4.

UNIT-II **Pharmacodynamics** — Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors, drug receptors interactions signal transduction mechanism, G-protein –coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. 2. Adverse drug reactions 3. Drug interactions (Pharmacokinetic and Pharmacodynamic) 4. Drug discovery and clinical evaluation of new drugs- Drug discovery phase, pre clinical evaluation phase, phases of clinical trials and pharmacovigilance.	**3 hrs** **1 hr** **1hr** **1 hr**	1. Principles of Pharmacology – David E Golan; 3rd edition; Chapter No.: 1 & 2 2. Lipincott Williams & Wilkins publishers; Chapter No.:2.
UNIT-III **Drugs acting on Autonomic & Peripheral Nervous System** 1. Cholinergic Pharmacology • Physiology of cholinergic neurotransmission • Cholinergic agonists • Cholinergic antagonists • Neuromuscular blockers & Skeletal muscle relaxants 2. Adrenergic Pharmacology • Physiology of Adrenergic neurotransmission • Adrenergic Agonists • Adrenergic Antagonists 3. Local anesthetics	**4 hrs** **3 hrs** **2 hrs**	1. Principles of Pharmacology – David E Golan; 3rd edition; Chapter No.: 9 - 11 2. Lipincott Williams & Wilkins publishers; Chapter No.:3 - 7. 3. Pharmacology – H.P Rang & M.M Dale; 5th edition; Churchill livingstone publishers; Section-4; Chapter No: 43

UNIT-IV **Drugs acting on Central Nervous System** 1. Neurotransmitters and modulators — Excitatory amino acids, Glutamate, Gama amino butyric acid, Noradrenaline Dopamine, 5-Hydroxy tryptamine, Acetylcholine, Purines, Histamine, Melatonin, Nitric oxide 2. General anesthetics 3. Anxiolytics & Hypnotics 4. Anti psychotic agents 5. Anti depressants and anti manic drugs 6. CNS stimulants and psychotomimetic drugs 7. Antiepileptic agents 8. Opioid analgesics and opioid antagonists 9. Drug therapy for neurodegenerative disorders — Parkinson's disease — Alzheimer's disease 10. Pharmacology of Drugs of Abuse — Mechanisms of tolerance, addiction, dependence and withdrawal — Drug abuse and its treatment	**1 hr** **2 hrs** **1 hr** **1 hr** **1 hr** **2 hr** **2 hrs** **2 hrs** **2 hrs** **1 hr**	1. Pharmacology – H.P Rang & M.M Dale; 5th edition; Churchill livingstone publishers; Chapter No.:32 - 34. 2. Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; Chapter No.:31-35, 37, 39, 40. 3. Principles of Pharmacology – David E Golan; 3rd edition; Chapter No.:18.
UNIT-V **Anti-inflammatory drugs and Autacoids** — Non steroidal anti-inflammatory drugs, drugs for gout and antirheumatic drugs — Histamine, 5-hydroxytryptamine and their antagonists, Bradykinin — Prostaglandins, leukotrienes and platelet activating factor	**2 hrs** **2 hrs** **2 hrs**	Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; 24 -26.

UNIT-VI **1. Drugs acting on Respiratory System** — Drug therapy of bronchial asthma — Drug therapy of cough and chronic obstructive pulmonary disease (COPD) **2. Drugs acting on Gastro intestinal tract** — Drugs used in peptic ulcer — Emetics and antiemetics — Drugs for constipation, diarrhea and irritable bowel syndrome	**2 hrs** **1 hr** **2 hrs** **1 hr** **2 hrs**	Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; Chapter No.: 27 – 29 and 48 - 49.

CB405T

II/IV B. PHARMACY-4th SEMESTER
PATHOPHYSIOLOGY
[THEORY -75 Hours]

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes.This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Chapter/Topic	Duration (hrs)	References
UNIT-I **Basic principles of Cell injury and Adaptation:** Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage),Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia),Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis,Electrolyte imbalance.	**15 hrs**	1. Text book of pathology-Harsh Mohan, 6th edition, Section-I, chapter-3 2. Pathologic basis of disease-Robbins and cotran, 8th edition, chapter-1.
UNIT II **Cardiovascular System:** Hypertension, congestive heart failure, ischemic heart disease (angina,myocardial infarction, atherosclerosis and arteriosclerosis) **Respiratory system:** Asthma,	**10 hrs**	1. Text book of pathology-Harsh Mohan, 6th edition, Section-I, chapter-15, 16 2. Clinical Pharmacy and

Chronic obstructive airways diseases **Renal system:**Acute and chronic renal failure.		Therapeutics-Roger Walker; 5th edition; Churchill Livingstone publications, Section-3,Chapters 17, 18, 19, 25 and 26.
UNIT-III **Haematological Diseases:** Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease. **Gastrointestinal system:** Peptic Ulcer	**15 hrs**	Clinical Pharmacy and Therapeutics-Roger Walker; 5th edition; Churchill Livingstone publications, Section-3,Chapters 12, 30, 31, 32, 44 and 49.
UNIT-IV Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease. **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout **Principles of cancer:** classification, etiology and pathogenesis of cancer	**15 hrs**	1. Clinical Pharmacy and Therapeutics-Roger Walker; 5th edition; Churchill Livingstone publications, Section-3,Chapter 13. 2. Text book of pathology-Harsh Mohan, 6th edition, Section-III, chapters-21, 28 3. Text book of pathology-Harsh Mohan, 6th edition, Section-I, chapter-8 4. Pathologic basis of disease - -Robbins and cotran 8th edition; Chapter 16.
UNIT V **Infectious diseases:**Meningitis,Typhoid, Leprosy, Tuberculosis, Urinary tract infections **Sexually transmitted diseases:**AIDS, Syphilis, Gonorrhea	**5 hrs**	1. Clinical Pharmacy and Therapeutics-Roger Walker; 5th edition; Churchill Livingstone publications, Section-3,Chapters 36, 38 and 40. 2. Text book of pathology-Harsh Mohan, 6th edition, Section-III, chapter-20 3. Text book of pathology-

		Harsh Mohan, 6th edition, Section-I, chapter-6
UNIT-VI Inflammation, Mechanism of inflammation-Alterations in vascular permeability and blood flow, Migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin. Basic mechanisms involved in the process of inflammation and repair. Introduction clinical signs of inflammation, different types of inflammation mechanism of inflammation, attraction in vascular permeability and blood flow, migration of WBC's mediators of inflammation, Basic principles of healing in the skin. Pathophysiology of atherosclerosis.	**15 hrs**	1. Pathologic basis of diseases -Robbins, Catran, 8th edition; Chapter 2, 3. 2. Text book of pathology Harshmohan-6th edition, chapter-5.

II/IV B. PHARMACY- 4th SEMESTER
PHARMACEUTICAL ENGINEERING
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1	Determination of radiation constant of brass, iron, unpainted and painted glass.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No.1 – 9.
2	Steam distillation – To calculate the efficiency of steam distillation.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No.103 – 107.
3	To determine the overall heat transfer coefficient by heat exchanger.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No.15 – 21
4	Construction of drying curves (for calcium carbonate and starch).	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No.133 – 138
5	Determination of moisture content and loss on drying.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No. 139 – 149
6	Determination of humidity of air – i) From wet and dry bulb temperatures – use of Dew point method.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No. 127- 131
7	Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No.27 – 34

8	Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No.
9	Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No. 76 – 89
10	Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.	**6 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications.
11	Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity	**5 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications.
12	To study the effect of time on the Rate of Crystallization.	**5 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No. 122 – 126
13	To calculate the uniformity Index for given sample by using Double Cone Blender.	**5 hrs**	Laboratory manual of pharmaceutical Engineering by C.V.S.Subrahmanyam, 2nd Edition,2011, Vallabh Publications. Pg.No. 60 – 63

CB407P

II/IV B. PHARMACY-4th SEMESTER
BIOCHEMISTRY
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1	Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)	**21 hrs**	Laboratory manual in Biochemistry by J.Jayaraman, Page. No.49-52.
2	Identification tests for Proteins (albumin and Casein)	**9 hrs**	Pharmaceutical Biochemistry theory and practicals by P.K.Sharma, P.C.Dandiya, Page No. 304.
3	Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)	**6 hrs**	1. An introduction to practical biochemistry by David.T.Plummer, page no. 180. 2. Laboratory manual in Biochemistry by J.Jayaraman, Page. No. 78.
4	Qualitative analysis of urine for abnormal constituents	**6 hrs**	Pharmaceutical Biochemistry theory and practicals by P.K.Sharma, P.C.Dandiya, Page No. 338.
5	Determination of blood creatinine	**6 hrs**	Pharmaceutical Biochemistry theory and practicals by P.K.Sharma, P.C.Dandiya, Page No. 325.
6	Determination of blood sugar	**6 hrs**	Pharmaceutical Biochemistry theory and practicals by P.K.Sharma, P.C.Dandiya, Page No. 310.
7	Determination of serum total cholesterol	**3 hrs**	Pharmaceutical Biochemistry theory and practicals by P.K.Sharma, P.C.Dandiya, Page No. 321.
8	Preparation of buffer solution and measurement of pH	**6 hrs**	Essentials of physical pharmacy by CVS Subramanyam, G.Vasantha Raju, page no. 69 – 71, 315 – 320.

9	Study of enzymatic hydrolysis of starch	**3 hrs**	An introduction to practical biochemistry by David.T. Plummer, 3rd edition, page no. 185 – 186
10	Determination of Salivary amylase activity	**3 hrs**	Text book of laboratory manual in biochemistry by J.Jayaraman, page no. 160.
11	Study the effect of Temperature on Salivary amylase activity.	**3 hrs**	An introduction to practical biochemistry by David.T. Plummer, 3rd edition, page no. 240 – 241.
12	Study the effect of substrate concentration on salivary amylase activity.	**3 hrs**	Text book of laboratory manual in biochemistry by J.Jayaraman, page no. 125.

III B.PHARMACY
5th SEMESTER

CB501T

III/IV B. PHARMACY-5th SEMESTER
PHARMACOGNOSY-I
[THEORY -75 Hours]

Scope of the subject:

— To learn and understand the cultivation, collection and storage of crude drugs and their usefulness and to make the student aware of systematic pharmacognostic study of crude drugs

Outcome of the subject:

Upon completion of the course, the student shall be able to:

1. To know the techniques in the cultivation and production of crude drugs.
2. To know the crude drugs their uses and chemical nature
3. To know the evaluation techniques of the herbal rugs
4. Understand macroscopical and microscopical characteristics of plant drugs

Unit No.	Chapter / Topics	Duration	References
I	**1. Introduction to Pharmacognosy** a) Definition, history, scope and development of Pharmacognosy b) Sources of Drugs – Plants, Animals, Marine & Tissue culture c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). **2. Classification of drugs:** Alphabetical, morphological, taxonomical, chemical, pharmacological, chemotaxonomical classification of drugs	**23 Hrs** 10 hrs 3 hrs 10hrs	1. Textbook of Pharmacognosy–T. E. Wallis; 5thedition ; CBS Publishers; Chapter:1 2. Text book of pharmacognosy-S.S.Handa,V.K Kapoor;Second Edition;Vallabh Prakashan Publishers; Chapter:2 3. Quality control of herbal drugs-Dr.Pullok. K.Mukherjee; 1stedition;Business Horizons Publishers; Part I : 1

	3. Quality control of Drugs of Natural Origin: Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.		4. Pharmacognosy - C.K. Kokate; 50thedition;Nirali Prakashan Publishers; Chapter:1 5. Quality Control of Herbal Drugs- Dr.Pullok.K.Mukherjee; 1st edition Business Horizons Publishers; Part II :4 6. Trease & Evans Pharmacognosy – W.C .Evans; 15thEdition; Elsevier publishers; Part 3 : 14 &Part 9 :42
II	**Cultivation, Collection, Processing and storage of drugs of natural origin:** Cultivation and Collection of drugs of natural origin Factors influencing cultivation of medicinal plants. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants	**15 hrs** 3 hrs 4 hrs 4 hrs 4 hrs	Trease & Evans Pharmacognosy – W.C .Evans; 15th edition; Elsevier publishers; Part 3 :9,10&12
III	**Plant tissue culture:** Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance.Applications of plant tissue culture in pharmacognosy. Edible vaccines	**07hrs**	1. Plant tissue culture- S.S.Bhajwani;1st edition;Elsevier; Chapter: 3 – 16 2. Biotechnology – V.Kumaresan; 1st edition; Saras publications; Chapter : 20

IV	**1. Pharmacognosy in traditional medicine:** Amla (*Phyllanthus emblica),* Bheda (*Terminalia bellirica*) Shatavari (*Asparagus racemosus*) Bhilwa (*Semecarpus anacardium*) Punarnava (*Boerhaevia diffusa*) Sankhapushpi (*Convolvulus pluricaulis*) **2. Introduction to secondary metabolites:** Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins	**14hrs** 6hrs 8hrs	1. Essentials of Pharmacognosy- Dr.S.H.Ansari, Birla publications, 1st edition, Chapter.12 2. Trease & Evans Pharmacognosy – W.C .Evans; 15th edition; Elsevier publishers; Part 5 : 19
V	Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs **1. Plant Products:** Fibres - Cotton, Jute, Hemp Surgical dressings – Preparation, Classification and applications Hallucinogens, Teratogens, Natural allergens. **2. Primary metabolites:** General introduction, detailed study with respect to sources, preparation, identification, storage, therapeutic uses and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: — **Carbohydrates:** Acacia, Agar, Tragacanth, Honey — **Proteins and Enzymes :** Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).	**16hrs** 5hrs 3 hrs 3 hrs 2 hrs	1. Trease & Evans Pharmacognosy – W.C .Evans; Fifteenth Edition ; Elsevier publishers; Part 6 :21-23. 2. Textbook of Pharmacognosy –T. E. Wallis; 5th edition ; CBS Publishers;

	— **Lipids(Waxes, fats, fixed oils)** : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax — **Marine Drugs:** Novel medicinal agents from marine sources : Cod liver oil, Shark liver oil, Carragenan, Alginates	3 hrs	

Further References:

1. American Herbal Pharmacopoeia-Roy Upton; 1 st Edition;CRS Press publishers.
2. Hand Book of Medicinal Herbs-James A. Duke; 2nd edition;CRS Press publishers.
3. Plant Drug Analysis-H.Wagner; 2nd edition;Springer publishers.

