

**DBF Dayanand College of Arts & Science, Solapur**

**Course Outcome**

**Name of the Department: Chemistry**

<b>M.Sc.II</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM III</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-301</b>		
<b>TITLE OF COURSE (NAME OF PAPER): BASICS IN PHARMACEUTICAL CHEMISTRY</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Drug Design</b> Development of new drugs, procedures followed in drug design, concept of lead identification and lead modification, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism, bioisosterism and spatial consideration. History and development of QSAR, Physiochemical parameters, Lipophilicity, electronic parameters, steric parameters, Shelton and surface activity parameters and redox potentials, Free Wilson and Hantzsch analysis, other statistical methods	<ul style="list-style-type: none"><li>• To know the procedures followed in drug design.</li><li>• To understand the QSAR, Physiochemical parameters</li><li>• To understand the concepts like structure-activity relationship (SAR)</li></ul>	<ul style="list-style-type: none"><li>• Students will gain the understanding of development of new drugs and procedures followed in drug design.</li><li>• Acquire the concept of lead identification and lead modification, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism, bioisosterism and spatial consideration along with history and development of QSAR, Physiochemical parameters,</li></ul>
<b>A] Pharmacokinetic</b> Introduction to drug absorption, disposition, drug metabolism, elimination, important pharmacokinetic parameters in defining drug disposition and in	<ul style="list-style-type: none"><li>• To study ADME concept</li><li>• To understand the concepts and</li></ul>	<ul style="list-style-type: none"><li>• Able to understand the drug action through ADME concept</li><li>• Students will come to know the</li></ul>

<p>therapeutics, importance of pharmacokinetics in drug development process, concept of pro drug and soft drug</p> <p><b>B] Pharmacodynamics</b> Introduction, principles of drug action, mechanisms of drug action, introduction to the concept of receptors and drug receptor interactions, dose-response relationships, drug potency and efficacy, combined effect of drugs, introduction to relative terminology like LD50, ED50, MIC, MEC etc.</p>	<p>importance of pharmacokinetic parameters in drug development process</p> <ul style="list-style-type: none"> <li>• To study the principles of drug action, and mechanisms of drug action</li> <li>• To understand terms like LD50, ED50, MIC, MEC etc.</li> </ul>	<p>difference between pharmacokinetic and Pharmacodynamics</p> <ul style="list-style-type: none"> <li>• Gain the knowledge of different terminology used in drug action and drug receptor interaction and other terminology like LD50, ED50, MIC, MEC etc.</li> </ul>
<p><b>Microbiology:</b> Microbial Drug Development - Introduction to Microbiology and classification of Microbes. Characterization and Screening of Microbes, Isolation and Improvement of Individual micro-organism, Microbial growth, Kinetics, Fermentation process, Fermenter designing, Media designing, Down Stream process and effluent treatment (Microbial and Chemical), Antimicrobial assays</p>	<ul style="list-style-type: none"> <li>• To know the basic concept of Microbiology and classification of Microbes</li> <li>• To study Characterization and Screening of Microbes, Microbial growth, Kinetics, Fermentation process, Fermenter designing, Media designing, Down Stream process and effluent treatment (Microbial and Chemical), Antimicrobial assays</li> </ul>	<ul style="list-style-type: none"> <li>• Understands concept of Microbiology and classification of Microbes</li> <li>• <b>Gaining the knowledge of</b> Characterization and Screening of Microbes, Microbial growth, Kinetics, Fermentation process, Fermenter designing, Media designing, Down Stream process and effluent treatment (Microbial and Chemical), Antimicrobial assays</li> </ul>
<p><b>Immunology:</b></p>	<ul style="list-style-type: none"> <li>• To know the Overview of the immune system and its role</li> </ul>	<ul style="list-style-type: none"> <li>• Able to understand different aspects Immunology and</li> </ul>

<p>Immunology and Immunopharmacology- Overview of the immune system and its role, Adaptive and innate Immunity. Immune response and the underlying mechanisms, Regulation of immune response. Hypersensitivity, immunodeficiency, Autoimmunity, Immunization, Immunosuppressants, Immunomodulators, Immunological techniques</p>	<ul style="list-style-type: none"> <li>• To understand the Adaptive and innate Immunity. Mechanism and Regulation of Immune response</li> <li>• To study the terms like Hypersensitivity, immunodeficiency, Autoimmunity, Immunization, Immunosuppressants, Immunomodulators, Immunological techniques</li> </ul>	<p>Immunopharmacology</p> <ul style="list-style-type: none"> <li>• Acquire the information w.r.t terms like Hypersensitivity, immunodeficiency, Autoimmunity, Immunization, Immunosuppressants, Immunomodulators, Immunological techniques</li> </ul>
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Signature of HOD

