M.Sc. **Prospectus No. 20111242**
Sem.I to IV (Pharm. Chem.)

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

PROSPECTUS

OF

M.Sc.PART-I (SEMESTER-I & II)

EXAMINATIONS 2010-2011

&

M.Sc. PART-II (SEMESTER-III & IV)

EXAMINATIONS 2011-2012

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/ provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.
Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.

Ordinance No. 6/2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba
Amravati University.

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM.

The pattern of question paper as per unit system will be broadly based on the following pattern

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60

(5) Each short answer type question shall contain 4 to 8 short sub question with no internal choice.

Syllabus Prescribed for M.Sc. Pharmaceutical Chemistry

Semester I

1SA-1 : Inorganic Chemistry

Unit I (A) Symmetry: Molecular symmetry, representation of symmetry operations as matrices, set of symmetry operations of molecules satisfying the conditions of point groups, multiplication tables.

(B) Transition Metal Chemistry: magnetic moments, magnetic properties of transition metal complexes. Interior magnetic coupling. Spin state crossovers. Comparison of first transition series with 2^{nd} and 3^{rd} transition series.

Unit II (A) Valence Bond Theory: Concepts of VB theory. Hybridization (sp, sp2, dsp2, sp3, sp3d, dsp3, sp3d2, d2sp3). Application of V.B theory to simple inorganic molecules and transition metal complexes. Inner and outer orbital complexes.

(B) Molecular orbital theory: A brief introduction to ICAD method. Resonance integral, energy level diagrams for O_2, F_2, CO, CO_2, PH_3, BF_3, NO, NO_2, NO_3 and H_2O, Molecular orbital description of tetrahedral and octahedral complexes of transition metals.

Unit III Crystal Field Theory: Splitting of energies of orbital under octahedral, tetrahedral and square planar environment, magnetic properties of complexes in terms of CFT. Crystal field stabilization energy and heats of ligation, Lattice energy, Terms and Symbols, Selection rules, Hole formulation, electronic spectra of co-ordination complexes. (Orgel diagrams of d1-d9 tetrahedral and Octahedral Complexes. Limitation of CFT. Stability of co-ordination complexes and factors effecting the stability. Nephelauxetic effect, ligand field theory.

Calculation of B and 10Dq from spectral data.

Unit IV Introduction to ligands complexes and their reactivity: Thermodynamics stability in aqueous medium, general classification of ligands, Ligand substitution or exchange reaction to 4-coordinate square planner Complexes and 6-coordinate octahedral complexes. Redox or electron transfer Reactions. Outer and inner sphere mechanisms for multielectron redox reaction and ligand field considerations. Photochemical reaction of chromium and Ruthenium complexes. Fluoxional molecules iso- and heteropolyacids, metal clusters. Spin crossover in coordination compounds.

Unit V (A) Industrial application of organometallics: General considerations, Homogenous catalysis by organometallics (Alkene Hydrogenation, Hydroformylation, pi-acid metal complexes, activation of small molecuels by coordination

(B) Bioinorganic Chemistry: Metal ions in Biology, Molecular mechanism of ion transport across membranes; ionophores. Photosynthesis, PSL, PSH; nitrogen fixation, oxygen uptake proteins, cytochromes and ferrodoxins. Iron-sulphur proteins.

Books Recommended :

1 R.S. Drago, Physical Methods in inorganic Chemistry, Affiliated East-West Press (Section 1& 2).

2. H.B. Gray, Electrons and Chemical Bonding. (Section 2).

3. F.A. Cotton and G.W. Wilkinsonn, Advanced Inorganic Chemistry. John Wiley and Sons.

4. J.E. Huheay, Inorganic Chemistry, Principles of Structure and Reactivity, harper International, SI edition.

5. G. Wilkinson (ed.) Comprehensive coordination chemistry vol. 3 chapter 23, Pergamon.

6. N.N. Greenwood and A.Earnshaw Chemistry of elements,Pergamon Press(Section 7).

7. Christopher master, Homogenous Transition metal catalysis (Section 8).

8. A.B.P. Lever : Inorganic Electronic Spectroscopy.

9. B.N. Figgis : Introduction to Ligand Fields.

1SA2 : Organic Chemistry

Unit I Nature and Bonding in Organic molecules: Delocalized chemical bonding, conjugation, cross-conjugation, resonance, hyper-conjugation, bonding in fullerenes. Aromaticity in benzenoid and non-benzenoid compounds, alternant and non-alternat hydrocarbons Huckel's rule,energy level of pi-molecules orbitals, annulenes, anti-aromaticity, homo-aromoaticity. Aromatic character and chemistry of cyclopentadiene anion, tropyllium cation,tropene and tropelene.