CB502T

III/IV B. PHARMACY-5th SEMESTER
PHARMACEUTICS-II
[THEORY -75 Hours]

Scope:
Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

Objectives:
Upon completion of the course the student shall be able to
1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms.
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Unit No.	Chapter/Topic	Duration (hrs)	References
1	**Preformulation Studies:** Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances. ***a. Physical properties:*** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism ***b. Chemical Properties:*** Hydrolysis, oxidation, reduction, racemisation, polymerization BCS classification of drugs & its significance. Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.	8	1. G.S.Banker Modern Pharmaceutics, 4th Edition, Ch-7, P.No.167, Informa healthcare USA, 2009. 2. M.E.Aulton, Pharmaceutics, The Design and Manufacture of Medicine, Part-5, 3rd Edition, Pg.No.336, Elsevier Ltd., 2007. 3. Lachman.L, Lieberman H.A., Joseph, LK. The Theory and practice of industrial pharmacy, 4th Edition, Ch.9, pg.No.217, CBS Publishers and distributors, 2013.
II	**Tablets:** a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods,	25	1. Lachmann.L, Liebermann H.A., Joseph L.K. The theory and practice of industrial pharmacy, 4th edition, Ch-13, 17, CBS

	compression and processing problems. Equipments and tablet tooling. b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. c. Quality control tests: In process and finished product tests **Liquid orals:** Formulation and manufacturing consideration of syrups,elixirs ,suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia.		Publishers, Pg.No.449, 629, 2013, 2. G.S.Banker, Modern Pharmaceutics, 4th edition, Ch-10, Pg.No.287, Informa Health Care, USA, 2009 3. Loyd.V.Allen, Jr.Howard. C.Ansel, Pharmaceutical Dosageforms and drug delivery systems. Ch.13, 14. Wolters Kluwer, 2011. 4. Aulton M.E.,Pharma-ceutics. The Science of dosage form design, Ch.24, 26, 27, 4th edition, Pg.No.395, 416, 435, churchili Livingston, 2013
III	**Capsules:** a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules. b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications. **Pellets:** Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets.	10	1. G.S.Banker, Modern Pharmaceutics, 4th edition, ch-11, Pg.No.335, Informa Health Care, USA, 2009. 2. Lachmann.L, Liebermann H.A., Joseph L.K. The Theory and Practice of Industrial Pharmacy, 4th Edition, Ch.-14, P.No.546, CBS Publishers, 2013. 3. Issac Ghebre-Sellassie, Pharmaceutical Pelletization Technology, Ch-6, 10, 11, Pg.No.145, 217, 241. Informa Health Care, USA, 2010.

IV	**Parenteral Products:** a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity b. Production procedure, production facilities and controls, aseptic processing c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products. d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. **Ophthalmic Preparations:** Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations	15	1. G.S.Banker, Modern Pharmaceutics, 4th edition, ch-12, 13, Pg.No.381, 415, Informa Health Care USA, 2009. 2. Lachmann.L, Liebermann H.A.Joseph UK. The theory and practice of Industrial Pharmacy, 4th edition, Ch-23, Pg.No.828, CBS Publishers, 2013. 3. Loyd V.Allen Jr.Howard. C.Ansel, Pharmaceutical Dosage forms and Drug Delivery systems. Ch-15, Pg.No.l431, Wolters kluwer, 2011. 4. Aulton M.E., Design and Manufacture of Medicines, Ch.No.41, Pg.No.710, Churchill Livingstone, 2013.
V	**Pharmaceutical Aerosols:** Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.	9	1. Lachmann.L, Liebermann H.A.Joseph UK. The theory and practice of Industrial Pharmacy, 4th edition, Ch-21, 27, CBS Publishers, 2013.
VI	**Cosmetics:** Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. **Packaging Materials Science:** Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.	8	1. Sanjunanda, Cosmetic Technology, Ch.-12, 15, 16, 17, 20, Biral Publications, 2007 2. G.S.Banker, Modern Pharmaceutics, 4th edition, ch-17, Informa Health Care USA, 2009.

CB503T

III/IV B. PHARMACY-5th SEMESTER
PHARMACEUTICAL BIOTECHNOLOGY
[THEORY -75 Hours]

Scope:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

Objectives: Upon completion of the subject student shall be able to;
1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

Unit No.	Chapter/Topic	Duration (hrs)	References
I	a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences. b) Enzyme Biotechnology- Methods of enzyme immobilization and applications. c)Biosensors- Working and applications of biosensors in Pharmaceutical Industries. d)Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.	12	1. Pharmaceutical Biotechnology, K.Sambamurthy, New Age International (P)Ltd., Publishers, 2006, Chapter 5 and 7 2. Biotechnology– A Text book of Industrial Microbiology, W.Crueger and A.Crueger, 2nd edition, Panima publishing corporation, 2005, chapter 11.

II	a) Brief introduction to Protein Engineering. b) Basic principles of genetic engineering. c) Study of cloning vectors, restriction endonucleases and DNA ligase. d) Recombinant DNA technology. Application of genetic engineering in medicine. e) Application of r DNA technology and genetic engineering in the production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin. f) Brief introduction to PCR	13	1. Pharmaceutical Biotechnology, S.P.Vyas and V.K.Dixit, CBS publishers, 2007, Chapter 10 and 14. 2. Pharmaceutical Biotechnology, K.Sambamurthy, New Age International (P) Ltd., Publishers, 2006, Chapter 3
III	Types of immunity- humoral immunity, cellular immunity a) Structure of Immunoglobulins b) Structure and Function of MHC c) Hypersensitivity reactions, Immune stimulation and Immune suppressions. d) Hybridoma technology- Production, Purification and Applications	13	1. Pharmaceutical Biotechnology, K.Sambamurthy, New Age International (P)Ltd., Publishers, 2006, Chapter 1 2. Pharmaceutical Biotechnology, S.P.Vyas and V.K.Dixit, CBS publishers, 2007, Chapter 10 and 14. 3. Prescott's Microbiology, J.M.Willey, L.M.Sherwood, C.J.Woolverton, McGraw Hill Publishers, 2011, Chapter 32, 33 and 35.
IV	a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting. b) Genetic organization of Eukaryotes and Prokaryotes c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons. d) Mutation: Types of mutation/mutants.	12	1. Prescott's Microbiology, J.M.Willey, L.M.Sherwood, C.J.Woolverton, McGraw Hill Publishers, 2011, Chapter 14. 2. Microbiology M.J.Pelezar, J.R.E.C.S.Chan, N.R.Kries, 5th Edition, Tata McGraw Hill publishers, 2002, Chapters 1 and 2.

V	a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. b) Large scale production fermenter design and its various controls. c) Study of the production of – penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, d) Introduction to Microbial biotransformation and applications.	12	1. Biotechnology – A text book of Industrial Microbiology, W.Crueger and A.Crueger, 2nd edition, Panima publishing corporation, 2005, chapter 12,13 and 15. 2. Pharmaceutical Biotechnology, K.Sambamurthy, Ashutochkar, New Age international (P)Ltd., Publishers, 2006, Chapter 3 and 4.
VI	a) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. b) Storage conditions and stability of official vaccines c) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitute.	13	1. Pharmaceutical Biotechnology, K.Sambamurthy, Ashutochkar, New Age international (P)Ltd., Publishers, 2006, Chapter 1. 2. Tutorial Pharmacy, S.J.Carter, 6th edition, CBS, Publishers, 2005, Chapter 33 and 34.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

CB504T

III/IV B. PHARMACY-5th SEMESTER
PHARMACY PRACTICE
[THEORY -75 Hours]

Scope:

In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counseling for improved patient care in the community set up.

Objectives:

Upon completion of the course, the student shall be able to

1. Know various drug distribution methods in a hospital
2. Appreciate the pharmacy stores management and inventory control
3. Monitor drug therapy of patient through medication chart review and clinical review
4. Obtain medication history interview and counsel the patients
5. Identify drug related problems
6. Detect and assess adverse drug reactions
7. Interpret selected laboratory results (as monitoring parameters in therapeutics)
   of specific disease states
8. Know pharmaceutical care services
9. Do patient counseling in community pharmacy;
10. Appreciate the concept of Rational drug therapy.

Unit No.	Chapter/Topic	Duration (hrs)	References
I	**a) Hospital and it's organization** Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.	3	Hospital and Clinical Pharmacy – Pratibhanand, Pg.3, Hospital Pharmacy-that paradhar, Pg. No.1.1

	b) Hospital pharmacy and its organization Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.	3	Modern Dispensing and Hospital Pharmacy, N.K.Jain, Pg.No. 309
	c) Adverse drug reaction Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction-beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. **d) Community Pharmacy** Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.	6 4	A text book of clinical pharmacy practice, G.Partha Sarathi, 2nd edition, Pg.No. 104 Text book of community pharmacy, Chapter-8, Adepu Ramesh, Pg.No.66
II	**a) Drug distribution system in a hospital** Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.	3	a. Hospital Pharmacy, Anand Paradkar, Chapter 9, Pg.No.9 b. Model dispensing and hospital pharmacy, N.K.Jain, Chapter-17, Pg. 327

	b) Hospital formulary Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary. **c) Therapeutic drug monitoring** Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic DrugMonitoring, and Indian scenario for Therapeutic Drug Monitoring.	3 4	a. Model dispensing and hospital pharmacy. N.K.Jain, Chapter 19, Pg.NO.379 b. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th edition, Pg.No.39 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Pg.No.395
III	**a) Medication adherence** Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence. **b) Patient medication history interview** Need for the patient medication history interview, medication interview forms. **c) Community pharmacy management** Financial, materials, staff, and infrastructure requirements.	3 2 2	Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Pg.No.74 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Pg.No.190 Text book of community pharmacy, Ch-8, Adepu Ramesh, Pg.No. 66
IV	**a) Pharmacy and therapeutic committee** Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation. **b) Drug information services** Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.	3 3 3	Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Ch.4, Pg.No.77 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Pg.No.267 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical*

	c) Patient counseling Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist **d) Education and training program in the hospital** Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education. **e) Prescribed medication order and communication skills** Prescribed medication order-interpretation and legal requirements, and Communication skills-communication with prescribers and patients.	3 3	*Pharmacy Practice-essential concepts and skills,* 1st ed. Pg.No.93 William E. Hassan. *Hospital pharmacy*, 5th ed. Ch. 26, Pg.No.566 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Pg.No.38
V	**a) Budget preparation and implementation** Budget preparation and implementation **b) Clinical Pharmacy** Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care. Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern. **c) Over the counter (OTC) sales** Introduction and sale of over the counter, and Rational use of common over the counter medications.	3 8 2	William E. Hassan. *Hospital pharmacy*, 5th ed. Ch. 8, Pg.No.184 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Pg.No.1, 10, 190, 211, 361 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice-essential concepts and skills,* 1st ed. Ch. 7, Pg.No.72

VI	**a) Drug store management and inventory control** Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure **b) Investigational use of drugs** Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee. **c) Interpretation of Clinical Laboratory Tests** Blood chemistry, hematology, and urinalysis	5 3 6	Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Pg.No.80 William E. Hassan. *Hospital pharmacy*, 5th ed. Ch. 8, Pg.No.160 Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Pg.No.140

Recommended Books (Latest Edition):

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.

Journals:

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

CB505T

III/IV B. PHARMACY-5th SEMESTER
PHARMACEUTICAL QUALITY ASSURANCE
[THEORY -75 Hours]

Scope:

This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives:

Upon completion of the course student shall be able to:

- Understand the cGMP aspects in a pharmaceutical industry
- Appreciate the importance of documentation
- Understand the scope of quality certifications applicable to pharmaceutical industries
- Understand the responsibilities of QA & QC departments

Unit No.	Chapter/Topic	Duration (hrs)	References
I	**Quality Assurance and Quality Management concepts:** Definition and concept of quality control, quality assurance and GMP **Total Quality Management (TQM):** Definition, elements, philosophies **ICH Guidelines**: Purpose, participants, process of harmonization, brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines	15	1.Pharmaceutical regulatory affairs, C.V.S.Subramanyam, Vallabh Prakashan publication, 2012, Chapter 04. 2.Pharmaceutical Quality Assurance, Manohar A.Potdar, Nirali Prakashan Publication, 2006, Chapter 05. 3.Handbook of pharmaceutical quality assurance, Premnath Shenoy, First edition, Omkar offset printers, 2016, Chapter 18.
II	**Quality by design (QbD)**: Definition, overview, elements of QbD program and tools **ISO 9000 & ISO14000**: Overview, benefits, elements, steps for registration **NABL accreditation** : Principles and procedures	10	1.Pharmaceutical regulatory affairs, C.V.S.Subramanyam, Vallabh Prakashan publication, 2012, Chapter 04. 2.Quantitative analysis of drugs in pharmaceutical formulations, P.D.Sethi, Third edition, CBS publishers and distributors, 1997, Chapter 04.

III	**Organization and personnel:** Personnel responsibilities, training, hygiene and personal records. **Premises:** Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. **Equipments and raw materials:** Equipment selection, purchase specifications and maintenance of stores for raw materials.	15	1.Pharmaceutical Quality Assurance, Manohar A.Potdar, Nirali Prakashan Publication, 2006, Chapter 01 & Chapter 02. 2.Handbook of pharmaceutical quality assurance, Premnath Shenoy, First edition, Omkar offset printers, 2016, Chapter 18.
IV	**Quality Control:** Quality control test for containers, rubber closures and secondary packing materials. **Good Laboratory Practices:** General provisions, organization and personnel, facilities, equipment, testing facilities, operation, test and control articles, protocol for conduct of a nonclinical laboratory study, records and reports, disqualification of testing facilities	15	1.Quantitative analysis of drugs in pharmaceutical formulations, P.D.Sethi, Third edition, CBS publishers and distributors, 1997, Chapter 04. 2.Pharmaceutical Quality Assurance, Manohar A.Potdar, Nirali Prakashan Publication, 2006, Chapter 01 & Chapter 05. 3.Drug regulatory affairs, V.Sai kishore, IKON books, 2011, Chapter 06.
V	**Complaints:** Complaints and evaluation of complaints, handling of return good, recalling and waste disposal.	10	1.Pharmaceutical Quality Assurance, Manohar A.Potdar, Nirali Prakashan Publication, 2006, Chapter 01 & Chapter 04 & Chapter 07. 2.Handbook of pharmaceutical quality assurance, Premnath Shenoy, First edition, Omkar offset printers, 2016, Chapter 02

	Document maintenance in pharmaceutical industry: Batch formula record, master formula record, SOP, quality audit, quality review and quality documentation, reports and documents, distribution records.		3.Pharmaceutical regulatory affairs, C.V.S.Subramanyam, Vallabh Prakashan publication, 2012, Chapter 08.
VI	**Calibration and Validation:** Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, qualification of UV-visible spectrophotometer, general principles of analytical method validation. **Warehousing:** Good warehousing practice, materials management	10	1.Handbook of pharmaceutical quality assurance, Premnath Shenoy, First edition, Omkar offset printers, 2016, Chapter 06. 2.Drug regulatory affairs, V.Sai kishore, IKON books, 2011, Chapter 04. 3.Quantitative analysis of drugs in pharmaceutical formulations, P.D.Sethi, Fourth edition, CBS publishers and distributors, 2012, Chapter 03.