<b>M.Sc.II</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM III</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-302</b>		
<b>TITLE OF COURSE (NAME OF PAPER): ORGANIC SPECTROSCOPY</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<p><b>Nuclear Magnetic Resonance Spectroscopy:</b>  General introduction and definition, chemical shift, spin-spin interaction, shielding mechanism, mechanism of measurement, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehyde and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides and mercapto), chemical exchange, effect of deuteration, complex spin-spin interaction between 2,3,4 and 5 nuclei (first order spectra), virtual coupling.  Stereochemistry, Hindered rotation, Fourier transforms technique, Nuclear Overhauser Effect (NOE) with examples</p>	<ul style="list-style-type: none"> <li>• To study the chemical shift, spin-spin interaction, shielding mechanism, chemical shift values and correlation for protons.</li> <li>• To understand complex spin-spin interaction between 2,3,4 and 5 nuclei.</li> <li>• To know Fourier transforms technique, Nuclear Overhauser Effect (NOE).</li> </ul>	<ul style="list-style-type: none"> <li>• Acquire the information about the chemical shift, spin-spin interaction, shielding mechanism, chemical shift values and correlation for protons.</li> <li>• Able to understand complex spin-spin interaction between 2,3,4 and 5 nuclei.</li> <li>• The student will come to know Fourier transforms technique, Nuclear Overhauser Effect (NOE).</li> </ul>

<p><b><sup>13</sup>C-NMR spectroscopy:</b> Introduction, <sup>13</sup>C- chemical shifts, calculation of <sup>13</sup>C- chemical shifts of aliphatic, olefinic, alkyne, aromatic, hetero aromatic and carbonyl carbons, factors affecting chemical shifts, proton coupled <sup>13</sup>C - spectra, proton decoupled <sup>13</sup>C- spectra. Off-resonance decoupling</p>	<ul style="list-style-type: none"> <li>• To know the calculation of <sup>13</sup>C- chemical shifts.</li> <li>• To study the factors affecting chemical shifts.</li> <li>• To understand the Off-resonance decoupling.</li> </ul>	<ul style="list-style-type: none"> <li>• Able to calculate of <sup>13</sup>C- chemical shifts.</li> <li>• Gaining the knowledge of the factors affecting chemical shifts.</li> <li>• Able to understand the Off-resonance decoupling.</li> </ul>
<p><b>Two-dimensional (2D) NMR spectroscopy:</b> Introduction, DEPT, COSY and HETCOR techniques, (including interpretation of COSY and HETCOR spectra). NOESY, ROESY and 2D-INADEQUATE techniques</p>	<ul style="list-style-type: none"> <li>• To study DEPT, COSY and HETCOR techniques.</li> <li>• To know the NOESY, ROESY and 2D-INADEQUATE techniques.</li> </ul>	<ul style="list-style-type: none"> <li>• Able to understand and distinguish DEPT, COSY and HETCOR techniques.</li> <li>• Gaining the knowledge of NOESY, ROESY and 2D-INADEQUATE techniques.</li> </ul>
<p><b>Mass Spectrometry:</b> Principle and theory, instrumentation, different ionization techniques (EI, CI, FAB, FD), general modes of fragmentation, fragmentation patterns of various classes of compounds, Mac Laffarty rearrangement with representative compounds, applications</p>	<ul style="list-style-type: none"> <li>• To study the instrumentation and different ionization techniques.</li> <li>• To understand the fragmentation patterns of various classes of compounds.</li> </ul>	<ul style="list-style-type: none"> <li>• The student will come to know the instrumentation and different ionization techniques.</li> <li>• Able to understand the fragmentation patterns of various classes of compounds.</li> </ul>

<b>Problems</b> based on combined use of spectroscopic techniques/ advanced techniques	To solve the problems based on combined use of spectroscopic techniques/ advanced techniques.	Able to solve the problems based on combined use of spectroscopic techniques/ advanced techniques.
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Signature of HOD