Unit II Stereochemistry: Conformational analysis of cycloalkanes (5 – 8 membered rings), decalines, effect of conformation on reactivity, steric strain due to unavoidable crowding.

Elements of symmetry, chirality, molecules with more than one chiral center, threo and erythro isomers, method of resolution, optical purity, enantiotopic and distereotopic atoms, groups and faces, stereospecific and steroselective synthesis.

Asymmetrical synthesis, optical activity in absence of chiral carbon (biphenyl, allenes and spiranes). Stereochemistry of the compounds containing N, P and Sulphur.

Unit III Selective organic name reaction: Aldol, Perkin, Stobbe, Dieckmann condensations; Hoffmann, Schmidt, Lossen, Curtius, Baeyer- Villiger reaction, Pinnacol reaarngement, Beckmann reaarngement the reaction and their mechanisms.

Unit IV Chemistry of Heterocyclic compounds: Nomenclature of heterocyclic compounds. Heterocyclic ring system with one heteroatom: structure, synthesis and reactions of pyrrole, furan, thiophene, â-lactam and pyridine.

Heterocyclic ring system with two heteroatom: structure, synthesis and reactions of imidazole, oxazole,thiazole, pyrazole, pyrmidine and pyrazine.

Unit V (A) Nucleophilic aliphatic substitution:

SN^1 and SN^2 reactions mechanisms, kinetics, structure and reactivity, stereochemistry, SN^1 vs SN^2 –role of solvents

(B) Electrophilic aromatic substitution: reactions mechanisms, proof for the mechanism, sulphonation, reversible reaction, theory of reactivity, theory orientation and synthesis, halogenations and Friedal-Craft reaction.

1SA-3 : Physical Chemistry

Unit I Chemical statistical thermodynamic I

Brief review of laws of thermodynamics, Concepts of free energy, entropy, fugacity and activity. Partial molar properties and their determination. Thermodynamics of ideal and non ideal mixtures, dilute solutions, excess functions. Activity coefficients of electrolytes, mean ionic activity coefficient, Debye Huckle treatment of dilute electrolyte solutions.

Unit II Chemical statistical thermodynamic II

Probability, ensembles, distribution law, Partition functions: translational, rotational, vibrational and electronic partition functions, Maxwell-Boltzmann, Bose-Einstein and Fermi Dirac Statistics, calculation of thermodynamic functions and equilibrium constants from partition functions, theories of specific heat for solids, Numerical Problems.

Unit III Phase rule

Recapitulation of thermodynamic derivation of Phase rule, Two component systems, determination of solid liquid

equilibria, Classification of two component systems with one example each. Three Component systems, method of graphical representation. Partially miscible, three-liquid systems with examples. (i) One

Partially miscible pair, (ii) Two Partially miscible pairs (iii) Three partially miscible pairs. Effect of temperature. Rochelle's salt (explanation). Systems composed of two salts and water and their application in crystallization of pure components.

Unit IV Chemical Kinetics

Recapitulation of first, second and third order rate laws opposing reactions, parallel reactions, consecutive reactions. Photochemical reactions, quauntum yield, transfer of excitation energy, actinometry, chain reactions, and oscillator reactions.

Theories of reaction rates : Molecular collision theory, Unimolecular Theory, Transition state Theory, Comparison of results with Eyring and Arrhenius equations. Reactions in solutions: Kinetics in solution, salt effects, influence of the solvent. Fast reactions - Rate constants of fast reactions. Relaxation methods, temperature-jump method. Stopped-flow technique, flash photolysis and magnetic reasonance method. (Numerical Problems).

