SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR

SYLLABUS EFFECTIVE FROM: 2018-19
SYLLABUS FOR M.SC. (PHARMACEUTICAL CHEMISTRY)
Semester- III

Paper Code: PS03CPCH21	**Total Credits:4**
Title of paper: Drug Design and Development	

Unit	Description in detail	Weightage (%)
I.	Drug design – optimizing access to the target: Improve absorption, Making drugs more resistant to chemical and enzymeatic degradation, Making drugs less resistant to drug metabolism, Targeting drugs, Reducing toxicity, and Pro-drug, Endogenous compounds as a drug. Protein as – drug target: Protein – drug interaction (viz. Inter-molecular bonding forces), Drug action at protein, Peptide or protein as drugs.	25
II.	Enzymes& Receptoras – drug target : Enzymes as – drug target: Enzymes as catalyst, The active sites of an enzymes, Substrate binding at active sites, Enzymes inhibitors: Mechanism based enzyme inactivators, examples. Receptoras – drug target: Introduction to receptor & Receptors role.	25
III.	Drug Discovery: Introduction, Irrational approach, Rational Approach, Antisense approach. Principles of Drug design Finding a lead Drug Design – optimizing target interaction, Identify structure – activity relationship (SARs), Binding role of various functional groups, Identify the pharmacophore, Strategies in drug design, Computer aided drug design (in brief).	25
IV.	Quantitative Structure Activity Relationship (QSAR) & Drug Development: Introduction, Graphs and Equation, Physicochemical properties like Hydrophobicity, Electronic effects, stearic effects. Hansch equation, Craig plot, Topliss scheme, Bioisoteres, Planning QSAR studies, 3D – QSAR: Introduction, Definition of steric and electrostatic fields, Relating shape and electronic distribution with biological activity, Hydrophobic potential, Advantages of 3D – QSAR over 2D – QSAR, Case study. Drug Development: Preclinical and clinical study, Patenting and regulatory affairs, Chemical and process development, Design a manufacturing process, Register and market the drug.	25

Text & Reference Books:

1. G. L. Patrick, *An Introduction to Medicinal Chemistry; 2nd Ed.,* Oxford University Press, ISBN0-19-850533-7.
2. David A. Williams, ThomasL. Lemke, Lippincott Williams & Wilkins, *Foye's Principles of Medicinal Chemistry*, *5th edition,* publisher- Walter Kluwer business, ISBN– 13: 978-81-89836- 02-3.
3. John H. Block, John M. Beale, Jr., Lippincott Williams & Wilkins *Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry, 11th edition*, publisher-a Walter kluwer business, ISBN– 0-7817-3481-9
4. T. Nogradyedey, *Medicinal chemistry –A biochemical Approach* by Oxford University Press, New York, Oxford, ISBN:13 978-0-19510455-4
5. Richard B. Silverman, *The Organic Chemistry of Drug Design and Drug Action*; 2nd edition, Academic Press, ISBN: 0-12-643732-7.

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Programme: M. Sc. PHARMACEUTICAL CHEMISTRY
Semester: III
Syllabus Effective From: June 2018

Paper Code: PS03CPCH22	**Total Credits:4**
Title of paper: Pharmaceutical Formulation, Development & Biopharmaceutics	

Unit	Description In Detail	Weightage (%)
I.	Preformulation studies: General terminology, factors influencing formulation, Characterization, Like: Crystallinity, hygroscopicity, Particle size and particle size distribution, compaction properties, Crystalline and polymorphism and its evaluation. Rationale for selecting the preferred polymorph/crystalline form, preformulation study of formulation like thermal analysis Differential scanning calorimetry, X-Ray diffraction, Drug-excipient compatibility study Traces of organic volatile impurities (OVIs) and their regulatory limits.	25
II.	Dissolution study: General introduction, objectives, equipments, and significance on dissolution study and its application in dosage form development. Selection of dissolution media and conditions. Comparison of dissolution profile by model independent (similarity and dissimilarity factor) and dependent methods.	25
III.	Stability Study: Basic concept and objectives of stability study, Order of reaction and their applications in predicting shelf life and half-life of pharmaceutical formulations, Importance of accelerated stability study, Effect of various environmental/ processing factors like light, pH, temperature, etc. on stability of the formulation, impurities in stability study Applications of stability study test.	25
IV.	Biopharmaceutical properties: The concept of bioavailability, biopharmaceutics, Release of drug from its dosage form into solution, Stability in physiological fluids, Perfusion studies, Presystemic metabolism, Assessment of Bioavailability: Plasma concentration-time curves, cumulative urinary drug excretion curves, Absolute and relative bioavailability, Bioequivalence. Assessment of site of release in vivo.	25