<b>M.Sc.</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM III</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-303A</b>		
<b>TITLE OF COURSE (NAME OF PAPER): BIOACTIVE HETEROCYCLES AND NATURAL PRODUCTS</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Three and four membered heterocycles:</b> Aziridines, Oxiranes, Thiranes, Azetidines, Oxitanes and Thietanes <b>Five and six membered heterocycles with one and two hetero atoms:</b> Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine	<ul style="list-style-type: none"> <li>To understand three and four membered heterocycles with preparation, properties and applications</li> <li>To gain knowledge of five and six membered heterocycles with one and two hetero atoms.</li> </ul>	<ul style="list-style-type: none"> <li>Students able to identify three and four membered heterocycles and applied in various synthetic route.</li> </ul> <p>Students capable of setting synthesis for various experiments using five and six membered heterocycles with one and two hetero cycles.</p>
<b>Five and six membered heterocycles with more than two hetero atoms:</b>	<ul style="list-style-type: none"> <li>To know advanced study of five and six membered heterocycles with more than two heteroatoms</li> </ul>	<ul style="list-style-type: none"> <li>Students capable of study of five and six membered heterocycles with more than two heteroatoms.</li> </ul>

<p>1, 2, 3-Triazole, 1, 2, 4-Oxadiazole, Tetrazole, 1, 3, 5-Triazine, Tetrazine</p> <p><b>Condensed heterocycles:</b> Benzofuran, Indole, Benzothiophene, Benzoxazole, benzthiazole, Benzimidazole, Coumarins and Chromones, Purines and Pteridines</p>	<ul style="list-style-type: none"> <li>To study condensed heterocycles i.e. condensation reactions with using heterocyclic rings.</li> </ul>	<ul style="list-style-type: none"> <li>Students understand and set condensation reactions with aromatic and heterocyclic reactions.</li> </ul>
<p>Classification, methods of isolation, synthesis and methods of structure determination of</p> <p><b>Alkaloids:</b> Cinchonine and atropine, morphine, nicotine</p> <p><b>Terpenoids:</b> Introduction, biological importance and synthesis of Farnesol, Zingiberine, Santonine, Phytol and Abietic Acid</p>	<ul style="list-style-type: none"> <li>To gain the knowledge of isolation, synthesis of Alkaloids and Terpenoids.</li> <li>To study the biological importance and synthesis of Alkaloids and Terpenoids.</li> </ul>	<ul style="list-style-type: none"> <li>Students are familiar with classification and gain knowledge of isolation of Alkaloids and Terpenoids.</li> <li>Students aware about biological importance and able to synthesize the different Alkaloids and Terpenoids.</li> </ul>
<p><b>Steroids:</b> Constitution of cholesterol (with synthesis), chemistry of Progesterone, Estrone, Testosterone, PGE and Bile acids</p> <p><b>Hormones:</b> Introduction, biological importance and synthesis of Hexosterol, stilbosterol and ACTH.</p>	<ul style="list-style-type: none"> <li>To study the constitution of different cholesterol and Bile acids</li> <li>To gain the knowledge and biological importance of hormones.</li> </ul>	<ul style="list-style-type: none"> <li>Students independently constitute the cholesterol, estrone, PGE and Bile acids</li> <li>Students capable to find out biological importance and synthesis of Hormones.</li> </ul>

Signature of HOD

<b>M.Sc.II</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM III</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-304A</b>		
<b>TITLE OF COURSE (NAME OF PAPER): MEDICINAL CHEMISTRY-I</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<p><b>Basic principles of medicinal chemistry:</b>  Basic consideration, historical evolution, fundamental aspects of drugs: forms, application, biological action, metabolism, drug interaction, adverse effects.  Classification of drugs, nomenclature of drugs, drug combination, Selection of essential drugs, physicochemical properties of drug: solubility, partition coefficient, hydrogen bonding. Prodrugs: utility of prodrugs, types of prodrugs, mechanism of drug activation- carrier linked prodrugs, carrier linkages for various functional groups, bio precursor</p>	<ul style="list-style-type: none"> <li>• To know the fundamental aspects of drugs.</li> <li>• To understand the physicochemical properties of drug.</li> <li>• To study the concept Prodrugs and mechanism of activation.</li> </ul>	<ul style="list-style-type: none"> <li>• Gaining the knowledge of fundamental aspects of drugs.</li> <li>• Able to understand the physicochemical properties of drug.</li> <li>• The students come to know the concept of Prodrugs and mechanism of activation.</li> </ul>
<p><b>Analgesic drugs:</b> Introduction, Classification, Mechanism of action, Synthesis and SAR of Ibuprofen, Paracetamol, Phenylbutazone, Acetaminophen,</p>	<ul style="list-style-type: none"> <li>• To study analgesic drugs w.r.t. mechanism of action, synthesis and SAR</li> </ul>	<ul style="list-style-type: none"> <li>• The students come to know the analgesic drugs w.r.t. mechanism of action, synthesis and SAR</li> </ul>