Unit V Surface Chemistry and Catalysis:

Pressure difference across a curved phase boundary. Enhanced vapour pressure of small droplets (Kelvin Equation). Gibbs adsorption equation. Homogenous catalysis, Acid-base catalysis as well as general acid-base catalysis, Surface catalysis, Salient features of Langmuir, Freundlich, Slygin-Frumkin (Temkin). B.E.T. (its derivation), Harkins-Jura equations of sorption. Mechanism of surface reactions.

1SA-4 : Genaral Analytical Chemistry

Unit-I: Concepts involved in Analysis

Role of analytical chemistry, classification of analytical methods-classical and instrumental, types of instrumental analysis, selecting analysis method, neatness and cleanliness, laboratory operations and practices, good laboratory practices, techniques of weighing, errors, volumetric glassware-cleaning and calibration of glassware, sample preparation – dissolution and decompositions, selecting and handling reagents, laboratory notebooks,

safety in the analytical laboratory, calibration and detection limits, proficiency testing.

Unit-II: Titrimetric and Gravimetric Methods of Analysis

General principles: Solvents in analytical chemistry, acid-base equilibria, concentration systems, stoichiometic calculation, acid-base titration, titration curves, acid base indicators, applications of acid-base titration, complexometric titration, metal-ion indicators, precipitation titration, Mohr's titration, Volhard's titration, adsorption indicators, Fajan's titration, titration curves in oxidation-reduction titration, redox indicators, applications of redox titrations.

Unit-III : Separation Techniques -I

(A) Solvent Extraction: Fundamental treatment, theoretical principle, classification, and factors favouring extraction, extraction equillibria, applications.

(B) Solid phase extraction and solid phase micro extraction, applications.

(C) Ion- Exchange: Theories, use of synthetic ion exchange in separation, chelating ion exchange resins, liquid ion exchangers, experimental technique.

Unit-IV: Separation Techniques -II

An introduction to chromatographic methods, paper, thin layer and column chromatography, theory of chromatography, classification of chromatographic techniques, retention time, relationship between retention time and partition coefficient, the rate of solute migration, differential migration rates, band broadening & column efficiency, kinetic variables affecting band broadening, Electrophoresis and capillary electrophoresis.

Unit-V: GC and HPLC

Instrumentation of GC and HPLC, applications in qualitative and quantitative analysis, comparison of GC and HPLC, Ion chromatography, pyrolytic gas chromatography, size exclusion chromatography, super critical fluid chromatography, affinity chromatography.

Books Recommended

1. D.A. Skoog, F.J. Holler and T.A. Nieman, Principles of Instrumental Methods, 5th ed.,,Thomson Asia Pvt. Ltd., Singapore (2003).
2. R.A. Day and A.L. Underwood, Quantitative Analysis, 6th ed., Prentice Hall of India Pvt. Ltd (1993).
3 G.D. Christian, Analytical Chemistry, 6th ed, John Wiley & Sons (2001).

4. S.M. Khopker, Environmental Pollution Analysis, 2nd ed., New Age International Pvt. Ltd.(2002).
5 A.I. Vogel, Textbook of Quantitative Chemical Analysis, 5th ed., Addison Wesley Longman Singapore (1999) [1]
6 G. W. Eving, Instrumental Methods of Chemical Analysis, 5th ed.,Mc-Graw Hill Book Company (1985)
7. Willard, Merritt, Dean, and Settle, Instrumental Methods of Analysis, 7th ed., C B S Publishers &Distributors (1986).

Semester I

LabI

1SA-5 : Organic Chemistry Practical

Marks: 50

Some of the following experiments to be taught

Unit I: - Basic Techniques

a) Calibration of thermometer and finding melting point, mixed melting point and boiling point.
b) Purification and drying of organic solvents.
c) Crystallization
d) Distillation, Fractional distillation, Distillation under reduced pressure.

Unit II: - Qualitative Analysis

Separation and identification of components of a mixture of two organic compounds (two solids, one solid and one liquid and all two liquids) using chemical methods or physical techniques. Purification of the compounds by crystallization. Chromatographic techniques (Minimun of 10 mixtures to be done).