Basic Text & Reference Books:

1. Remingtons "*Pharmaceutical Sciences*" 19th edition.
2. Lachman "*The theory and Practice of Industrial Pharmacy*" 3rd edition.

3. Aulton; *Pharmaceutics "The Science of Dosage form design.*
4. Husa, *Pharmaceutical dispensing*.
5. G. S. Banker *Modern pharmaceutics*.
6. Encyclopedia of pharmaceutical technology Volumes: 1 to 19.
7. Banaker, *Pharmaceutical dissolution testing*.
8. Yalkowsky, *Techniques of Solubilization of Drugs.*
9. Jens. T. Carstensen, *Drug stability (Principles and Practices).*

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Paper Code :PS03CPCH23	**Total Credits: 4**
Title of paper: Spectroscopy	

Unit	Description in Detail	Weightage (%)
I.	UV-Visible Spectroscopy: Basic principles, Instrumentation, Electronic transitions. Concept of chromophore and auxochrome, Effect of conjugation, solvent and pH. Instrumentation. Multicomponent analysis. Woodward-Fieser rules for calculating absorption maximum for unsaturated hydrocarbons. Difference and derivative spectra. Interpretation of spectra, Qualitative and quantitative analysis of drug molecules.	25
II.	Infra-Red Spectroscopy: Basic principle, Interaction of infrared radiation with organic molecules and its effect on bonds. Instrumentation- Dispersive IR and FT-IR spectrophotometers. Sample preparation & Sample handling. Interpretation of IR spectra. Fermi Resonance. Brief note on Attenuated Total Reflectance. Qualitative and quantitative applications of IR.	25
III.	Nuclear Magnetic Resonance Spectroscopy: Fundamental principles of NMR. Instrumentation. Chemical shift concept, spin-spin coupling and decoupling, shielding and deshielding, solvents. Pascle triangle, signal multiplicity in PMR. Spin-spin and spin-lattice relaxation, Nuclear overhauser effect, Interpretation of PMR, 13 C NMR.	25
IV.	Mass Spectrometry: Basic principles and instrumentation. Ionization techniques, mass spectrum and its characteristics, molecular ion, metastable ions, fragment ions; fragmentation processes, fragmentation patterns and fragment characteristics in relation to parent structure and functional groups. Relative abundances of isotopes and their contribution to characteristic peaks. Thermal Methods: Thermogravimetry, Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) .	25

Basic Text & Reference Books:

1. Robert M Silverstein, *Spectrometric Identification of Organic compounds* - Sixth edition, John Wiley & Sons, 2004.
2. Doglas A Skoog, F. James Holler, Timothy A. Nieman, *Principles of Instrumental Analysis - 5th edition*, Eastern press, Bangalore, 1998.
3. Willards, *Instrumental methods of analysis –7th edition*, CBS publishers.
4. Beckett and Stenlake, *Practical Pharmaceutical Chemistry –Vol II, 4th edition*, CBSPublishers, New Delhi, 1997.

5. William Kemp, *Organic Spectroscopy - 3rd edition*, ELBS, 1991.
6. P D Sethi, *Quantitative Analysis of Drugs in Pharmaceutical formulation - 3rd Edition*, CBSPublishers, New Delhi, 1997.
7. J W Munson, *Pharmaceutical Analysis- Modern methods – Part B - Volume 11*, MarcelDekker Series.