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, SandyWeinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol IWHO Publications.
4. A guide to Total QualityManagement- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total QualityManagement – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

CB506P

III/IV B. PHARMACY-5TH SEMESTER
PHARMACOGNOSY-I
[PRACTICALS -75 Hours]

S. No	Experiment	Duration	References
1	Analysis of crude drugs by chemical tests: (i)Tragacanth (ii) Acacia (iii)Agar (iv)Gelatin (v) starch (vi) Honey (vii) Castor oil	12 hrs	Practical pharmacognosy- Rasheeduz zafar; First edition; CBS publishers & distributors; Chapter:21 &2
2	Determination of stomatal number and index	9hrs	Practical pharmacognosy- DrC.K.kokate;5thedition; Vallabhprakashan publishers; Chapter: 8 & 9
3	Determination of vein islet number, vein islet termination and palaside ratio	6hrs	
4	Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer	6hrs	Practical pharmacognosy- Dr C.K.kokate;5thedition; Vallabh prakashan publishers; Chapter: 7
5	Determination of Fibre length and width	6hrs	
6	Determination of number of starch grains by Lycopodium spore method	6hrs	Practical pharmacognosy- Dr.C.K.kokate; 5thedition; Vallabh prakashan publishers; Chapter: 7
7	Determination of Ash value	9hrs	Quality control of herbal drugs- Dr.Pullok.K.Mukherjee; 1stedition; Business horizons publishers; Part II : 9.12
8	Determination of Extractive values of crude drugs	6hrs	Quality control of herbal drugs- Dr.Pullok.k. Mukherjee; 1st edition; Business horizons publishers; Part II : 9.2
9	Determination of moisture content of crude drugs	6hrs	Practical pharmacognosy- Khandelwal K.R;19 th edition; Vallabh prakashan publishers; Chapter:41

10	Determination of swelling index and foaming index.	3hrs	Practical pharmacognosy- Dr C.K.kokate;5thedition; Vallabhprakashan publishers; Chapter: 8 & 9
11	Morphological identification of crude drugs: Acacia, Agar, Tragacanth, Honey, cotton, gelatin, castor oil, beeswax, Yeast, Wool fat.	3hrs	Practical pharmacognosy- Dr C.K.kokate;5thedition; Vallabhprakashan publishers; Chapter: 11
12	Callus development and its maintenance for *Catharantus roseus* leaves	3hrs	Herbal drug technology – S.S.Agarwal; 1st edition; Universities press publishers; Pg.No. 198

CB507P

III/IV B. PHARMACY-5TH SEMESTER
PHARMACEUTICS - II
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1	Preformulation studies on paracetamol/aspirin/ or any other drug	7	Roop.K.Khar, S.P.Vyas. Lachman/Liberman's the theory and practice of industrial pharmacy, Ch.9, Pg.217, 4th edition, 2013, CBS publishers, New Delhi,
2	Formulation and evaluation of Paracetamol tablets by wet-granulation technique.	8	C.V.S.Subrahmanyam, J.Thimmasetty, laboratory manual of industrial pharmacy, Pg.12, 1st Edition, 2006, Vallabha publications, New Delhi.
3	Formulation and evaluation of Aspirin tablets by dry granulation technique.	8	C.V.S.Subrahmanyam, J.Thimmasetty, laboratory manual of industrial pharmacy, Pg.25,1st Edition, 2006, Vallabha publications, New Delhi.
4	Coating of tablets- film coating of tablets/ granules	4	Roop.K.Khar, S.P.Vyas. Lachman/Liberman's the theory and practice of industrial pharmacy, Ch.13, Pg.518, 4th edition, 2013, CBS publishers, New Delhi,
5	Preparation and evaluation of Tetracycline capsules	4	Dr.A.K.Seth, Practical Pharmaceutics, Pg.230,
6	Preparation of Calcium Gluconate injection	4	C.V.S.Subrahmanyam, J.Thimmasetty, laboratory manual of industrial pharmacy, Pg.85,1st Edition, 2006, Vallabha publications, New Delhi.
7	Preparation of Ascorbic Acid injection	4	C.V.S.Subrahmanyam, J.Thimmasetty, laboratory manual of industrial pharmacy, Pg.78,1st Edition, 2006, Vallabha publications, New Delhi.

8	Quality control tests of (as per IP) marketed tablets	4	C.V.S.Subrahmanyam, J.Thimmasetty, laboratory manual of industrial pharmacy, Pg.46,1st Edition, 2006, Vallabha publications, New Delhi.
9	Quality control test of (as per IP) marketed capsules	4	C.V.S.Subrahmanyam, J.Thimmasetty, laboratory manual of industrial pharmacy, Pg.61,1st Edition, 2006, Vallabha publications, New Delhi.
10	Preparation of Eye drops	4	R.S.Gaud., G.D.Gupta. Practical Pharmaceutics, Pg.125-144, CBS Publishers and distributors, New Delhi.
11	Preparation of Eye ointments	4	R.S.Gaud., G.D.Gupta. Practical Pharmaceutics, Pg.125-144, CBS Publishers and distributors, New Delhi.
12	Preparation of cold cream	4	R.S.Gaud., G.D.Gupta. Practical Pharmaceutics, Pg.32, CBS Publishers and distributors, New Delhi.
13	Preparation of Vanishing Cream	4	R.S.Gaud., G.D.Gupta. Practical Pharmaceutics, Pg.33, CBS Publishers and distributors, New Delhi.
14	Evaluation of Glass containers (as per IP)	4	Indian Pharmacopoeia, The controller of publications, 1st edition, Vol.1, Pg.889-891, New Delhi.

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea & Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

III B.PHARMACY
6th SEMESTER

CB601T

III/IV B. PHARMACY-6th SEMESTER
PHARMACEUTICAL CHEMISTRY-V (Medicinal Chemistry-II)
[THEORY -75 Hours]

Scope:

Medicinal chemistry is designed to impart fundamental knowledge on the chemistry, S.A.R. and therapeutic uses of drugs employed in treating cardiovascular and endocrine disorders. Chemotherapy is widely employed to successfully treat variety of diseases including cancer, tuberculosis, leprosy, malaria, helminthiasis, amoebiasis, mycosis and viral infections. C*hemotherapy* features interdisciplinary studies that build our understanding of the underlying mechanisms and therapeutic applications of antimicrobial and antineoplastic agents.

Objectives :

Upon completion of the course the student shall be able to

- Gain knowledge on drugs used in various cardiovascular disorders
- Understand the principles of chemotherapy
- Learn the importance of therapeutic regimen in treating diseases
- Interpret the relationship between structure and biological activity

Unit No.	Chapter/Topic	Duration (hrs)	References
1.	**Drugs acting on cardiovascular system:** Classification, mechanism of action, SAR and therapeutic uses of the following categories of drugs. **a. Antihypertensive agents**- Timolol, lisinopril, enalapril, benazepril, guanethidine, guanabenz acetate, sodium nitroprusside, diazoxide, minoxidil, reserpine, hydralazine hydrochloride prazosin, methyldopate hydrochloride*, clonidine, amlodipine, hydralazine and captopril	14	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed Press, 2013, chapter-24 &25. 2. A text book of medicinal chemistry(Synthetic and biochemical Approach), Surendra N. Pandeya, 3rd edition, SG Publisher, 2006, volume-I, chapter-20, 17, 18 and 19 3.Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, John H.Block, JohnM.Beale, Jr, 11th edition, Lippincott Williams and Wilkins, 2004, chapter-19.

	b. Antianginal agents- Amylnitrite, nitroglycerine, pentaerythritol, isosorbide dinitrate, dipyridamole, bipridil, nifedipine, amlodipine*, felodipine, diltiazem and verapamil **c. Anti-arrhythmic drugs**- Quinidine sulphate, procainamide hydrochloride*, disopyramide phosphate, sotalol. **d. Antihyperlipidemic agents**- Atorvastatin, clofibrate*, cholesteramine and cholestipol **e. Anticoagulants**- Warfarin*, menadione, anisindione, clopidogrel		4.Medicinal and pharmaceutical chemistry, Hari kishan Singh, V.K.Kapoor, 2nd edition, Vallabh Prakashan, 2005, chapter-22 5. Foye's Principles of Medicinal Chemistry, David A. Williams, Thomas L. Lemke, 5th edition, Lippincott Williams & Wilkins, Wolters Kluwer Health (India) Pvt. Ltd., 2002, part-II, section-3, chapter-21, 23, 24,25 and 26.
2.	**Drugs acting on urinary and endocrine system:** Chemical classification along with structures, mechanism of action, S.A.R, metabolism and synthesis of following categories of drugs. **a. Diuretics**- **Osmotic Diuretics:** Mannitol and Isosorbide **Carbonic anhydrase inhibitors:** Acetazolamide*, methazolamide and dichlorphenamide.	10	1. A text book of medicinal chemistry (Synthetic and biochemical Approach), Surendra N. Pandeya, 3rd edition, SG Publisher, 2006, volume-I, chapter- 14, volume-II, chapter 32. 2. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, John H.Block, JohnM.Beale, Jr, 11th edition, Lippincott Williams and Wilkins, 2004, chapter-20 and 19.

	Thiazides: Chlorthiazide*, hydrochlorothiazide, hydroflumethiazide and cyclothiazide **Loop Diuretics:** Furosemide*, bumetanide and ethacrynic acid **Potassium sparing Diuretics:** Spironolactone, triamterene and amiloride* **b. Thyroid and antithyroid drugs**-L-Thyroxine, propylthiouracil and methimazole **c. Hypoglycemics**-Insulin, tolbutamide*, metformin, acetazolamide, glipizide* and glibenclamide		3. Medicinal and pharmaceutical chemistry, Harkishan Singh, V.K.Kapoor, 2nd edition, Vallabh Prakashan, 2005, chapter-23, 26 and 27. 4.Foye's Principles of Medicinal Chemistry, David A. Williams, Thomas L. Lemke, 5th edition, Lippincott Williams & Wilkins, Wolters Kluwer Health (India) Pvt.Ltd., 2002, part-II, section-4, chapter-22, 27 and 30.
3.	Source, classification, stability, degradation, mechanism of action, S.A.R, metabolism and synthesis of following categories of drugs. **a. Sulphonamides –** Sulfacetamide*, sulphadoxine, sulfamethoxazole*, sulphadiazine and trimethoprim **b. Fluoroquinolones**-Ciprofloxacin*, ofloxacin and norfloxacin **c. Penicillins-**Benzyl penicillin and amoxicillin* **d. Cephalosporins**-Cephalexin* and cefuroxime	11	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed Press, 2013, chapter-7, 14, 8 and 9. 2. A text book of medicinal chemistry (Synthetic and biochemical Approach), Surendra N. Pandeya, 3rd edition, SG Publisher, 2006, volume-II, chapter-22 and 29. 3. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, John H.Block, JohnM.Beale, Jr, 11th edition, Lippincott Williams and Wilkins, 2004, chapter-10.

	e. β-Lactamase inhibitors-Clavulanic acid and sulbactam		4. Medicinal and pharmaceutical chemistry, Harkishan Singh, V.K.Kapoor, 2nd edition, Vallab Prakashan, 2005, chapter-34, 36 and 35. 5. Foye's Principles of Medicinal Chemistry, David A. Williams, Thomas L. Lemke, 5th edition, Lippincott Williams & Wilkins, Wolters Kluwer Health(India)Pvt.Ltd., 2002, part-II, section-6, chapter- 34.
4.	**a. Tetracyclines-** Source, structures of tetracycline, chlortetracycline, oxytetracyclin, doxycycline, minocycline, mechanism of action, SAR and clinical uses b. **Aminoglycosides -** Source, structures of streptomycin, gentamycin, neomycin, amikacin, mechanism of action and clinical uses **c. Macrolides** - Source, structures of erythromycin, clarithromycin, azithromycin, mechanism of action and clinical uses **d. Miscellaneous :** Chloramphenicol*	11	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed Press, 2013, chapter-11, 10, 12 and 13. 2. A text book of medicinal chemistry (Synthetic and biochemical Approach), Surendra N. Pandeya, 3rd edition, SG Publisher, 2006, volume-II, chapter-30. 3. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, John H.Block, JohnM.Beale, Jr, 11th edition, Lippincott Williams and Wilkins, 2004, chapter-10. 4. Medicinal and pharmaceutical chemistry, Harkishan Singh, V.K.Kapoor, 2nd edition, Vallab Prakashan, 2005, chapter-35. 5.Foye's Principles of Medicinal Chemistry, David A. Williams, Thomas L. Lemke, 5th edition, Lippincott Williams & Wilkins, Wolters Kluwer Health(India) Pvt.Ltd., 2002, part-II, section-6, chapter- 34.

5.	Classification, mechanism of action, S.A.R. and synthesis of following categories of drugs. **a. Anti-tubercular drugs**-INH and ethambutol. **b. Antileprotics**-Dapsone **c. Antifungal agents**-Clotrimazole*, ketoconazole, griseofulvin and flucytosine. **d. Antimalarials**-Quinine sulphate, chloroquine*, pyrimethamine, pamaquine* and proguanil. **e. Anthelmintics**-Diethylcarbamazine and albendazole **f. Antiamoebics**-Metronidazole* and diloxanide furoate	15	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed Press, 2013, chapter-15, 16, 20, 17, 19 and 18. 2. A text book of medicinal chemistry (Synthetic and biochemical Approach), Surendra N. Pandeya, 3rd edition, SG Publisher, 2006, volume-II, chapter-23, 28,24 and 25. 3. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, John H.Block, JohnM.Beale, Jr, 11th edition, Lippincott Williams and Wilkins, 2004, chapter-8 and 9. 4. Medicinal and pharmaceutical chemistry, Harkishan Singh, V.K.Kapoor, 2nd edition, Vallab Prakashan, 2005, chapter-37, 38, 32 and 33. 5. Foye's Principles of Medicinal Chemistry, David A. Williams, Thomas L. Lemke, 5th edition, Lippincott Williams & Wilkins, Wolters Kluwer Health(India) Pvt.Ltd., 2002, part-II, section-6, chapter-37, 36 and 35.