<p>Diclofenac sodium, Dichlorophenac, Indomethacin, Rofecoxib, Celecoxib</p> <p><b>Antitubercular and antileprotic agents:</b> Introduction, Classification, Mechanism of action, Synthesis and SAR of Isoniazid, Ethambutal, Clofazimine, Dapsone</p>	<ul style="list-style-type: none"> <li>• To understand the antitubercular drugs w.r.t. mechanism of action, synthesis and SAR</li> <li>• To know antileprotic drugs w.r.t. mechanism of action, synthesis and SAR</li> </ul>	<ul style="list-style-type: none"> <li>• Able to understand the antitubercular drugs w.r.t. mechanism of action, synthesis and SAR</li> <li>• Gaining the knowledge of antileprotic drugs w.r.t. mechanism of action, synthesis and SAR</li> </ul>
<p><b>Sulfonamides:</b> Introduction, Nomenclature, Synergism of Sulfonamides, SAR studies and Synthesis of Sulfisoxazole, Sulfapyridine, Sulfacetamide and Sulfamethoxazole</p> <p><b>Antiamoebic agents:</b> Introduction, Classification, and Mechanism of action and Synthesis of Metronidazole, Iodoquinol and Dimercaprol</p> <p><b>Anti-infective agents:</b> Introduction, Classification, Mechanism of action, Synthesis and SAR of Nitrofurazone and Furazolidos</p>	<ul style="list-style-type: none"> <li>• To know the mechanism of action, synthesis of Sulfonamides.</li> <li>• To study the mechanism of action, synthesis of Antiamoebic agents</li> <li>• To understand mechanism of action, synthesis and SAR of Anti-infective agents.</li> </ul>	<ul style="list-style-type: none"> <li>• Gaining the knowledge of the mechanism of action, synthesis of Sulfonamides.</li> <li>• Acquire the knowledge about the mechanism of action, synthesis of Antiamoebic agents</li> <li>• Able to understand the mechanism of action, synthesis and SAR of Anti-infective agents.</li> </ul>

<p><b>Antimalerials:</b> Etiology of malaria. Mechanism of action and SAR of Quinolone antimalarials, Synthesis of Chloroquin, Primaquin and Quinacrine</p> <p><b>CNS depressants:</b> Introduction, Classification, Mechanism of action, Synthesis and SAR of -</p> <p>a) Anaesthetics – Halothane, Lidocaine and Thiopental</p> <p>b) Sedative and hypnotics: Chlorodiazepoxide and Diazepam</p> <p>c) Anticonvulsant: Phenytoin Sodium, Carbamazepine</p>	<ul style="list-style-type: none"> <li>• To understand mechanism of action, synthesis and SAR of Antimalarial drugs.</li> <li>• To study the mechanism of action, synthesis and SAR of CNS depressants such as Anaesthetics, Sedative and hypnotics, Anticonvulsant</li> </ul>	<ul style="list-style-type: none"> <li>• Able to understand mechanism of action, synthesis and SAR of Antimalarial drugs.</li> <li>• Acquire the knowledge about the mechanism of action, synthesis and SAR of CNS depressants such as Anaesthetics, Sedative and hypnotics, Anticonvulsant</li> </ul>
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M.Sc.II		
NAME OF SUBJECT: Pharmaceutical Chemistry		
SEM IV		
COURSE NUMBER (PAPER NUMBER) HCT-401		
TITLE OF COURSE (NAME OF PAPER): STEREOCHEMISTRY, PHOTOCHEMISTRY AND PERICYCLIC REACTIONS		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p><b>Fused and bridged rings:</b> Cis- and trans- decalins and nine methyl decalines and perhydropheanthrene, perhydroanthracene. Bridged rings, Nomenclature stereo chemical restrictions. The Bredts rule, Reactivities, Stereochemistry of Allenes, spiranes and biphenyls.</p>	<ul style="list-style-type: none"> <li>To differentiate between fused and bridged rings, to know about nomenclature, Bredts rule and stereochemistry of Allenes, Spiranes and Biphenyls.</li> </ul>	<ul style="list-style-type: none"> <li>Students able to differentiate fused and bridged rings. Also gain the knowledge of nomenclature, understand bredts rule and known about stereochemistry of Allenes, Spiranes and Biphenyls.</li> </ul>
<p><b>Principles and applications of asymmetric synthesis:</b> Stereoselectivity in cyclic compounds, enantioselectivity, diastereo-selectivity, enantiomeric and diastereomeric excess, stereoselective aldol reactions, Cram's rule, Felkin Anh rule, Cram's chelate model, Prochirality, Asymmetric synthesis, use of chiral auxiliaries, chiral reagents and catalysts, asymmetric hydrogenation, asymmetric epoxidation and asymmetric dihydroxylation, Synthetic and Industrial applications</p>	<ul style="list-style-type: none"> <li>To study the stereoselectivity, enantioselectivity, diastereo-selectivity, crams rule, Felkin-Anh model, prochirality, asymmetric synthesis.</li> <li>To know how to use chiral auxiliaries, chiral agents and catalysts.</li> </ul>	<ul style="list-style-type: none"> <li>Students understand the stereoselectivity, enantioselectivity,</li> <li>diastereo-selectivity, crams rule, Felkin-Anh model, prochirality, asymmetric synthesis.</li> <li>Able how to use chiral auxiliaries, chiral agents and catalysts.</li> <li>Able how to apply asymmetric hydrogenation, asymmetric</li> </ul>