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Paper Code: PS03CPCH24	Total Credits: 4
Title Of Paper : Practical-I	

Unit	Description	Weightage (%)
I.	Group – A: Effect of pH and solvent on UV Spectrum of certain drugs. Water analysis (COD, Total Hardness, CD). Determination of pK value.	50
II.	Group – B: Estimation and analysis of various commercial drugs and drug intermediates Using conventional and instrumental techniques viz: Aspirin, Analgin, Isoniazid, Iron tablet, Anta acid, Sulpha drug,	50

Basic Text& Reference Books:

1. Longman; *Organic Qualitative analysis by Vogel's*, ISBN-13: 9780582442504;ISBN: 0582442508.
2. Longman; *A Text book of Practical Organic Chemistry by Vogel's*, ISBN: 0582442508.
3. Longman; *Elementary Practical Organic Chemistry by Vogel's*, Part-I, II, & III (ELBS) ; ISBN: 81-239-1033-9.
4. Mannand Saunders; *Practical Organic Chemistry,* Orient Logmann Publisher; OLBN: 0-00209- 058-9.
5. V. K. Ahuluwalia, *Comprehensive Practical Organic Chemistry: Volume–I&II;* Universities Press (India) Pvt. Ltd; ISBN: 8173712735.

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Paper Code: PS03CPCH25	Total Credits:4
Title Of Paper: Practical-II	

Unit	Description in detail	Weightag
I.	Group– A: Preparation and evaluation of different Pharmaceutical dosageforms (Tablet, Capsule & Parenteral viz.): Introduction & operations of various tablet machines. Preparation and evaluation of paracetamol, calcium lactate, feroussulphate. Preparation andevaluation of aspirin, amoxicillincapsules. Preparation and evaluation of chloroquine phosphate syrup, strong ammonium acetatesolution, magnesium hydroxide suspension. Preparation and supply of atropine sulphate eye ointment, atropine sulphate eye drop.	50
II.	Group– B: Preparation citrimidecream. Prepare and supply of dextrose injection, calcium gluconate injections. Bulk densities ofpowder. Dissolution test fortablet (viz. paracetamol, aspirin, ibuprofen, diclofenac sodium). Various testing of commercial tablets (viz. disintegration time, hardness, friability etc). • Estimation of Acid + Amide mixture Estimation of Acid + Ester mixture	50

Basic Text & Reference Books:

1. Longman; *Organic Qualitative analysis by Vogel's*, ISBN-13: 9780582442504; ISBN: 0582442508.
2. Longman; *A Text book of Practical Organic Chemistry by Vogel's*, ISBN: 0582442508.
3. Longman; *Elementary Practical Organic Chemistry by Vogel's*, Part-I, II, & III (ELBS); ISBN: 81-239-1033-9.
4. Mannand Saunders; *Practical Organic Chemistry,* Orient Logmann Publisher; OLBN: 0-00209- 058-9.
5. V. K. Ahuluwalia, *Comprehensive Practical Organic Chemistry: Volume–I&II;* Universities Press (India) Pvt. Ltd; ISBN: 8173712735.

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Semester: III
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Paper Code: PS03EPCH21	**Total Credits: 4**
Title of paper: General Pharmacology	

Unit	Description In detail	Weightage (%)
I.	General terminology and scope Pharmacology: Clinical pharmacy, Clinical Pharmacology, Pharmacokinetics, Pharmacodynamics, Pharmacoepidemiology, Pharmacoeconomics, Pharmacogenomics, Therapeutics, Toxicology, Chemotherapy, Pharmacopoiea, Drug, Nature and source of drugs, Nature and sources of drugs, Drug nomenclature, Routes of drug administration.	25
II.	Pharmacokinetics: Biological membrane, mechanism of drug transportation, Absorption, Factors affecting absorption, Distribution, volume of distribution, Redistribution, Penetration into brain, passage across placenta, plasma protein binding, tissue storage, Metabolism/biotransformation, Phase-I and Phase-II reactions, microsomal enzymes and their induction, Excretion, mechanism of renal excretion, enterohepatic circulation. Area under curve (for single dose and repeated dose), Bioavailability and bioequivalence, Plasma half-life and Clearance, Loading dose and maintenance dose, Therapeutic drug monitoring (TDM) and its significance.	25
III.	Pharmacodynamics: Principle of drug action, Target of drug action– receptors, ion channels, enzymes, transport proteins, Introduction to various types of receptor- ligand gated ion channel, G-protein coupled receptor, kinase linked receptor, nuclear receptor, Introduction to various types of ion channels- open channels and gated channels, Dose response relationship, Agonist and antagonist, Combined effects of drugs (potentiation, addition, synergism and antagonism), Drug antagonism.	25
IV.	Clinical Pharmncology and adverse drug effects Drug dosage, Fixed dose ratio combination preparations, Factors Modifying Drug Action, Placebo, Tolerance, Cross Tolerance, Rational use of Medicines, Expiry date of Pharmaceuticals, Evidence Based Medicine, Meta-Analysis. Adverse Drug Effects: Introduction, Predictable (Type A Or Augmented) Reaction, Unpredictable (Type B Or Bizarre) Reactions, Pharmaco vigilance, Prevention of Adverse Effects of Drugs, Adverse Drug Effects Categorization.	25