6.	**a. Antiviral agents:** Drugs that act on various stages of viral replication, nucleoside and non nucleoside reverse transcriptase inhibitors, HIV protease inhibitors, synthesis and therapeutic uses of amantadine*, ioxuridine, acyclovir*, zidovudine, zalcitabine, lamivudine, ribavirin and indinavir. **b. Anticancer agents** DNA alkylating and interchelating agents, antimetabolites and antimitotic agents. Synthesis and therapeutic uses of mechlorethamine*, busulphan, cyclophosphamide, chlorambucil, mercaptopurine*, 5-fluorouracil and methotrexate. Plant products: Etoposide, vinblastine sulphate and vincristine sulphate	14	1. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, PharmaMed Press, 2013, chapter-21 and 22. 2. A text book of medicinal chemistry (Synthetic and biochemical Approach), Surendra N. Pandeya, 3rd edition, SG Publisher, 2006, volume-II, chapter-27 and 26. 3. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, John H.Block, JohnM.Beale, Jr, 11th edition, Lippincott Williams and Wilkins, 2004, chapter-11 and 12. 4. Medicinal and pharmaceutical chemistry, Harkishan Singh, V.K.Kapoor, 2nd edition, Vallab Prakashan, 2005, chapter-39 and 40. 5. Foye's Principles of Medicinal Chemistry, David A. Williams, Thomas L. Lemke, 5th edition, Lippincott Williams & Wilkins, Wolters Kluwer Health(India) Pvt. Ltd., 2002, part-II, section-6, chapter-39, 36 and 38.

Further reading:

1. An introduction to medicinal chemistry, Grahan L.Patrick, 3rd edition, Oxford University press,2006.
2. Essentials of medicinal chemistry, Andrejus Korolkovas, 2nd edition, John-Wiley & Sons, 2008.
3. Burger's medicinal chemistry drug discovery, Donald J Abraham, 6th edition, John-Wiley & Sons, Inc., 2003.
4. Remington, The science and practice of pharmacy, 22nd edition, Lippincott Williams and wilkins, 2012

III/IV B. PHARMACY-6th SEMESTER
BIOPHARMACEUTICS AND PHARMACOKINETICS
[THEORY -75 Hours]

Scope:

This subject is designed to impart knowledge and skills of biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.

Objectives:

Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time profile data to calculate the Pharmacokinetic parameters to describe the kinetics of drug absorption (A), Distribution (D), metabolism (M), excretion (E).
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.
4. To understand the significance of various pharmacokinetic parameters and their applications.

Unit No.	Chapter/Topic	Duration (hrs)	References
I	**Introduction to Biopharmaceutics : Absorption**; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from non *per* oral extra-vascular routes, **Distribution:** Tissue permeability of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs	12	1. Leon Shargel, Applied biopharmaceutics and pharmacokinetics. 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch.No.10, 13 2. Biopharmaceutics and clinical pharmacokinetics, Milo Gibaldi, 4th edition Pharma Book Syndicate, Hyderabad, 1991, Ch.No.3,

II	**Bioavailability and Bioequivalence:** Definition, objectives of bioavailability; absolute and relative bioavailability; measurement of bioavailability *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations (IVIVC), bioequivalence studies; methods to enhance dissolution and bioavailability of poorly soluble water-soluble drugs.	15	1. Leon shargel Applied biopharmaceutics and pharmacokinetics., 5th edition, McGraw Hill companies Inc., Singapore, 2005, Ch.No.14, 15 2. V.Venkateswarlu. Biopharmaceutics and Pharmacokinetics, 2nd edition, pharmaMed Press, Hyderabad, 2010, Ch.No.11
III	**Elimination:** Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs	12	1. Leon Shargel, Applied biopharmaceutics and pharmacokinetics. 5th edition, McGraw Hill companies Inc., Ch.No.6, 11
IV	**Pharmacokinetics:** Introduction to Pharmacokinetics, Compartment models, Non-compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra-vascular administrations. Pharmacokinetics parameters - K_E ,$t_{1/2}$,V_d, AUC, K_a, Cl_T and CL_R- definitions, methods of assessments and understanding their significance and applications	15	1. Leon shargel. Applied biopharmaceutics and pharmacokinetics, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch.No.3-5, 7 2. Rowland and Tozer. Clinical pharmacokinetics, Malcolm, 3rd edition Lippincott's Williams and Wilkins, New York, 1995, Ch.No.1-4

V	**Multi-compartment models:** Two compartment open model-IV bolus Kinetics of multiple dosing, steady state drug concentration levels, calculation of loading and maintenance doses and their significance in clinical settings.	12	Leon shargel. Applied biopharmaceutics and pharmacokinetics, 5th edition, McGraw Hill companies Inc., Singapore, 2005, Ch.No.4
VI	**Nonlinear Pharmacokinetics:** a. Introduction b. Factors causing Non-linearity. c. Michaelis-Menton's method of estimating parameters (K_m and V_{max}, Explanation with example of drugs.	09	Leon shargel. Applied biopharmaceutics and pharmacokinetics, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch.No.-9

Recommended Books: (Latest Editions)

01. Milo Gibaldi. Biopharmaceutics and Clinical Pharmacokinetics
02. Robert E Notari Biopharmaceutics and Pharmacokinetics.
03. Leon Shargel, Andrew B.C., Susan WU- Pong. Applied biopharmaceutics and pharmacokinetics, 5th edition, McGraw Hill Companies Inc., Singapore, 2005.
04. M. Brahmankar and Sunil B.Jaiswal. Biopharmaceutics and Pharmacokinetics-A Treatise, Vallabh Prakashan, Pitampura, Delhi
05. Milo Gibaldi and Donald.R. Pharmacokinetics Marcel Dekker Inc.,
06. Milo Gibaldi and Laurie. Hand Book of Clinical Pharmacokinetics, Prescott by ADIS Health Science Press.
07. Malcom Rowland and Thomas, N. Tozer. Clinical Pharmacokinetics: Concepts and Applications, Wolter Kluwers, Philadelphia, 1995.
08. Abdou H.M. Dissolution, Bioavailability and Bioequivalence. Mack Publishing Company, Pennsylvania 1989.
09. Robert E. Notari Biopharmaceutics and Clinical Pharmacokinetics-An Introduction 4th edition Revised and expanded by Marcel Dekker Inc, New York and Basel, 1987.
10. Remington's Pharmaceutical Sciences, ByMack Publishing Company, Pennsylvnia

CB603T

III/IV B. PHARMACY-6th SEMESTER
PHARMACOGNOSY-II
[THEORY -75 Hours]

Scope :

— The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine.

Objectives:

Upon completion of the course, the student shall be able to:

1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. To understand the preparation and development of herbal formulation.
3. To understand the herbal drug interactions
4. To carryout isolation and identification of phytoconstituents

Unit No.	Chapter/ Topics	Duration	References
I	**Metabolic pathways in higher plants and their determination** a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies	**10 hrs** 7hrs 3hrs	1.Trease & Evans Pharmacognosy – W.C .Evans; 15th Edition; Elsevier publishers; Part 5 :19 2.Pharmacognosy & Phytochemistry – Vinod.D.Rangari; Career publications; Part 1 :9

II	General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: — **Alkaloids:** Vinca, Rauwolfia, Belladonna, Opium. — **Glycosides:** Senna, Aloe, Bitter Almond, Liquorice, Dioscorea, Digitalis, Squill, Strophanthus. — **Phenylpropanoids and Flavonoids:** Lignans, Tea, Ruta	**10 hrs** 4 hrs 4 hrs 2hrs	1.Pharmacognosy - C.K. Kokate; 50thedition;Nirali Prakashan Publishers; Chapter:1 2.Trease & Evans Pharmacognosy – W.C .Evans; 15thEdition; Elsevier publishers; Part 6 :20 - 34
III	General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following secondary metabolites: — **Volatile oils**: Mentha, Clove, Cinnamon, Fennel, Coriander. — **Tannins:** Catechu, Pterocarpus — **Resins:** Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony **Iridoids, Other terpenoids & Naphthaquinones:** Gentian, Artemisia, taxus, carotenoids	**10 hrs** 3 hrs 2 hrs 3 hrs 2 hrs	1.Pharmacognosy - C.K. Kokate; 50thedition;Nirali Prakashan Publishers; Chapter:1 2.Trease & Evans Pharmacognosy – W.C .Evans; 15thEdition; Elsevier publishers; Part 6 :20 - 34
IV	Isolation, Identification and Analysis of Phytoconstituents a) Terpenoids: Menthol, Citral, Artemisin b) Glycosides: Glycyrhetinic acid & Rutin c) Alkaloids: Atropine, Quinine, Reserpine, Caffeine d) Resins: Podophyllotoxin, Curcumin	**13hrs** 3 hrs 3 hrs 5 hrs 2 Hrs	1.Standardization of Botanicals – Dr.V.Rajpal; Volume1-3. 2.Indian Herbal Pharmacopoeia;2002

V	a) Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine. b) Commercialization and Industrialization of medicinal plants	**20 Hrs** 16 hrs 4 hrs	Standardization of Botanicals – Dr.V.Rajpal; Volume1-3.
VI	**Basics of Phytochemistry** Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	**12 Hrs**	Phytochemical methods, J.B.Harborne; 3rd edition;Unit 1

Further References:

1. American Herbal Pharmacopoeia-Roy Upton; 1st Edition;CRS Press publishers.
2. Hand Book of Medicinal Herbs-James A. Duke; 2nd edition; Press publishers.
4. Fundamentals of pharmacognasy and phytotherapy-Michael Heinrich; 1st Edition; Churchill livingstone publishers.
5. Modern Phytochemical methods – Nikolaus H.Fisher; Volume-25; Springer Publishers.

CB604T

III/IV B. PHARMACY-6th SEMESTER
SOCIAL AND PREVENTIVE PHARMACY
[THEORY -75 Hours]

Scope:

The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives:

After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issues related to health and pharmaceutical problems with in the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related to health and pharmaceutical issues

Unit No.	Chapter/Topic	Duration (hrs)	References
I	**Concept of health and disease:** Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick. **Social and health education:** Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.	15	Park's Text book of Preventive and Social Medicine-K.Park, 23rd edition-Pg.No.13. Park's text book of Preventive and Social Medicine-K.Park, 23rd edition, Pg.No.608.
II	**Sociology and health:** Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health **Hygiene and health:** personal hygiene and health care; avoidable habits	10	Park's text book of Preventive and Social Medicine, K.Park, 23rd edition, Pg.No.668

III	**Preventive medicine:** General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.	15	Park's text book of Preventive and Social Medicine, K.Park, 23rd edition, Pg.No.143.
IV	**National health programs, its objectives, functioning and outcome of the following:** HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.	15	Park's text book of Preventive and Social Medicine, K.Park, 23rd edition, Pg.No.414
V	National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program.	10	Park's text book of Preventive and Social Medicine, K.Park, 23rd edition, Pg.No.414, 454, 473, 516, 919

VI	Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.	10	Park's text book of Preventive and Social Medicine, K.Park, 23rd edition, Pg.No.445, 904.

Recommended Books (Latest edition)*:*

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

Recommended Journals:

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

III/IV B. PHARMACY-6th SEMESTER
PHARMACEUTICAL CHEMISTRY-IV (Medicinal Chemistry-II)
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
1	**I Preparation of drugs and intermediates**		
	Sulphanilamide	6	Mann & Saunders, Practical Organic Chemistry, 4th edition, Pg: 181.
	7-Hydroxy, 4-methyl coumarin	4	Mann & Saunders, Practical Organic Chemistry, 4th edition, Pg: 307.
	Chlorobutanol	4	Bentley and Driver's Textbook of Pharmaceutical Chemistry, 8th edition, Pg.:343, 344, Oxford University Press.
	Triphenyl imidazole	4	Vogel's text book of Practical Organic Chemistry, 5th edition, Pg: 181.
	Tolbutamide	4	The Organic Chemistry of Drug synthesis by Lednicer, Vol-1, Pg: 136.
	Hexamine	3	Bentley and Driver's Textbook of Pharmaceutical Chemistry, 8th edition, Pg.:361, Oxford University Press.
2	**Assay of drugs** Isonicotinic acid hydrazide	3	• Indian pharmacopoeia 2018 edition ,volume II, page no 2321. • Pharmaceutical Drug Analysis by Ashutoshkar, 1st edition, pg: 193.

	Chloroquine	3	• Indian pharmacopoeia 2018 edition ,volume II, page no 1590. • Pharmaceutical Drug Analysis by Ashutoshkar, 1st edition, pg: 330.
	Metronidazole	3	• Indian pharmacopoeia 2018 edition ,Vol.II, page no 2543. • Pharmaceutical Drug Analysis by Ashutoshkar, 1st edition, pg: 112 .
	Dapsone	3	• Indian pharmacopoeia 2018 edition ,Vol.II, page no 1758. • Pharmaceutical Drug Analysis by Ashutoshkar, 1st edition, pg: 211.
	Chlorpheniramine maleate	3	• Indian pharmacopoeia 2018 edition , Vol. II, page no 1596. • Pharmaceutical Drug Analysis by Ashutoshkar, 1st edition, pg: 14.
	Benzyl penicillin	3	• Indian pharmacopoeia 2018 edition ,Vol.II, page no 1358. • Pharmaceutical Drug Analysis by Ashutoshkar, 1st edition, pg: 184,142.
3	Preparation of medicinally important compounds or intermediates by Microwave irradiation technique	7	• New Trends in Green Chemistry by V.K Ahluwalia & M. Kidwai; 2nd edition.
4	Drawing structures and reactions using chem draw	10	• Chemdraw software, Cambridge soft, version 17.0, September 2017

5	Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)	15	• QSAR & Molecular modeling by S.P Gupta, 2011; Models of QSAR analysis, 59-111

Recommended Books (Latest Editions)

01. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
02. Foye's Principles of Medicinal Chemistry.
03. Burger's Medicinal Chemistry, Vol. I to IV.
04. Introduction to principles of drug design- Smith and Williams.
05. Remington's Pharmaceutical Sciences.
06. Martindale's extra pharmacopoeia.
07. Organic Chemistry by I.L. Finar, Vol. II.
08. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
09. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

CB606P

III/IV B. PHARMACY-6th SEMESTER
BIOPHARMACEUTICS AND PHARMACOKINETICS
[PRACTICALS -75 Hours]

Sl. No	Title of the Experiment	Time Hrs	Reference
01	Dissolution rate testing and analysis of data*	3	1.Laboratory manual of biopharmaceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 3. 2.Quantitative calculations in pharmaceutical practice and research. Themistocles P. Hadjiioannou. 1st Edition. VCH publishers, New York, USA, 1993, Ch. No. 13.
02	Evaluation of disintegration and dissolution rate of commercial tablets.	3	1.Laboratory manual of biopharmaceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 4. 2.Quantitative calculations in pharmaceutical practice and research. Themistocles P. Hadjiioannou. 1st Edition. VCH publishers, New York, USA, 1993, Ch. No. 13.
03	Effect of surfactant on the solubility and dissolution rate of salicylic acid*	3	Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 2.
04	Effect of diluents on dissolution rate of salicylic acid*	3	Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 2.
05	Effect of concentration of LUsricent on dissolution rate of salicylic acid*	3	Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 2.