	<ul style="list-style-type: none"> <li>• How to apply asymmetric hydrogenation, asymmetric epoxidation and asymmetric dihydroxylation.</li> <li>• Know about synthetic and industrial applications.</li> </ul>	<p>epoxidation and asymmetric dihydroxylation.</p> <ul style="list-style-type: none"> <li>• Known about synthetic and industrial applications.</li> </ul>
<p><b>Organic Photochemistry:</b> Introduction, Electronic transition, Jablonskii diagram, photosensitizations, photochemistry of carbonyl compounds, unsaturated system and aromatic compounds.</p>	<ul style="list-style-type: none"> <li>• To understand meaning of photochemistry, Jablonski diagram, photosensitization and photochemistry of some functional groups.</li> </ul>	<ul style="list-style-type: none"> <li>• Students able to know about photochemistry, knowledge about Jablonski diagram and know how to study the photochemistry of functional groups.</li> </ul>
<p><b>Pericyclic Reactions:</b> Introduction: Types and stereochemistry, Theoretical basis of Pericyclic reactions, M O Theory and symmetry property reactant and product orbital, Cyclo addition reactions – [2 + 2] and [4 + 2], Electrocyclic reactions, Sigmatropic rearrangement and group transfer reactions</p>	<ul style="list-style-type: none"> <li>• To study the pericyclic reactions, M O theory, cycloaddition reactions, electrocyclic reactions, sigmatropic reactions and group transfer reactions.</li> </ul>	<ul style="list-style-type: none"> <li>• Students gain knowledge and know the difference and applications of periclic reactions MO theory, cycloaddition reaction, electrocyclic reactions, sigmatropic reactions and group transfer reactions.</li> </ul>

Signature of HOD

<b>M.Sc.II</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM IV</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-402</b>		
<b>TITLE OF COURSE (NAME OF PAPER): DRUG DISCOVERY AND DOSAGE FORMS</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<p><b>Introduction to drug discovery and dosage forms:</b> Introduction, drug discovery and design: a historical outline, sources of drugs and lead compounds, classification of drugs, brief discussion on methods of drug administration, introduction of drug action and bioavailability</p> <p><b>Dosage forms:</b> oral solids, oral liquids, solution properties, suspensions, emulsions, parenteral, aerosols, inhalation products, topical semisolids, topical lipids and powders, ophthalmic products, rectal and vaginal products. Oral solids: tablets, types of tablets, methods of tablet production- wet granulation, coating of tablets. Quality control methods and measurement of tablet properties. Oral liquids: introduction, type, oral suspensions and oral emulsions</p>	<ul style="list-style-type: none"> <li>• To know the drug discovery and design and their sources, classification, methods and bioavailability.</li> <li>• To study and understand the different forms of dosage and their parameters</li> </ul>	<ul style="list-style-type: none"> <li>• Students will be able to understand concept of drug discovery and design along with their sources, classification, methods and bioavailability.</li> <li>• Students will acquire the information regarding different dosage forms including their preparation methods, properties and applications.</li> </ul>