Unit III: - Quantitative Analysis

Student is expected to carry out following estimations

1) Estimation of Vitamin "C" Iodometry.
2) Estimation of Glucose by Benedict's solution.
3) Estimation of Phenol by $KBrO_3$-KBr.
4) Estimation of Formaldehyde by Iodometry.
5) Estimation of Aldehyde by Oxidation method.
6) Estimation of Glucose in blood.
7) Estimation of Proteins in serum.
8) Fat determination in milk.
9) Determination of blood cholesterol.
10) Determination of acid and alkaline phosphatase.
11) Estimation of uric acid in serum and urine.
12) Estimation of chloride in serum and urine.

13) Estimation of liver glycogen.
14) Estimation of free fatty acids in serum.
15) Determination of creatinine and creatin in blood and urine.

Practical I

Organic Chemistry Practical

Time: 6-8 Hrs. (One day examination) Marks: 50

1)	Exercise-1: Basic Techniques	- 05 Marks
2)	Exercise-2: Qualitative Analysis	- 15 marks
3)	Exercise-3: Quantitative Analysis	- 10 marks
4)	Record	- 05 Marks
5)	Viva-voce	- 05 Marks
7)	Internal Assessment	- 10 Marks

Total Marks = 50 Marks

Semester I

1SA-6 : Laboratory II

Physical Chemistry Practical

Total Hours: 90 Hrs. (9 Hrs. /week)

Time: 6-8 Hrs. Marks: 50

Use of computer programs 5 terms of practicals

Treatment of experimental data, X-Y plots, programs with data preferably from Physical Chemistry practicals. Student will operate two packages I) MS-Word and II) MS-Excel.

Part-A

1) To study the surface tension concentration relationship for the solution and determination of surface excess concentration by using Gibb's Adsorption equation.
2) To compare the cleansing power of two samples of detergents by surface tension method.
3) Distribution of solute between two immiscible solvents.
4) Kinetics of hydrolysis of an ester and comparison of relative strength of two acids.
5) To determine the rate constant of a reaction between ethyl acetate and caustic soda solution at two different temperatures and energy of activation.
6) Study the effect of catalyst on the decomposition of hydrogen peroxide.
7) Study the phase diagram of Naphthalene and Benzoic acid.
8) To study the effect of concentration of an electrolyte (KCl, NaCl) on the solubility of organic acid.

9) To find out molecular weight of given liquid by steam distillation method.
10) To study the effect of temperature on adsorption.
11) To determine the viscosity of different mixture (benzene-nitrobenzene) and also test the validity of Kendall's method.
12) To find out the degree of association of benzoic acid in benzene.

Part- B

1) Standardization of acid with a standard solution of base using pH meter.
2) Determine the pK values of amino acids by pH metry.
3) Titration of strong acid Vs strong base, weak acid Vs strong base, weak acid Vs weak base by conductometry.
4) Titration of mixture of strong acid and weak acid with a strong base by conductivity.
5) Determination of dissociation constant of acetic acid by conductometry.
6) Verify the Lambert-Beer law and determine the molar extinction coefficient: Copper sulphate pentahydrate or Potassium dichromate.
7) Measurement of optical rotation and study the mutarotation of glucose.
8) Titration of HCl with NaOH using potentiometer.
9) Determination of solubility and solubility product of sparingly soluble salt ($PbSO_4$, $BaSO_4$) conductometrically.
10) Determination of standard electrode potential of zinc and copper.
11) To determine the dipole moment of given liquid.
12) Determination the pK value of acid-base indicator (methyl red) by spectrophotometrically.

Practical II

Physical Chemistry Practical

Time: 6-8 Hrs. (One day examination) Marks: 50

1)	Exercise-1 (Non-instrumental)	- 15 Marks
2)	Exercise-2 (Instrumental)	- 15 marks
3)	Record	- 05 Marks
4)	Viva-voce	- 05 Marks
5)	Internal Assessment	- 10 Marks

Total Marks = 50 Marks

Semester II

2SA-1 : Biochemistry

Unit I — Bimolecules, Amino Acids and Proteins:

Broad classification and role of bimolecules. Structural and functional classification of proteins. Structure, Physicochemical properties, configuration and optional properties of amino acids. Colour reactions of Proteins and Amino acids, Purification of proteins and Amino acid sequence determination, Peptide bond. Ramachandran Plot. Primary, Secondary Teritiary and quaternary structure of Proteins. Three dimensional structure of proteins, Structure and functioning of Hemoglobin.