Basic Text & Reference Books:

1. K.D. Tripathi.; *Essentials of Medical Pharmacology*.
2. Roger Walker and Cate Whittlesea; *Clinical pharmacy and therapeutics*.
3. Satoskar, R.S. and Bhadarkar, S. D.; *Pharmacology and pharmacotherapeutics*.
4. Rang, H.P. & Dale, M.M.; *Pharmacology*.
5. Goodman Gilman, A., Rall, T.W., Nies, A.I.S. and Taylor, P.; *The pharmacological Basis of therapeutics*.
6. Katzung, B.G. *Basic and Clinical Pharmacology*. Latest edition.

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Paper Code:PS03EPCH22	**Total Credits:4**
Title Of Paper: Mechanical Operations	

Unit	Description in detail	Weightage (%)
I. 1	Size Reductions & Separation: Size reductions. Type of Crushers, Grinder and Disintegrators for coarse, intermediate and fine grinding, Power requirements, close and open circuit grindings, Laws of Crushing. Introduction to size enlargement and agglomeration. Size separation: Particle size analysis, Screening, Industrial screening, Equipements, Elutriation. Settling, Classification, Floatation, Electrostaticand Magneticseparation, Centrifugal separation.	25
II. 2	Mixing, Agitation and Conveying: Mixing and Agitation: Fundamentals of Mixing, Characteristics of Mixing equipments, Power consumption and equipments. Conveying: Introduction, Type, Mechanical and pneumatic conveying, elevators, storage of solids.	25
III. 3	Settling and Fluidization: Settlingand sedimentation: Freeand hindered settling, Type of thickness –Batch and Continuous, Settling Chambers, Cyclones and their design, ducts and fumes, flow of solids through fluids, settling velocities, stoke's law, terminal velocity Fluidization: Aggregateand particulate fluidization, incipient fluidization velocity,expansion of fluidized beds.	25
IV. 4	Drying and Evaporation: Drying: Introduction, Objective of Drying, Definitions, Equilibrium moisture content, Type of Moisture, Mechanism of drying, rate of drying, drying curves, Driers, Type of driers, Tray drier, Truck drier, Tunnel drier, Rotary drier, Spray drier, Freeze drier, Radiation drying– Microwave drier, driers for solutions and suspensions – drum drier. Evaporation:Introduction, General principles ofEvaporation, factors effecting evaporation -time, temperature, moisture, typeofproduct and concentration. Evaporators, Typeof Evaporators – Pan Evaporators, Evaporating stills, short tube evaporators, forced circulation evaporators, film evaporators, longtube/ climbingfilm evaporators, fallingfilm evaporator,wiped film evaporators, multiple effect evaporator, evaporation underreduced pressure.	25

BasicText& ReferenceBooks:

1. W. L. McCabeand J. C.Smith;*UnitOperations in Chemical Engineering*, 3rdedition, McGraw Hill and Kogakusha (1976)
2. K. Sambamurthy, *Pharmaceutical Engineering*,NewAgeInternational.

3. S. J. Carter;*Cooperand Gunn's Tutorial Pharmacy*, Kothari Book Depot.
4. J. M. Caoulsonand J. F. Richardson.*Chemical Engineering, Vol – I and II, 2nd Edition,*Asian Books Pvt.Ltd.
5. *Perryand ChiltonChemical Engineer's Handbook,* McGraw Hill.