06	Relationship between pH, pKa, partition coefficient and percent ionization of salicylic acid.	3	1.Laboratory manual of biopharmaceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 1. 2.Quantitative calculations in pharmaceutical practice and research. Themistocles P. Hadjiioannou. 1st Edition. VCH publishers, New York, USA, 1993, Ch. No. 13.
07	Enhancement of dissolution rate of poorly soluble drug by solid dispersion technique*	3	Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 11.
08	Effect of polymorphism on dissolution rate.	3	Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 2.
09	Basic pharmacokinetic calculations	3	Applied biopharmaceutics and pharmacokinetics. Leon Shargel, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch No. 2-3.
10	Calculation of area under curve by Trapezoidal rule	3	Laboratory manual of biopharmaceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 26.
11	Calculation of pharmacokinetic parameter as per one compartment model	3	Applied biopharmaceutics and pharmacokinetics. Leon Shargel, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch No. 3 and 7.
12	Determination of absorption rate constant by method of residuals*	3	Biopharmaceutics and pharmacokinetics. V. Venkateswarlu, 2nd edition, Pharma Med Press, Hyderabad, 2010, Ch. No. 6.
13	Determination of absorption rate constant by Wagner-Nelson method for the given data.*	3	Applied biopharmaceutics and pharmacokinetics. Leon Shargel, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch No. 7.

14	Determination of K_E & biological half life from plasma concentration and urinary excretion data.	3	Biopharmaceutics and pharmacokinetics. V. Venkateswarlu, 2nd edition, Pharma Med Press, Hyderabad, 2010, Ch. No. 6.
15	Calculation of bioequivalence for the given data.	3	Applied biopharmaceutics and pharmacokinetics. Leon Shargel, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch No. 15.
16	Estimation of renal creatinine clearance by cockroft-gault method.	3	1.Medical laboratory technology. Kanai L Mukherjee. 1st edition, Tata Mcgraw-hill publishing company limited, New Delhi, 2002, volume III, Ch.No.33. 2.Practical Biochemistry & Clinical pathology. S.R.Kale, 18th edition, Nirali prakashan, Pune, 2008. Ch.No. 4
17	Determination of biological half-life of rifampicin by urinary excretion data	3	Laboratory manual of biopharma-ceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 19.
18	Determination mean residence time (MRT) and mean absorption time (MAT) for the given data	3	Biopharmaceutics and pharma-cokinetics. V. Venkateswarlu, 2nd edition, Pharma Med Press, Hyderabad, 2010, Ch. No. 10.
19	Estimation of Protein-drug binding study by equilibrium dialysis or dynamic dialysis method.	6	Laboratory manual of biopharmaceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 14.
20	Construction of calibration curve of sulphamethaxazole in plasma.	3	Quantitative analysis of pharmaceutical formulations. P.D.Sethi, 4th edition, volume 4, CBS publishers and distributors Pvt. Ltd. 2012 Ch.No.5
21	*In vitro* permeation study using Franz diffusion cell	3	1.Laboratory manual of biopharmaceutics and pharmacokinetics. S.B. Bhise. 1st Edition. Trinity publishing house, Satara, India, 2010, Expt. No. 13. 2.Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 2.

22	*In vitro* absorption studies by using animal inverted intestine	6	Biopharmaceutics and pharmacokinetics: A treatise. D.M. Brahmankar, 2nd edition, Vallabh Prakasham publishers, Delhi, 2009, Ch No. 2.
23	Determination of pharmacokinetic parameters of given data using Win non Lin/Phoenix software.	3	Applied biopharmaceutics and pharmacokinetics. Leon Shargel, 5th edition, McGraw Hill Companies Inc., Singapore, 2005, Ch No. 3 and 7.

CB607P

III/IV B. PHARMACY-6th SEMESTER
PHARMACOGNOSY-II
[PRACTICALS -75 Hours]

S.No	Experiment	Duration	References
1	Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander	12 hrs	Practical pharmacognosy-Khandelwal K.R; 16th edition;nirali prakasan
2	Exercise involving isolation & detection of active principles a. Caffeine - from tea dust. b. Solanine from potato c. Atropine from Belladonna d. Sennosides from Senna e. Piperine from pepper	15 hrs	Practical pharmacognosy-Dr C.K.kokate;5thedition; Vallabhprakashan publishers; Chapter: 10
3	Separation and identification of sugars by descending Paper chromatography	12 hrs	A manual of paper chromatography and paper electrophoresis by Richard J.Block Academic press publishers, Chapter-VI
4	TLC of herbal extract	9 hrs	Quality control of herbal drugs –Dr.Pulok.K.Mukherjee; Chapter 19
5	Distillation of volatile oils and detection of phytoconstitutents by TLC	12 hrs	Practical pharmacognosy-Dr C.K.kokate;5thedition; Vallabhprakashan publishers; Chapter: 9
6	Analysis of crude drugs by chemical tests: (i)Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh	15 hrs	Practical pharmacognosy-Dr C.K.kokate;5thedition; Vallabhprakashan publishers; Chapter: 05

IV B.PHARMACY
7th SEMESTER

CB701T

IV/IV B. PHARMACY-7th SEMESTER
PHARMACOLOGY-II
[THEORY -75 Hours]

Scope:

- The subject enables the student to adopt the 'prototype drug' approach and a structured, systematic study of mechanism of actions, kinetics and toxicological aspects of drugs are described along with the pharmacological basis of their use and role/status in the therapy of various systemic and infectious diseases/conditions.
- In addition, emphasizes on the basic concepts of bioassays and principles of toxicology.

Objectives:

Upon completion of the subject the student will be able to:

- Understand the pharmacological aspects of drugs acting on various systemic and infectious diseases
- Know the various biological standardization techniques for drugs
- Encompass the principles of toxicology and treatment of various poisonings
- Perform the experiments to observe the effect of drugs from different therapeutic classes on isolated tissues and intact animals using animal simulator software.

Chapter/Topic	Duration (hrs)	References
UNIT-I	**8 hrs**	1. Hand book of Experimental Pharmacology – S.K.Kulkarni 3rd edition; Vallabh Prakashan publishers; Exp. No: 1. 2. Indian Pharmacoepiea (1985); Indian Pharmacoepiea Commission; Vol-1 & 2 3. Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; Chapter No. : 16
A) Bioassays — Principles and methods of bioassay, Bioassay of insulin, adrenaline, acetylcholine, d-tubocurarine, oxytocin, vasopressin	5 hrs	
B) Drugs acting on Urinary System — Diuretics and anti-diuretics	3 hrs	

UNIT-II **Drugs acting on Cardiovascular System** 1. Anti hypertensive drugs 2. Anti anginal drugs 3. Anti arrhythmic drugs 4. Drugs used in heart failure 5. Drugs used in dyslipidaemia 6. Heamatinics & Heamopoetic growth factors 7. Antiplatelet drugs 8. coagulant & Anticoagulants 9. Thrombolytics 10. Fibrinolytics 11. Plasma volume expanders	**17 hrs** 3hrs 2hrs 2hrs 1hr 2hrs 2 hrs 1 hr 2 hrs 2 hrs	1) Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; Chapter No. : 19-23, 50, 51. 2)Pharmacology – H.P Rang & M.M Dale; 6th edition; Churchill livingstone publishers; Chapter No.:18 – 22 3)Essentials of Medical Pharmacology - K.D. Tripathi; Jaypee publications; Chapter No.: 44 & 45.
UNIT-III **Drugs acting on Endocrine system** 1. Pituitary hormones 2. Thyroid and anti thyroid drugs 3. Insulin and oral hypoglycemic agents 4. Sex hormones and contraceptive agents 5. Adrenocortical steroids and their analogues 6. Parathyroid hormone, Vitamin D, Calcitonin and drugs affecting calcium balance	**11 hrs** 1 hr 2 hrs 3 hrs 3 hrs 1 hr 1 hr	Principles of Pharmacology - H.L. Sharma & K.K. Sharma; 2nd edition; Paras publishers; Chapter No.: 41, 43, 45, 46, 47.
UNIT-IV **Chemotherapy-I** A) Basic principles of chemotherapy B) Antibacterial agents • *Cell wall inhibitors* 1. β-lactam antibiotics-pencillins, cephalosporins, monobactams, carbapenems 2. β-lactamase inhibitors 3. Other antibiotics • *Protein synthesis inhibitors* - Tetracyclines - Glycylcyclins	**12 hrs** 1 hr 4 hrs 7 hrs	1. Pharmacology – H.P Rang & M.M Dale; 5th edition; 2. Churchill livingstone publishers; Chapter No.:46. 3. Lippincott's Illustrated Reviews: Pharmacology; 4th edition; Lipincott williams & wilkins publishers; Chapter No.: 22, 30, 31, 33.

- Chloramphenicol - Aminoglycosides - Macrolide antibiotics - Lincosamides(Clindamycin) - Streptogramins (Quinupristin & dalfopristin) - Oxazolidinones (Linezolid) - Floroquinolones, - Folic acid antagonists - Urinary antiseptics		
UNIT-V **Chemotherapy-II** 1. Antimycobacterial agents — Anti tubercular agents — Anti leprotic agents 2. Anti fungal drugs 3. Anti viral drugs 4. Anti protozoal drugs 5. Anthelmentic drugs 6. Anti cancer drugs 7. Immunosuppressant drugs and immunostimulants	**17 hrs** 3 hrs 2 hrs 3 hrs 3 hrs 2 hrs 3 hrs 1 hr	Lippincott's Illustrated Reviews: Pharmacology; 4th edition; Lipincott williams & wilkins publishers; Chapter No.: 34 - 40.
UNIT-VI **Principles of Toxicology** 1.Introduction to poisoning, Diagnosis of poisoning. 2.General principles management of poisoning. 3.Specific antidotes, adjunctival antidotes and obsolete antidotes. 4.Heavy metal poisoning and its treatment. 5.Animal toxicology (Non-clinical toxicity studies) - Acute, Sub acute and chronic toxicity studies as per Schedule Y (Amended Version-2005-CDSCO) and OECD guidelines.	**10 hrs** 2 hrs 2 hrs 2 hrs 2 hrs 2 hrs	1. Modern medical toxicology – VV.Pillay, 4th Edition, Jaypee Publications. Section-I;Chapter-4 2. Schedule Y (Amended Version-2005-CDSCO); Pg.No.:16 - 31 3. OECD guidelines for testing of chemicals.

Further References:

1. Goodman Gilman's: The pharmacological basis of therapeutics - Goodman Gilman; s 9th edition; McGraw Hill.
2. Basic and Clinical Pharmacology - Katzung B. G; 10th edition; McGraw Hill

CB702T

IV/IV B. PHARMACY-7th SEMESTER
PHARMACEUTICAL ANALYSIS - II
[THEORY -75 Hours]

Scope:
This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives:
Upon completion of the course the student shall be able to
1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative and qualitative analysis of drugs using various analytical instruments.

Topic	Duration (Hrs)	Reference
UNIT –I **A) UV Visible spectroscopy** Introduction, Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law and deviations. Instrumentation - Sources of radiation, wavelength selectors and sample cells. Detectors-Photo tube, Photomultiplier tube, Photo voltaic cell and Silicon Photodiode. Applications - Spectrophotometric titrations, Single component and multi component analysis.	**13 hrs**	1. Instrumental Methods of Chemical Analysis by B.K Sharma, 1st Editio, Krishna Publications, 1972, Chapter No: 02, P.No: 68. 2. Organic spectroscopy by Y.R Sharma, Multicolour edition, S.CHAND, Chapter No: 02, P.No: 9-64. 3. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 4th, CBS, Chapter No: 07 & 09, P.No: 275-337 & 358-378. 4. Organic spectroscopy by William Kemp 3rd, PALGRAVE, Chapter No: 04, P.No: 243-269. 5. Instrumental methods of chemical analysis Gurdeep R.Chatwal, Sham K.Anand, 5th edition, Himalaya publishers, Chapter 16, Pg.2.399.

B) Fluorimetry Theory, concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications		
UNIT –II **A) IR spectroscopy** Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations. Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications. **B) Basic principles** and applications of ^{1}H NMR spectroscopy and mass spectrometry.	**13 hrs**	1. Instrumental Methods of Chemical Analysis by B.K Sharma, 1st Editio, Krishna Publications, 1972, Chapter No: 03, P.No: 193. 2. Organic spectroscopy by Y.R Sharma, Multicolour edition, S.CHAND, Chapter No: 03, P.No: 69. 3. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 4th, CBS, Chapter No: 10, P.No: 379. 4. Quantitative Analysis of Drugs by D. C. Garrett, Third edition, CBS, 2004, Chapter No: 16, P.No: 881. 5. Spectrophotometric identification of Organic Compounds by Silverstein Sixth edition, WILEY, 2007, Chapter No: 03, P.No: 71.
UNIT-III **A) Flame Photometry-** Principle, interferences, instrumentation and applications. **B) Atomic absorption spectroscopy**- Principle, interferences, instrumentation and applications. **C) Nepheloturbidometry**- Principle, instrumentation and applications.	**12 hrs**	1. Instrumental Methods of Chemical Analysis by B.K Sharma, 1st Editio, Krishna Publications, 1972, Chapter No: 05, 06 & 10, P.No: 383, 421 & 576. 2. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel, 6th Pearson, Chapter No: 15, P.No: 612. 3. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 4th, CBS, Chapter No: 08, P.No: 338. 4. Quantitative Analysis of Drugs by D. C. Garrett, Third edition, CBS, 2004, Chapter : 14, P.No: 870.

UNIT-IV **A)** Introduction to chromatography, adsorption and partition column chromatography**-**methodology, advantages, disadvantages and applications. **B) Thin layer chromatography-** Introduction, principle, methodology, types of TLC, R_f values, adsorption isotherms, advantages, disadvantages and applications. **C) Paper chromatography-** Introduction, methodology, development techniques, advantages, disadvantages and applications. **D) Electrophoresis**– Introduction, factors affecting electrophoretic mobility, techniques of paper, gel, capillary electrophoresis, applications.	**13 hrs**	1. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 4th, CBS, Chapter No: 04, P.No: 85. 2. Instrumental Methods of Chemical Analysis by B.K Sharma, 1st Editio, Krishna Publications, 1972, Chromatography Chapter No: 05, 06, 10, 11, 12, and 13, P.No: 96, 113, 225, 241 and 268
UNIT V **A) Gas chromatography –** Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications of gas chromatography. **B) High performance liquid chromatography (HPLC)-** Introduction, theory, instrumentation, advantages and applications.	**12 hrs**	1. Text book of Pharmaceutical Analysis by Kenneth A. Connors, Third, WILEY, Chapter No: 17 & 18, P.No: 373, 439. 2. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 4th, CBS, Chapter No: 04, P.No: 128, 157. 3. Quantitative Analysis of Drugs by D. C. Garrett, Third edition, CBS, 2004, Chapter : 15, P.No: 876.
UNIT-VI **A) Ion exchange chromatography-** Introduction, classification, ion exchange resins, properties, mechanism of ion exchange processes, factors affecting ion exchange, methodology and	**12 hrs**	1. Instrumental Methods of Chemical Analysis by B.K Sharma, 1st Editio, Krishna Publications, 1972, Chromatography, chapter 7 and 8, Pg.No: 123, 161.

applications. **B) Gel chromatography-** Introduction, theory, instrumentation and applications. **C) Affinity chromatography-** Introduction, theory, instrumentation and applications.		2. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake 4th, CBS, Chapter No: 04, P.No: 96, 99.