<p><b>Drug screening methods:</b></p> <p>General principles of screening of drugs, general screening methods, clinical trial. Experimental animals used in pharmacological assays, invitro, invivo studies. Tissue experiments and whole animal experiments. Bioassay, scope, principals involved and general methods. Bioassay of acetylcholine, insulin and atropine. Screening method for evaluation of analgesic, anti-inflammatory, antiulcer, anticonvulsants, hepatoprotective, antidiabetic and antifertility activities. Methodology for microbial assay of penicillin and miconazole. Enzyme inhibition studies: inhibition of acetylcholine esterase activity in rat striatum, Cox inhibition studies</p>	<ul style="list-style-type: none"> <li>• To study the principles of screening of drugs, general screening methods, clinical trial.</li> <li>• To understand the concepts of pharmacological assays, invitro, and invivo studies</li> <li>• To study the principles, methods and application of different bioassays</li> </ul>	<ul style="list-style-type: none"> <li>• Students will gain the knowledge of screening of drugs, general screening methods, clinical trial.</li> <li>• Students will come to know the concepts related to pharmacological assays, invitro, and invivo studies</li> <li>• Acquire the knowledge of principles, methods and application of different bioassays</li> </ul>
<p><b>GMP and Drug Regulations:</b></p> <p>Introduction, requirements of good manufacturing practice and quality management, guidelines to manufacturing practice for medicinal products, premises</p>	<ul style="list-style-type: none"> <li>• To know the basic concept of GMP and Drug Regulations</li> <li>• To study the requirements of good manufacturing practice and quality management, guidelines to manufacturing practice for medicinal products.</li> </ul>	<ul style="list-style-type: none"> <li>• Understands the concept of GMP and Drug Regulations.</li> <li>• Gaining the knowledge of good manufacturing practice and quality management, guidelines to manufacturing practice for medicinal products.</li> </ul>

<p>and equipments, documentation and production and quality control.</p> <p>GCP- guidelines and related management. Principles of ICH and GCP, ethical principles related to GCP.</p> <p>Regulations for obtaining permission for clinical trial, application for permission, report: clinical trial report, trial management, data monitoring committee (DMC)</p>	<ul style="list-style-type: none"> <li>• To understand the guidelines and related management w.r.t. GCP, ICH.</li> <li>• To know the regulations for obtaining permission for clinical trial, clinical trial report, trial management, data monitoring committee (DMC)</li> </ul>	<ul style="list-style-type: none"> <li>• Acquire the information regarding the guidelines w.r.t. GCP, ICH.</li> <li>• Able to understand the process of clinical trial and their parametres.</li> </ul>
<p><b>Drug delivery systems:</b></p> <p>Fundamental of novel drug delivery: Rationale of sustained release, controlled release dosage forms.</p> <p>Physicochemical and biological factors influencing design and performance of CR products.</p> <p>Pharmacokinetics and pharmacodynamic basis of NDDS. Bioavailability assessment of CR systems.Regulatory requirements. Theory of mass transfer. Fick`s law and its application in NDDS.</p> <p>Polymers in CR- classification, properties biocompatible and biodegradable polymers. Modeling of drug release from porous polymer: drug release from nonporous and hydrophobic polymers. Oral controlled</p>	<ul style="list-style-type: none"> <li>• To know the Overview of Fundamental of novel drug delivery.</li> <li>• To understand the Physicochemical and biological factors influencing design and performance of CR products.</li> <li>• To study Polymers in CR- classification, properties biocompatible and biodegradable polymers</li> <li>• To know about the Modeling of drug release along with</li> </ul>	<ul style="list-style-type: none"> <li>• Able to understand the Fundamental of novel drug delivery.</li> <li>• Aquire the information w.r.t Physicochemical and biological factors influencing design and performance of CR products.</li> <li>• Gain the knowledge of biodegradable polymeric materials used for drug delivery systems.</li> <li>• Able to understand the modeling study along with</li> </ul>

drug delivery systems, mucosal drug delivery system, ocular drug delivery systems, parenteral drug delivery systems, transdermal drug delivery systems	different types of drug delivery systems.	different types of drug delivery systems.
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Signature of HOD

<b>M.Sc.II</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM IV</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-403</b>		
<b>TITLE OF COURSE (NAME OF PAPER): MEDICINAL CHEMISTRY - II</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Anti-neoplastic agent</b> Introduction, cancer chemotherapy, special problems; Role of alkylating agent and anti-metabolites in treatment of cancer. Mention of carcinolytic antibiotics and mitotic inhibitors, synthesis of some antineoplastic agent-e.g. Taxol <b>a) Antagonist: Fluorouracil (b) Alkylating agents:</b> i) Chlorambucil (ii) Cis-Platin	<ul style="list-style-type: none"> <li>• To study about anti-neoplastic, cancer therapy and synthesis of antineoplastic agents</li> <li>• To know about antagonist and alkylating agents</li> </ul>	<ul style="list-style-type: none"> <li>• Gaining the knowledge of antineoplastic agents and treatment of cancer, antibodies and mitotic inhibitors.</li> <li>• Synthesizing and uses of antagonist-fluorouracil, alkylating agents chlorambucil</li> </ul>