Further readings:

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
4. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
5. Organic spectroscopy by William Kemp
6. Spectrophotometric identification of Organic Compounds by Silverstein

CB703T

IV/IV B. PHARMACY-7th SEMESTER
NOVEL DRUG DELIVERY SYSTEMS
[THEORY -75 Hours]

Scope:
This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Objectives: Upon completion of the course student shall be able

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

Chapter/Topic	Duration (hrs)	References
UNIT-I **A) Controlled drug delivery systems** Introduction, terminology/ definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations **B) Polymers:** Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.	**12 hrs**	01.Robinson, J.R., Lee V.H.L. Controlled drug delivery system, Marcel dekker Inc., New York, Vol.20, 1992. Part I, Chapter -1 to 5: Pg.No.3 to 241. 02.Patrick J.Sinko. Martin's physical pharmacy & Pharmaceutical Sciences, 6th edition. New Delhi: Wolters Kluwer 2011, Chapter-20, pg. 492 to 515.
UNIT-II **A) Microencapsulation:** Definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, applications	**13 hrs**	01.S.P.Vyas and R.K.Khar, targeted and controlled drug delivery : Novel Carriers system. 1st edition, New Delhi : CBS Publications, 2008, Chapter-11, Pg.417 to 457.

B) Mucosal Drug Delivery system: Introduction, theories of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems		02. Y.Madhusudan Rao, V.Jithan Advances in Drug delivery: 1st edition, Hyderabad: Pharma Med Press, 2012, Vol.II, Chapter-1 : 185 to 214.
UNIT-III **A) Transdermal Drug Delivery Systems:** Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches **B) Nasopulmonary drug delivery system:** Introduction to nasal and pulmonary routes of drug delivery, formulation of Inhalation dosage form (dry powder and metered dose), nasal sprays, nebulizers.	**12 hrs**	01.Robinson J.R. Lee V.H.L. Controlled drug delivery; fundamentals and applications. 2nd edition. Informa healthcare : New York; 2009, Vol 20, Chapter. 12, pg. 523-544. 02.Shobha Rani R.Hiremath. Text book of industrial pharmacy: drug delivery system and cosmetic and herbal drug technology. Chennai: Orient longman Private Ltd.,Chapter 5:60-52.
UNIT-IV **Targeted drug Delivery:** Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications	**13 hrs**	01.S.P.Vyas and R.K.Khar. Targeted and continued drug delivery : Novel carrier system. 1st edition, New Delhi: CBS publishers, 2008. Chapter-5, 6, 9, pg.173 – 331.
UNIT-V **A) Ocular Drug Delivery Systems:** Introduction, intra ocular barriers and methods to overcome – Preliminary study, ocular formulations and ocuserts **B) Intrauterine Drug Delivery Systems:** Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	**13 hrs**	01. N.K.Jain. controlled and novel drug delivery, 1st edition, new Delhi, CBS publishers and distributors, 2004, chapter-4 : Pg.82-98. 02. Yie W.Chien. Novel Drug Delivery System. 2nd edition, Vol.50, New York : Marcel Dekker, Inc. 2005.

UNIT-VI **A) Gastroretentive drug delivery systems:** Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications **B) Implantable Drug Delivery Systems:** Introduction, advantages and disadvantages, concept of implants and osmotic pump and applications.	**12 hrs**	01.N.K.Jain.Progress in controlled and novel drug delivery system. 1st edition, New Delhi; CBS publishers and distributors, 2005, Chapter-4 : 76 to 97. 02. Robinson J R, Lee Y.H.L. Controlled drug delivery: Fundamentals and Applications, 2nd edition. New York: Informa Health care; 2009. Vol.20, Chapter-12: Pg.523-554.

Recommended Books: (Latest Editions)

01. Yie W.Chien.Novel Drug Delivery System. 2nd edition, Vol.50, New York : Marcel Dekker, Inc. 2005.
02. Joseph R.Robinson, Vincent H.L.Lee. Controlled drug delivery: Fundamentals and applications, 2nd edition. New York: Marcel Dekker, Inc.:2005.
03. Mathiowitz. Encyclopedia of controlled drug delivery. 1st edition. New York: Wiley Inter science publication John Wiley and Sons, Inc. Reprint 2009.
04. N.K.Jain. Controlled and Novel drug delivery. 1st edition, New Delhi: CBS publishers and distributors; Reprint 2004.
05. S.P.Vyas, R.K.Khar. Targeted and controlled drug delivery:Novel carrier systems. 1st edition. New Delhi : CBS Pubilshers and Distributors : 2008.

Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

CB704T

IV/IV B. PHARMACY-6th SEMESTER
HERBAL DRUG TECHNOLOGY
[THEORY -75 Hours]

Scope:

This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Objectives:

Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

Chapter/Topic	Duration (hrs)	References
UNIT-I **A) Herbs as raw materials** Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material	10 hrs	01. Pharmacognosy and phytochemistry, SL Deore, Dr.S.S.Khadabadi, 1st edition, 2014, Pharma med press (Chapter-1, 9) 02. Pharmacognosy and Pharmacobiotechnology, Ashutoshkar, 2nd edition , 2007, New age international pvt ltd, New Delhi, Chapter-1. 03. Text book of pharmacognosy, 2nd edition, 2006, S S Handa, V.K.Kapoor, Vallabh Prakashan, New Delhi, (Chapter-33, 34)
UNIT-II **A) Biodynamic Agriculture** Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides	**13 hrs** 8 hrs	01. Herbal Drug Technology, S S Agarwal, M.Paridhavi, 1st edition, 2007, Universities Press (India) Pvt. Ltd., Hyderabad, (Chapter 2) 02. Essential of pharmacognosy, Dr.S.H.Ansari, 1st edition, 2006, Birla Publications Pvt. Ltd,(Chapter-12)

B) Indian Systems of Medicine a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.	5 hrs	03. Pharmacognosy, C K Kokate, A Purohit, 15th edition, 2014, Nirali Prakashan, Chennai (Chapter-18).
UNIT-III **A) Nutraceuticals** General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina **B) Herbal-Drug and Herb-Food Interactions:** General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.	**11hrs** 7 hrs 4 hrs	01.Pharmacognosy and phytochemistry, SL Deore, Dr.S.S.Khadabadi, 1st edition, 2014, Pharma med press (Chapter-27) 02. Pharmacognosy and Pharmacobiotechnology, Ashutoshkar, 2nd edition , 2007, New age international pvt ltd, New Delhi, 03. Essential of pharmacognosy, Dr.S.H.Ansari, 1st edition, 2006, Birla Publications Pvt. Ltd,(Chapter-12, 16, 22) 04. Handbook of Medicinal herbs, James A.Duke, 2nd edition, 2006, C R C Press, New Delhi, 05. Quality control of herbal drugs, Dr.Pulok, K.Mukharjee, 5th edition, 2012, business horizons, New Delhi (Chapter 2) 06. Fundamentals of Pharmacognosy and phytotherapy, Michel Henrich, 2008, Church Living Stone, (Chapter, 9, 10), section 4.

UNIT-IV **A) Herbal Cosmetics** Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products. **B) Herbal excipients:** Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes. **C) Herbal formulations :** Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes	**15 hrs** 5 hrs 5 hrs 5 hrs	01. Herbal Drug Technology, S S Agarwal, M.Paridhavi, 1st edition, 2007, Universities Press (India) Pvt. Ltd., Hyderabad, (Chapter 11) 02.Pharmacognosy and phytochemistry, SL Deore, Dr.S.S.Khadabadi, 1st edition, 2014, Pharma med press (Chapter-20, 21, 26) 03. Essential of pharmacognosy, Dr.S.H.Ansari, 1st edition, 2006, Birla Publications Pvt. Ltd,(Chapter-16) 04. Pharmacognosy, C K Kokate, A Purohit, 15th edition, 2014, Nirali Prakashan, Chennai (Chapter-18).
UNIT-V **A) Evaluation of Drugs** WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs. **B) Patenting and Regulatory requirements of natural products:** a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bio-prospecting and Biopiracy b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem. **C) Regulatory Issues** - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.	**13 hrs** 5 hrs 5 hrs 3 hrs	01.Pharmacognosy and phytochemistry, SL Deore, Dr.S.S.Khadabadi, 1st edition, 2014, Pharma med press (Chapter-11. 12. 23. 30) 02. Quality control of herbal drugs, Dr.Pulok, K.Mukharjee, 5th edition, 2012, business horizons, New Delhi (Chapter-17) 03. Herbal Drug Technology, S S Agarwal, M.Paridhavi, 1st edition, 2007, Universities Press (India) Pvt. Ltd., Hyderabad, (Chapter-10) 04. WHO monograph selected medicinal plants, Vol 1 and 2, AITBS publishers, and distributors, Indraprastha Press, New Delhi.

UNIT- VI **A) General Introduction to Herbal Industry** Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. **B) Schedule T – Good Manufacturing Practice of Indian systems of medicine** Components of GMP (Schedule – T) and its objectives Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.	**13 hrs** 7 hrs 6 hrs	01. Text book of industrial pharmacognosy (PB) A.N.Kalia, 2nd edition, 2009, C B S Publishers and distributors, Chapter-4. 02. Pharmacognosy and phytochemistry, SL Deore, Dr.S.S.Khadabadi, 1st edition, 2014, Pharma med press (Chapter-10, 19)

CB705P

IV/IV B. PHARMACY-7th SEMESTER
PHARMACOLOGY-II
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (Hrs)	References
01	Introduction to invitro pharmacology and physiological salt solutions.	3 hrs	Hand book of Experimental Pharmacology – S.K.Kulkarni; 3rd edition; Vallabh Prakashan publishers; Exp. No.:1
02	Commonly used instruments in experimental pharmacology	3 hrs	Hand book of Experimental Pharmacology – S.K.Kulkarni; 3rd edition; Vallabh Prakashan publishers; Exp. No.:1
03	Study of common laboratory animals	3 hrs	1)Screening methods in Pharmacology - N.S. Parmar; 1st edition; Narosa publishers; Exp. No.:3. 2) Experiments in Pharmacology using Animal simulator Software
04	Maintenance of laboratory animals as per CPCSEA guidelines	3 hrs	Hand book of Experimental Pharmacology – S.K.Kulkarni; 3rd edition; Vallabh Prakashan publishers; Exp. No.:1
05	Study of different routs of drug administration in mice/rats	3 hrs	Introduction to experimental pharmacology, Dr. Uma Bandari; 1st edition; Birla Publications; Chapter No: 6.
6	Euthanasia in Experimental Animals	3 hrs	Drug discovery and evaluation, pharmacological assays; H. Gerhard Vogel; 2nd edition; Chapter Q.
7	Effects of drugs on rabbit eye	3 hrs	1. Experiments in Pharmacology using animal simulator software 2. Simuulated experiments in Pharmacology using Ex-pharm probeta software
8	Effect of drugs on ciliary motility of frog oesophagus	3 hrs	
9	DRC of acetylcholine on frog rectus abdominis muscle	3 hrs	
10	Effect of physostigmine on the DRC of acetylcholine on frog rectus abdominis muscle*	6 hrs	
11	Determination of PD_2 value using gunia pig ileum*	6 hrs	

12	DRC of histamine on guinea pig ileum	3 hrs	
13	Bioassay of acetylcholine on rat ileum by four point assay method*	6 hrs	1.Experiments in Pharmacology using animal simulator software 2. Simuulated experiments in Pharmacology using Ex-pharm probeta software
14	Effect of atropine on the DRC of the acetylcholine on Rat Ileum*	6 hrs	
15	Effect of drugs on isolated frog heart	6 hrs	
16	Effect of drugs on isolated and perfused frog heart*	6 hrs	
17	Demonstration of analgesic activity of drug in mice using eddy's hot plate	6 hrs	
18	Determination of the anticonvulsant effect of phenytoin in mice using electro convulsiometer	3 hrs	

NOTE : * Major experiment

IV/IV B. PHARMACY-7th SEMESTER
PHARMACEUTICAL ANALYSIS-II
[PRACTICALS -75 Hours]

Exp. No	Topic	Duration (Hrs)	Reference
1.	Determination of absorption maxima and effects of solvents on absorption maxima of organic compounds.	3 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No:1,Pg.15. 2.Practical Pharmaceutical Chemistry, A.H.Beckett and J.B. Stenlake, part-II fourth edition. CBS, Chapter No: 07, P.No: 327.
2.	Estimation of dextrose by colorimetry.	3 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :6 Pg.26. 2. Elementary organic spectroscopy, Y.R.Sharma, 14th edition, S.Chand, Chapter No: 02, P.No: 52.
3.	Estimation of sulfanilamide by colorimetry.	3 hrs	Dr.A.V.Kasture, Dr.Mahadik, pharmaceutical Analysis vol-II, 19th edition, Chapter No: 20, P.No: -183.
4.	Assay of paracetamol by UV-Spectroscopy.	3 hrs	Indian Pharmacopeia, Government of India, Ministry of health and family welfare, the Indian Pharmacopoeia Commission, Ghaziabad, 1985, Vol-I, 3rd edition, P.No: 359.
5.	Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy.	6 hrs	A.H.Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, part-II fourth edition, CBS Chapter No: 07, P.No: 284

6.	Estimation of quinine sulfate by flourimetry.	3 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :10 Pg.40. 2.A.H.Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, part-II fourth edition, CBS Chapter No:09, P.No: 369,372
7.	Study of quenching of fluorescence.	3 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :10 Pg.42. 2.A.H.Beckett and J.B. Stenlake, Practical Pharmaceutical Chemistry, part-II fourth edition,CBS Chapter No: 09, P.No: 372
8.	Determination of sodium by flame photometry.	3 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :13 Pg.48. 2.A.V.Kasture, Mahadik, Pharmaceutical Analysis vol-II, 19th edition, S.Chand, Chapter No: 23, P.No: 203
9.	Determination of potassium by flame photometry.	3 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :13 Pg.48. 2.A.V.Kasture, Mahadik, Pharmaceutical Analysis vol-II, 19th edition, S Chand Chapter No: 23, P.No: 203

10.	Determination of chlorides and sulphates by nephelo turbidometry.	6 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :9 Pg.36.
11.	Separation of amino acids by paper chromatography.	6 hrs	1. Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No :24 (A) Pg.72.
12.	Separation of sugars by thin layer chromatography.	3 hrs	Laboratory hand book of instrumental drug analysis, B.G.Nagavi, 3rd Edition, Vallabh Prakasham Publi-cations,2005,Exp.No:25,Pg.76.
13.	Separation of plant pigments by column chromatography.	6 hrs	Laboratory hand book of instrumental drug analysis, B.E.Nagoji, 3rd Edition, Vallabh Prakasham Publications, 2005, Exp. No : 24 (B). Pg.NO.74
14.	Demonstration and estimation of drugs by HPLC. (paracetamol/ aceclofenac/ cimetidine/ doxycycline.	9 hrs	1.Indian Pharmacopeia, Government of India, Ministry of health and family welfare, the Indian Pharmacopoeia Commission, Ghaziabad, 2018,Vol-II & III, 8th edition, P.No: 1145, 1621, 1901 and 2853. 2. Siarhei V. Charapitsa, Direct Determination of Volatile Compounds in Spirit Drinks by Gas Chromatography, *J. Agric. Food Chem.,* ***2013***,61 (12), P.No: 2950–2956. 3. Indian Pharmacopeia, Government of India, Ministry of health and family welfare, the Indian Pharmacopoeia Commission, Ghaziabad, 2018,Vol-II , 8th edition, P.No: 1901 and 1994.
15.	Demonstration and estimation of drugs by gas liquid chromatography. (doxycycline/ethanol)	3 hrs	

16.	Potentiometric titration of an acid with a strong base.	6 hrs	A.V.Kasture, Mahadik, Pharmaceutical Analysis vol-II, 19th edition, Chapter No: 10, P.No: 116
17.	Comparison of the IR spectrum of a compound with that of its derivatives.	6 hrs	Y.R.Sharma, Elementray organic spectroscopy, 14th edition, Chapter No: 03, P.No: -112.

IV B.PHARMACY
8th SEMESTER

CB801T

IV/IV B. PHARMACY-8th SEMESTER
BIOSTATISTICS AND RESEARCH METHODOLOGY
[THEORY -75 Hours]

Scope:

To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel**.**

Objectives:

Upon completion of the course the student shall be able to

• Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)

• Know the various statistical techniques to solve statistical problems

• Appreciate statistical techniques in solving the problems**.**

Chapter/Topic	Duration (hrs)	References
UNIT-I **A) Introduction:** Statistics, Biostatistics, Frequency distribution. **B) Measures of central tendency**: Mean, Median, Mode-Pharmaceutical examples. **C) Measures of dispersion**: Dispersion, Range, standard deviation, Pharmaceutical Problems. **D) Correlation**: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples.	**15 rs**	1)Fundamentals of mathematical statistics; S.C.Gupta, V.K.Kpoor;9th edition, pageNo.:2.6,2.13,2.17,3.1,3.2 10.1,10.103. 2)Biostatistics; P.N.Arora, P.K.Malhan;6th edition; Chapter-5-page No.-81-96, Chapter-6-Page No- 109,113, chapter-8-Page.No-137,149, chapter-9-Page No- 155,156. 3)Pharmaceutical statistics; T.E.Gopala Krishna Murthy, R.Srinivasa Babu, P.Seshagiri Rao;chapter-2-Page No-8,13,19, Chapter-5-Page No-118,121.

UNIT - II **A) Regression:** Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples. **B) Probability:**Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties – problems Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples.	**12 hrs**	1. Fundamentals of mathematical statistics; S.C.Gupta, V.K.Kpoor;9th edition, pageNo.-10.49, 10.60,7.1. 2. Pharmaceutical statistics-Practical and clinical applications- Stanford Bolton, 5th edition, Chapter-7-Page No-147,151,170. 3. Fundamentals of statistics; S.C.Gupta; 7th edition-Chapter-16-Page No.- 16.25 – 16.33.
UNIT-III **A) Introduction to Research:** Need for research, Need for design of Experiments, Experiential Design Technique, ethics and research plagiarism. **B) Designing the methodology:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases. **C)** Randomization and methods of Randomization, types bias and over coming bias.	**11 hrs**	1. Research methodology; C.R.Kothari, Gaurav Garg; 3rd edition- Page No-1,3,19,38. 2. Research methodology concepts and cases; Deepak Chawla, Neena Sondhi, 2nd edition, Page No-51. 3. Research methodology and quantitative methods; G.Nageswara Rao;1st edition; Page No.-274-279.
UNIT-IV Blocking and confounding system for Two-level factorials. **A) Regression modeling:** Hypothesis testing in Simple and Multiple regression models. **B) Introduction to Practical components of Industrial and Clinical Trials Problems**: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach.	**15 hrs**	1. Biostatistics; P.N.Arora, P.K.Malhan, Chapter-18, Page No-382-384. 2. Pharmaceutical statistics-Practical and clinical applications- Stanford Bolton, 5th edition, Chapter-9-Page No-222-234.

UNIT-V **A) Design and Analysis of experiments: Factorial Design:** Definition, 2^2, 2^3design. Advantage of factorial design **B) Response Surface methodology**: Central composite design, Historical design, Optimization Techniques	**12 hrs**	Pharmaceutical statistics; T.E.Gopala Krishna Murthy, R.Srinivasa Babu, P.Seshagiri Rao;chapter-12- Page No- 368-382.
UNIT – VI **A) Graphs:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph **B)Parametric test**: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference **C)Non Parametric tests:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test	**10 hrs**	1. Pharmaceutical statistics- Practical and clinical applications- Stanford Bolton, 5th edition, Chapter-1- page No-26-35. 2. Fundamentals of statistics; S.C.Gupta;7th edition –Page No-26.1-26.40. 3. Pharmaceutical statistics- Practical and clinical applications- Stanford Bolton, 5th edition, Chapter-15- page No-393,394,398,402,409.Chapter-8- 182,198.

Recommended Books (Latest edition):

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. New York.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

CB802T

IV/IV B. PHARMACY-8th SEMESTER
PHARMACEUTICAL CHEMISTRY-V
(Chemistry of Natural Products)
[THEORY -75 Hours]

Scope:

Natural products are considered to be symbols of protection in comparison to the synthetic products that are regarded as unsafe to human life and environment. Natural products possess many pharmacological activities like anti ulcer, anti ageing, anti bacterial, anti oxidant, anti fungal, anti-inflammatory, anti diabetic, anti hepatotoxic, anti allergic, anti cancer and vasodilator properties. Plants have always been a rich source of natural product leads like morphine, digoxin, quinine, nicotine, papaverine, paclitaxel and artemisinin. Hence there is a need to study sources, isolation, chemistry and medicinal uses of naturally derived compounds.

Objectives :

At the end of the course the student will be able to:

- Gain knowledge about the sources and properties of natural products.
- Understand the isolation techniques and various identification tests.
- Elucidate the structure of different classes of compounds which includes alkaloids, carbohydrates, glycosides, proteins, terpenoids and steroids.
- Appreciate the medicinal importance of natural products.

Chapter/Topic	Duration (hrs)	References
UNIT-I **Fixed oils and volatile oils:** a. Properties and analysis of fixed oils fats and waxes (acid value, saponification value, ester value, iodine value and peroxide value). b. Analysis of volatile oils- clove oil (eugenol) and eucalyptus oil (cineole) c. Classification of terpenes and terpenoids. d. Chemistry of monoterpenoids (geraniol, citral, α-terpineol, limonene and menthol) and their interconversions (excluding structural elucidation)	09 hrs	1. Organic chemistry, I. L. Finar, Dorling Kindersley (India) Pvt. Ltd, Delhi, 2008, 5th edition, volume-II, chapter-8, P. No. 368. 2. Bentley and driver's textbook of pharmaceutical chemistry, LM Atherden, 8th edition, oxford university press, chapter-48, P. No. 596.

e. Structure and uses of camphor, carvone, β-carotene, α-tocopherol and α-pinene. f. Classification, brief introduction to flavonoids and their biological significance (excluding structural elucidation).		3. Organic chemistry of natural products, Gurdeep R Chatwal, 4th edition, volume-I, Himalaya publishing house, 2008, chapter-7, P.No.7.1. 4. Organic chemistry of natural products, Gurdeep R Chatwal, revised 4th edition, volume-II, Himalaya publishing house, 2008, chapter-1, P.No.1.1 and chapter 13, P. No.13.1. 5. Organic chemistry natural products, O. P. Agrawal, 34th edition, Krishna prakashan media (P) Ltd. 2007, volume-I, chapter-4, P. No. 312. 6. Organic chemistry of natural products, O. P. Agrawal, 32nd edition, Krishna prakashan media (P) Ltd. 2007, volume-II, chapter-5, P. No. 331.
UNIT-II **Carbohydrates and glycosides:** a. Physical and chemical properties of mono and disaccharides. b. Structural elucidation of glucose, fructose, sucrose and lactose. c. Qualitative analysis of carbohydrates d. Classification, extraction and qualitative analysis of glycosides.	17 hrs	1.Organic chemistry, I. L. Finar, Dorling Kindersley (India) Pvt. Ltd, 2008, 5th edition, volume-II, chapter-7, P. No. 290. 2. Bentley and drivers textbook of pharmaceutical chemistry, LM Atherden, 8th edition, Oxford university press, chapter-39, P. No.473 and chapter 49, P. No.607.

e. Sources and chemistry of cardiac and anthraquinone glycosides. f. Structure and uses of scillarin –A, hellebrin, cascaroside-A, rhein and aloin. g. Structural elucidation of salicin and amygdalin.		3. Organic chemistry of natural products, Gurdeep R Chatwal, 4th edition, volume-I, Himalaya publishing house, 2008, chapter-1, P. No.1.1. 4. Organic chemistry natural products, O. P. Agrawal, 34th edition, Krishna prakashan media (P) Ltd. 2007, volume-I, chapter-1, P. No. 1. 5. Pharmaceutical organic chemistry, Part-I, chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, Vallabh publications, chapter-8, P. No.128 and chapter-9, P. No.157.
UNIT-III **Alkaloids :** a. Classification and isolation of alkaloids b. General methods for structural elucidation of alkaloids. c. Chemistry of ephedrine, nicotine and papaverine. d. Structure and medicinal uses of ephedrine, strychnine and piperine.	13 hrs	1. Organic chemistry, I. L. Finar, Dorling Kindersley (India) Pvt. Ltd, 2008, 5th edition, volume-II, chapter-14, P. No. 710. 2. Bentley and drivers textbook of pharmaceutical chemistry, L M Atherden, 8th edition, Oxford university press, chapter-72, P. No. 813 and chapter-73, P. No. 838. 3. Organic chemistry of natural products, Gurdeep R Chatwal, revised 4th edition, volume-I, Himalaya publishing house, 2008, chapter-3, P. No. 3.1.

		4. Organic chemistry natural products, O.P. Agarwal, 34th edition, Krishna prakashan media (P) Ltd. 2007, volume-I, chapter-3, P. No. 193. 5. Pharmaceutical organic chemistry, Part-I, chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, Vallabh publications, chapter-13, P. No. 206.
UNIT-IV **Proteins and purines:** a. Classification of amino acids and proteins. b. Physical and chemical properties of proteins. c. C-terminal and N-terminal analysis of proteins. d. Chemistry and biological significance of thyroxine, oxytocin and insulin (excluding structural elucidation) e. Chemistry, biological significance of uric acid, theobromine, theophylline and caffeine. (excluding structural elucidation)	11 hrs	1. Organic chemistry, I. L. Finar, Dorling Kindersley (India) Pvt. Ltd, 2008, 5th edition, volume-II, chapter-13,P. No. 652 and chapter-16,P. No. 808. 2. Bentley and driver's textbook of pharmaceutical chemistry, LM Atherden, 8th edition, Oxford university press, chapter-67, P. No. 743 and chapter-72, P. No. 813. 3. Organic chemistry of natural products, Gurdeep R Chatwal, revised 4th edition, volume-I, Himalaya publishing house, 2008, chapter-2, P. No. 2.1 and chapter-4, P. No. 4.1. 4. Organic chemistry natural products, O. P. Agrawal, 34th edition, Krishna prakashan Media (P) Ltd. 2007, volume-I, chapter-2, P. No. 122 and chapter-7, P. No. 513.

		5. Organic chemistry natural products, O.P.Agarwal, 32nd edition, Krishna prakashan media (P) Ltd. 2007, volume-II, chapter-6, P. No. 349. 6. Pharmaceutical organic chemistry, Part-I, chemistry of heterocyclic and natural compounds, Rama Rao Nadendla, Vallabh publications, chapter-11, P. No. 177 and chapter-14, P. No. 239.
UNIT-V **Vitamins :** a. Stability of water soluble and fat soluble vitamins b. Pro-vitamins and anti-vitamins c. Chemistry of thiamine, riboflavin and ascorbic acid (including structural elucidation). d. Structural features of pyridoxine and folic acid.	10 hrs	1. Wilson and Griswold's textbook of organic medicinal and pharmaceutical chemistry, 11th edition, John H Block and M Beale Jr, Lippincott Williams and Wilkins, Chapter-26, P. No. 866. 2. Organic chemistry, I. L. Finar, Dorling Kindersley (India) Pvt. Ltd, 2008, 5th edition, volume-II, chapter-17, P. No. 843. 3. Bentley and drivers textbook of pharmaceutical chemistry, L M Atherden, 8th edition, Oxford university press, chapter-70, P. No. 779. 4. Organic chemistry of natural products, Gurdeep R Chatwal, 4th edition, volume-I, Himalaya publishing house, 2008, chapter-6, P. No. 6.1.

		5. Organic chemistry natural products, O. P. Agarwal, 32nd edition, Krishna prakashan media (P) Ltd. 2007, volume-II, chapter-1, P. No. 1. 6. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, Pharma Med Press, 2013, chapter-27,P.No.334. 7. Pharmaceutical organic chemistry, Part-II, chemistry of natural products, Rama Rao Nadendla, Vallabh publications, chapter-4, P. No. 56.
UNIT-VI **Chemistry of steroids and Hormones:** a. Classification, nomenclature, stereochemistry and metabolism of steroids. b. Chemistry and biological significance of cholesterol, bile acids and cortisone (excluding structural elucidation). c. Structure, nomenclature and uses of ethinyl estradiol, diethyl stilbestrol, betamethasone, dexamethasone, prednisolone, norethisterone,testosterone, progesterone, sildenafil, tadalafil, mifepristone, norgestrel, levonorgestrel, hydrocortisone and nandrolone. d. Interrelationship of estradiol, estrone and estriol. e. Marker's synthesis of progesterone. f. Irradiation of ergosterol to ergocalciferol.	15 hrs	1. Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry, 11th edition, John H Block and M Beale Jr, Lippincott Williams and Wilkins, chapter-23, P. No. 767. 2. Foye's principles of medicinal chemistry, 6th edition, Thomas L Lemke, David A Williams, Victoria F Roche, S William Zho, Lippincott Williams and wilkins, chapter-33, P. No. 877 and chapter-34, P. No. 913. 3. Organic chemistry, I. L. Finar, Dorling Kindersley (India) Pvt. Ltd, Delhi, 2008, 5th edition, volume-II, chapter-11, P. No. 531.