<p><b>Antibiotics</b> Preparation of semi synthetic penicillin, conversion of penicillin into cephalosporin, general account of tetracycline and macaracyclic antibiotics (no synthesis) Introduction, Classification, Mechanism of action and Synthesis of the following drug molecules (at least one convenient synthetic route with Possible mechanism) from following classes: <b>Antibiotics:</b> (a) Chloramphenicol (b) Ampicillin (c) Amoxycillin (d) Cefepime (e) Cefpirome <b>Antimycobacterial:</b> Ethambutol, <b>Antiviral:</b> Acyclovir, <b>Antimicrobial:</b> Sulfamethoxazole</p>	<ul style="list-style-type: none"> <li>• To and apply the antibodies, classification, mechanism of action, synthesis.</li> <li>• Study how to synthesize the antibiotics like chloramphenicol, ampicillin, cefepime Antimycobacterial, Antiviral, Antimicrobial drugs.</li> </ul>	<ul style="list-style-type: none"> <li>• Students clear about meaning of antibodies, conversion of penicillin, classification, mechanism of action</li> <li>• Students know how to synthesize and take precaution for antibodies like chloramphenicol, ampicillin, cefepime, etc.</li> <li>• Also know about synthesis of antimycobacterial, antiviral and antimicrobial.</li> </ul>
<p><b>Antidiabetics, Antihistamines and Anti-hypertensive drugs</b> Introduction, Classification, Mechanism of action and Synthesis of the following drug molecules (at least one convenient synthetic route with possible mechanism) from following classes: <b>Anti-hypertensive Drugs:</b> (a) Verapamil (b) Captopril (c) d-sotalol (d) Atenolol (e) Diltiazem (f) Semotiadilfumarate. <b>Antidiuretics:</b> (a) Troglitazone (b) Chlorpropamide (c) Tolbutamide <b>Antihistamines;</b> Phenobarbiton, Fenediazole, Diphenylhydramine, mechanism of action</p>	<ul style="list-style-type: none"> <li>• Detail study of antidiabetics, antihistamines and anti-hypertensive drugs- classification, mechanism of action and synthesise.</li> <li>• Anti-hypertensive drugs like d-sotalol, atenolol, diltiazem.</li> <li>• Antidiuretics like chlorpropamide, tolbutamide. Antihistamines</li> </ul>	<ul style="list-style-type: none"> <li>• Students are able to classify, know the mechanism of action and synthesize the drugs of categories- antidiabetics, antihistamines and anti-hypertensive drugs.</li> <li>• Gain knowledge of synthesis and mechanism of action for antihypertensive drugs like d-sotalol, atenolol, diltiazem</li> </ul>

	like phenobarbitone, fenediazol, etc.	<ul style="list-style-type: none"> <li>• Antidiuretics like chlorpropamide, tolbutamide. Antihistamines like phenobarbitone, fenediazol, etc.</li> </ul>
<p><b>Tranquilizers, Anti-AIDS and Cardiovascular Drugs:</b>  Introduction, Classification, Mechanism of action and Synthesis of the following drug molecules (at least one convenient synthetic route with Possible mechanism) from following classes:</p> <p><b>Tranquilizers:</b> Diazepam, Trimeprazin  <b>Anti-AIDS drugs:</b> Cause, Antimetabodies and Anti-AIDS drugs  <b>Cardiovascular Drugs:</b> Dilliazem, Quindine, Methyldopa, Atenolol, Oxyprenol  <b>Antacids / Antiulcer:</b> Omeprazole, Ranitidine</p>	<ul style="list-style-type: none"> <li>• To study the drugs Tranquilizers, anti-AIDS and Cardiovascular drugs- classification, mechanism of action and synthesis of-</li> <li>• Tranquilizers-Diazepam, Trimeprazin</li> <li>• Anti-AIDS – cause, antimetabodies.</li> <li>• Cardiovascular drugs – Dilliazem,oxyprenol</li> <li>• Antacids/Antiulcer - Rantidine</li> </ul>	<ul style="list-style-type: none"> <li>• Students acquired knowledge of Tranquilizers, anti-AIDS and Cardiovascular drugs their classification, mechanism of action and synthesis of –</li> <li>• Tranquilizers –Diazepam, Trimeprazin</li> <li>• Anti-AIDS –cause, antimetabodies</li> <li>• Cardiovascular drugs – Dilliazem, oxyprenol, methyldopa.</li> <li>• Antacids/antiulcer – omeprazole, Rantidine.</li> </ul>