		4. Bentley and drivers textbook of pharmaceutical chemistry, LM Atherden, 8th edition, Oxford university press, chapter-69, P. No. 761. 5.Organic chemistry of natural products, Gurdeep R Chatwal, 4th edition, volume-II, Himalaya publishing house, 2008, chapter-4, P. No. 4.1. 6. Organic chemistry natural products, O.P.Agarwal, 32nd edition, Krishna Prakashan Media (P) Ltd. 2007, Volume-II, chapter-4, P. No. 235. 7. Medicinal chemistry, Rama Rao Nadendla, 2nd edition, Pharma Med Press, Hyderabad, 2013, chapter-28, P. No. 349. 8. Pharmaceutical organic chemistry, Part-II, chemistry of natural products, Rama Rao Nadendla, Vallabh publications, chapter-1, P. No.1

Further readings:

01. Burger's medicinal chemistry and drug discovery, Donald J.Abraham, 6th edition, John wiley and Sons, 2003.
02. Remington, The science and practice of pharmacy, 21st edition, Lippincott Williams and Wilkins, 2012.

CB803T

ELECTIVE – I

IV/IV B. PHARMACY-8th SEMESTER

PHARMACOVIGILANCE [THEORY -75 Hours]

Scope: This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.

Objectives:

At completion of this paper it is expected that students will be able to (know, do, and appreciate):

01. Why drug safety monitoring is important?
02. History and development of pharmacovigilance
03. National and international scenario of pharmacovigilance
04. Dictionaries, coding and terminologies used in pharmacovigilance
05. Detection of new adverse drug reactions and their assessment
06. International standards for classification of diseases and drugs
07. Adverse drug reaction reporting systems and communication in pharmacovigilance
08. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
09. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality.

Chapter/Topic	Duration (hrs)	References
UNIT-I **A) Introduction to Pharmacovigilance** • History and development of Pharmacovigilance • Importance of safety monitoring of Medicine • WHO international drug monitoring programme • Pharmacovigilance Program of India(PvPI)	04 06	01. Textbook of Pharmacovigilance: S K Gupta. Pg.No.13, 135, 16 02. A Textbook of Clinical Pharmacy Practice - Essential Concepts and Skills:G. Parthasarathi, 85, 90, 91.

B) Introduction to adverse drug reactions • Definitions and classification of ADRs • Detection and reporting • Methods in Causality assessment • Severity and seriousness assessment • Predictability and preventability assessment • Management of adverse drug reactions **C) Basic terminologies used in pharmacovigilance** • Terminologies of adverse medication related events • Regulatory terminologies	03	03. Textbook of Pharmacovigilance: S K Gupta. Pg.No.44 04. Textbook of Pharmacovigilance: S K Gupta. Pg.No.01
UNIT-II **A)Drug and disease classification** • Anatomical, therapeutic and chemical classification of drugs • International classification of diseases • Daily defined doses • International Non proprietary Names for drugs **B) Drug dictionaries and coding in pharmacovigilance** • WHO adverse reaction terminologies • MedDRA and Standardised MedDRA queries • WHO drug dictionary • Eudravigilance medicinal product dictionary **C) Information resources in pharmacovigilance** • Basic drug information resources • Specialised resources for ADRs	05 04 04	01. A Textbook of Clinical Pharmacy Practice - Essential Concepts and Skills:G. Parthasarathi, Pg.No. 412. 02.Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna, Pg.No.99 03. A Textbook of Clinical Pharmacy Practice - Essential Concepts and Skills:G. Parthasarathi, Pg.No. 323.

UNIT-III **A) Establishing pharmaco-vigilance programme** • Establishing in a hospital • Establishment & operation of drug safety department in industry. • Contract Research Organisations (CROs). • Establishing a national programme. **B) Pharmacovigilance methods** • Passive surveillance – Spontaneous reports and case series • Stimulated reporting • Active surveillance – Sentinel sites, drug event monitoring and registries • Comparative observational studies – Cross sectional study, case control study and cohort study • Targeted clinical investigations **C) Communication in pharmacovigilance** • Effective communication in Pharmacovigilance • Communication in Drug Safety Crisis management Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media	05 06 05	01. Textbook of Pharmacovigilance: S K Gupta. Pg.No.93 02.Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna, Pg.No.29. 03. Textbook of Pharmacovigilance: S K Gupta. Pg.No.119
UNIT-IV **Safety data generation** • Pre clinical phase • Clinical phase • Post approval phase (PMS) **ICH Guidelines for Pharmacovigilance** • Organization and objectives of ICH • Expedited reporting • Individual case safety reports • Periodic safety update reports	04 06	01. Textbook of Pharmacovigilance: S K Gupta. Pg.No.75 02. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Pg.No.138, 516.

• Post approval expedited reporting • Pharmacovigilance planning • Good clinical practice in pharmacovigilance studies		
UNIT-V **Pharmacogenomics of adverse drug reactions** • Genetics related ADR with example focusing PK parameters. **Drug safety evaluation in special population** • Paediatrics • Pregnancy and lactation • Geriatrics **Vaccine safety surveillance** • Vaccine Pharmacovigilance • Vaccination failure • Adverse events following immunization **Haemovigilance and Materiovigilance**	03 03 04	01.Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna, Pg.No.87. 02. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Pg.No.94, 96. 03. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Pg.No.423.
UNIT-VI **CIOMS** • CIOMS Working Groups • CIOMS Form **CDSCO (India) and Pharmacovigilance** • D & C Act and Schedule Y Differences in Indian and global pharmacovigilance requirements **Case Handling Activities :** • Causality assessment of ADR • Case narrative • Signal detection and risk management	03 04 06	01. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy, Pg.No.431, 631. 02.Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna, Pg.No.10, 98, 102.

CB804T

ELECTIVE-II

IV/IV B. PHARMACY-8th SEMESTER
PHARMACEUTICAL REGULATORY SCIENCE
[THEORY -75 Hours]

Scope: This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug Products.

Objectives: Upon completion of the subject student shall be able to;

01. Know about the process of drug discovery and development
02. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
03. Know the regulatory approval process and their registration in Indian and international markets

Chapter/Topic	Duration (hrs)	References
UNIT-I **Regulatory Concepts** Basic terminology, roles and responsibility of regulatory science in industry. Guidance, guidelines, regulations, laws and acts, orange book, federal register, code of federal regulatory and purple book.	10 hrs	1.Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, NiraliPrakashan. 2.The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.185. Informa Health care Publishers.
UNIT-II **New drug discovery and development** Stages of drug discovery, drug development process, pre-clinical studies, non-clinical activities and clinical studies. Innovator and generics, concept of generics and generic drug product development.	12 hrs	1.Drugs: From Discovery to Approval, Second Edition By Rick Ng 2.Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene

		3.Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer, Marcel Dekker series, Vol.143
UNIT-III **Regulatory Approval Process** Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.	12 hrs	1.New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190. 2.www.fda.gov
UNIT-IV **Regulatory authorities and agencies :** Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)	11 hrs	Country Specific Guidelines from official websites.
UNIT-V **Registration of Indian drug product in overseas market** Procedure for export of pharmaceutical products, technical documentation, Drug Master File (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD).	15 hrs	1.Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc. 2.www.fda.gov
UNIT-VI **Clinical trials** Developing clinical trial protocols, Institutional review board / Independent ethics committee - formation and working procedures, informed consent process and procedures, GCP obligations of investigators, sponsors and monitors, managing and monitoring clinical trials, pharmacovigilance and safety monitoring in clinical trials.	15 hrs	1.Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams 2.FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.

Recommended books (Latest edition):

01. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
02. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.185. Informa Health care Publishers.
03. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
04. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
05. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
06. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
07. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
08. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
09. Drugs: From Discovery to Approval, Second Edition by Rick Ng

IV/IV B. PHARMACY-8th SEMESTER
PHARMACEUTICAL CHEMISTRY-V
(Chemistry of Natural Products)
[PRACTICALS -75 Hours]

S. No.	Name of the Experiment	Duration (hrs)	References
1	Determination of acid value of a fixed oil/fat.	3 hrs	1. Indian Pharmacopoeia, 2014, 7th edition, The Indian pharmacopoeia commission, Ghaziabad, 2014, volume-I, 2.3.23, P. No.100. 2. Practical pharmaceutical chemistry, A. H. Beckett and J.B. Stenlake, 4th edition, part-I, CBS publishers and distributors, 2005, chapter-5, P. No.146. 3. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak, 1st edition, S.Vikas & PV books, 2009, chapter-7, P. No. 215.
2	Determination of saponification value of a fixed oil/fat.	6 hrs	1. Indian Pharmacopoeia, 2014, 7th edition, The Indian pharmacopoeia commission, Ghaziabad, 2014, volume-1, 2.3.37, P. No.109. 2. Practical pharmaceutical chemistry, A. H. Beckett and J. B. Stenlake, 4th edition, part-I, CBS publishers and distributors, 2005, chapter-5, P. No.158. 3. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak, 1st edition, S.Vikas & PV books, 2008, chapter-7, P. No. 214.
3	Determination of ester value of a fixed oil/fat	3 hrs	Indian Pharmacopoeia, 2014, 7th edition, The Indian pharmacopoeia commission, Ghaziabad, 2014, volume-1, 2.3. 26, P. No.101.
4	Determination of Iodine value of a fixed oil/fat	6 hrs	1. Indian Pharmacopoeia, 2014, 7th edition, The Indian pharmacopoeia commission, Ghaziabad, 2014, volume-1, 2.3.28, P. No.102. 2. Practical pharmaceutical chemistry, A. H. Beckett and J.B. Stenlake, 4th edition, part-I, CBS publishers and distributors, 2005, chapter-7, P. No.188.

			3. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak, 1st edition, S.Vikas & PV books, 2008, chapter-7, P. No.216.
5	Determination of peroxide value of a fixed oil/fat	3 hrs	Indian Pharmacopoeia, 2014, 7th edition, The Indian pharmacopoeia commission, Ghaziabad, 2014, volume-1, 2.3.35, P. No.109.
6	Determination of aldehyde content of cinnamon oil*	3 hrs	1. Practical pharmaceutical chemistry, A. H. Beckett and J.B. Stenlake, 4th edition part-I, CBS publishers and distributors, 2005, chapter-5, P. No.143. 2. Practical Pharmacognosy, Dr C. K.Kokate, Vallabh Prakashan, 4th edition, 2006, chapter-9, expt, 9.12,P.No.133. 3. Experimental Pharma-cognosy, Biren N.Shah, B.S.Nayak, 1st edition, S.Vikas & PV books, 2008, chapter-7, P. No. 211.
7	Determination of eugenol content of clove oil	3 hrs	1. Quality control of herbal drugs-An approach to evaluation of botanicals, Dr. Pulok K.Mukherjee, 1st edition, 3rd reprint, Business horizons pharmaceutical publisher, 2008, chapter-9, P. No. 203. 2. Practical pharmaceutical chemistry, A. H. Beckett and J.B. Stenlake, 4th edition, part-I, CBS publishers and distributors, 2005, chapter-10, P. No.256.
8	Isolation of piperine from black pepper	4 hrs	1. Practical Pharmacognosy, Dr C. K. Kokate, Vallabh Prakashan, 4th edition, 2006, Chapter-10, expt-10.11, P.No.143. 2. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak,1st edition, S.Vikas & PV books, 2008, chapter-11, P.No.248. 3. Natural products-a laboratory guide, Raphael Ikan, 2nd edition, Elsevier, 2005, chapter-4, P. No. 233.
9	Isolation of caffeine from tea dust	4 hrs	1. Practical Pharmacognosy, Dr C.K.Kokate, Vallabh Prakashan, 4th edition, 2006, Chapter-10, expt -10.07, P. No.140.

			2. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak, 1st edition, S. Vikas & PV books, 2008, chapter-11, P. No.247. 3. Natural products-a laboratory guide, Raphael Ikan, 2nd edition, Elsevier, 2005, chapter-4, P. No. 230.
10	Isolation of aloin from aloes	4 hrs	1. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak,1st edition, S.Vikas & PV books, 2008, chapter-11, P. No. 244.
11	Qualitative analysis of carbohydrates	6 hrs	1.Quality control of herbal drugs-An approach to evaluation of botanicals, Dr. Pulok K. Mukherjee, 1st edition, 3rd reprint, Business horizons pharmaceutical publisher, 2008,chapter-10, P. No. 246. 2. Experimental Pharmacognosy, Biren N.Shah, B.S.Nayak, S.Vikas & PV books, 2008, chapter-6, P.No.190.
12	Qualitative analysis of aminoacids	3 hrs	
13	Qualitative analysis of proteins	3 hrs	
14	Qualitative analysis of selected alkaloids	3 hrs	
15	Qualitative analysis of selected steroids	3 hrs	
16	Qualitative analysis of selected flavonoids	3 hrs	
17	Qualitative analysis of selected glycosides	3 hrs	
18	Estimation of quinine sulphate by non-aqueous titration.	3 hrs	Practical pharmaceutical chemistry, 4th edition, part-1, A.H. Beckett, J.B.Stenlake, chapter-6, P. No.167.
19	Demonstration on estimation of selected vitamin by UV spectroscopy	6 hrs	Sethi's quantitative analysis of pharmaceutical formulations, methods with reaction mechanism, 4th edition, volume-4, 2012, CBS publishers & distributors(P) Ltd, folic acid, P. No.333 and ascorbic acid, P. No. 329

20	Demonstration of estimation of selected steroid by colorimetry	3 hrs	Sethi's quantitative analysis of pharmaceutical formulations, methods with reaction mechanism, 4th edition, volume-3, 2012, CBS publishers & distributors(P) Ltd, dexamethasone, P. No.190

CB806

IV/IV B. PHARMACY-8th SEMESTER
PROJECT

Course Outcomes:

C806.1	To recall and identify the societal issues related to health and pharmaceuticals and to report the aims and objectives of the project.
C806.2	To review and compare the literature on selected topic / problem / issue.
C806.3	To design a plan of work and execute it accordingly.
C806.4	To analyze and compile the results of the project.
C806.5	To justify the objectives and summarize the reports.
C806.6	To publish a paper or patent with acceptable limit of (<30%) plagiarism.

CB807

IV/IV B. PHARMACY-8th SEMESTER
PRACTICE SCHOOL
[PRACTICALS -150 Hours]

Scope:

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.