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<b>M.Sc.II</b>		
<b>NAME OF SUBJECT: Pharmaceutical Chemistry</b>		
<b>SEM IV</b>		
<b>COURSE NUMBER (PAPER NUMBER) HCT-404A</b>		
<b>TITLE OF COURSE (NAME OF PAPER): ADVANCED ORGANIC SYNTHESIS</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<p><b>Name reactions</b>  Darzen, Prins, Henry, Strecker amino acid synthesis. Bamford-Steven, Baylis-Hillmann, Corey-Fuchs Reaction, Julia Olefination, Mukaiyamaaldol, Mitsunobu, Corey-Winter olefination, Shapiro, Ritter, Stille, Heck, Sonogashira, Suzuki, Duff, Chugaev, Petasis, McMurry reaction and Coupling. Ring closing metathesis (Grubb's metathesis), Aldol-Tishchenko reaction (Evans-Tishchenko reaction), Ugi, Passerini, Biginelli</p>	<ul style="list-style-type: none"> <li>• To study the various name reactions useful for the organic synthesis.</li> <li>• To understand and distinguish between various name reactions.</li> <li>• To apply the knowledge of name reactions to different organic synthesis.</li> </ul>	<ul style="list-style-type: none"> <li>• Gaining the knowledge of the various name reactions useful for the organic synthesis.</li> <li>• Able to understand and distinguish between various name reactions.</li> <li>• Able to apply the knowledge of name reactions to different organic synthesis.</li> </ul>

<p><b>Free radical reactions</b>  Preparation of semi synthetic penicillin, conversion of penicillin into cephalosporin, general account of tetracycline and macaracyclic antibiotics (no synthesis)  Introduction, Classification, Mechanism of action and Synthesis of the following drug molecules (at least one convenient synthetic route with Possible mechanism) from following classes:  <b>Antibiotics:</b> (a) Chloramphenicol (b) Ampicillin (c) Amoxycillin (d) Cefepime (e) Cefpirome  <b>Antimycobacterial:</b> Ethambutol, <b>Antiviral:</b> Acyclovir, <b>Antimicrobial:</b> Sulfamethoxazole</p>	<ul style="list-style-type: none"> <li>• To know the different types of free radical reactions.</li> <li>• To understand mechanism and reactivity of attacking free radicals.</li> <li>• To study the reactions involving free radical mechanism.</li> </ul>	<ul style="list-style-type: none"> <li>• Acquire the knowledge of the different types of free radical reactions.</li> <li>• Able to understand mechanism and reactivity of attacking free radicals.</li> <li>• The students come to know the reactions involving free radical mechanism.</li> </ul>
<p><b>Rearrangements</b>  Pummerer, Payne, Eschenmoser fragmentation, Brook, Wagner-Meerwein, Wolf, Semipinacol, Epoxide rearrangement with lewis acid, Tiffeneau-Demjanov, von Richter, Wittig, Neber, Smiles, Steven, Hofmann, Iodolactonisation</p>	<ul style="list-style-type: none"> <li>• To study the various name reactions useful for the organic synthesis.</li> <li>• To understand and distinguish between various name reactions.</li> <li>• To apply the knowledge of name reactions to different organic synthesis.</li> </ul>	<ul style="list-style-type: none"> <li>• The students come to know the various name reactions useful for the organic synthesis.</li> <li>• Able to understand and distinguish between various name reactions.</li> <li>• Able to apply the knowledge of name reactions to different organic synthesis.</li> </ul>

<p><b>Reagents</b></p> <p>Lithium dialkylcuprate, Trimethylsilyl iodide, Peracids, PPA, Ozone, Hoffmann-Löffler Fretag reactions, Ene reaction, Barton reaction, Selenium dioxide, Periodic acid, Iodoisobenzyl diacetate</p>	<ul style="list-style-type: none"> <li>• To study the various name reactions useful for the organic synthesis.</li> <li>• To understand and distinguish between various name reactions.</li> <li>• To apply the knowledge of name reactions to different organic synthesis.</li> </ul>	<ul style="list-style-type: none"> <li>• Gaining the knowledge of the various name reactions useful for the organic synthesis.</li> <li>• Able to understand and distinguish between various name reactions.</li> <li>• Able to apply the knowledge of name reactions to different organic synthesis.</li> </ul>
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Signature of HOD

## **Program Outcome [M.Sc. Pharmaceutical Chemistry]**

- Obtain knowledge with facts and findings related to Pharmaceutical chemistry
- Understands the fundamental concept, principles and working of theories related to scientific phenomena
- Gain enough skill in handling instruments, planning and execution of innovative experiments
- Obtain the observations and drawing logical answers from the conducted experiments.
- Able to do creative thinking and put the conclusions based on scientific findings.
- Develop the critical thinking ability and analytical mindset.
- Realize the knowledge of the subject and utilize it for the benefit of the human mankind.