Unit II — Enzymes and Coenzymes: Classification, Mechanism of enzymatic reactions, kinetics of enzymatic reactions, Michaelis Menton model, Measurement of significance of Km and Vmax perfect enzymes. Inhibition of enzymetic reactions. Kinetics of competitive and non-competitive Inhibition. Allosteric enzymes Mechanism of enzymatic catalysis by Lysozyme and carboxypeptidasc. Zymogens.

Classification, Structure and Function of Nicotinamide adenine dinucleotides (NAD and NADP), Riboflavin Nuleotides (FMN and FAD), Lipoic acid, Cytocromes, Pyridoxal phosphate, Nucleoside diphosphates. Tetrahydrofolic acid conjugates, Biotinyl conenzyme. Conenzyme - A, and Thiamine pyrophosphate.

Unit III — Biotechnological Application of Enzymes : Large scale production and purification of enzymes, techniques and method of immobilization of enzymes, effect of immobilization on enzyme activity, Application of immobilized enzymes use of enzymes as targets for drug design. Clinical uses of enzymes, enzyme therapy, enzymes and recombinant DNA technology. 9

Unit IV — Carbohydrates and Metabolism : Configuration and chemical Transformation of Carbohydrates. Absolute configuration of carbohydrates. General concepts, energetics and control on metabolic pathways. Glycolysis and Citric acid cycle. 7 Genetic Code, nucleic acids as carrier of genetic information. Structure of DNA Replication of DNA. Protein biosynthesis. 7

Unit V — Membranes and Membrane Transport : Membrane structure, phospho and glycolipids, membrane proteins, Sodium potassium pump, Calcium and Sugar transport, Inophorous antibiotics. 7

Books Recommended :

1. Biochemistry by L. Stryer, GBS Publishers and Distributors, Second Edition, 1972.
Chapters: 2, 3, 4, 6, 7, 8,11, 12, 13, 24, 25, 26, 27, 33 and 36.

2. Biochemistry by D. Voet and J.G. Voet, John Wiley & Sons, Ist Edition 1995.
Chapter: 1, 2, 3, 4, 5, 6, 7, 9, 12, 13, 14, 15, 16, 18, 19, 27, 28, 29, 30 and 34.

2SA-2 : Organic synthesis

Unit I — Design of Synthesis : Annelation reaction. Functional group interconversions. Donor acceptor disconnection in the carbon-carbon single bond formation. Retero-analysis. Transforms and retrons, selecting transform. Strategies for reterosynthetic analysis.

Unit II — Reagents in Organic Synthesis : Use of following reagents in Organic Synthesis and functional group transformations: Complex metal hydrides, Gilman's reagent, Lithium diisopropyl-amide (LDA), dicyclohexylcarbodiimide, Umpoloung of reactivity (dipole inversions), trimethylsilyl iodide, tri-n-butyltin hydride, Woodward and Prevost hydroxylation, Osmium tetraoxide, selenium dioxide, phase transfer catalysis, Crown ethers, Merifield resin, Peterson's synthesis Wilkinson's catalyst; Bakers Yeast.

Unit III — Oxidation and Reduction in Organic Synthesis : Oxidation of alcohols to carbonyl. Phenols to quinones, conversion of alkene to epoxides and diols, Oxidative bond cleavages, Oxidation of sulfur, selenium & nitrogen. Reduction with metal hydrides, Alkoxyaluminates, alkoxy – and alkyl-Borohydrides, Stereoselectivity in hydride reduction. Catalytic hydrogenation and dissolving metal reductions.

Unit IV — Formation of carbon-carbon single bonds : Ketone enolates, O Vs C alkylation, Enamine and related reactions, Thio and seleno carbanions, Aldol condensation, Allylic alkylations of alkenes. Coupling reactions of Organo copper, Organopalladium and Organonickel complexes, Synthetic applications of carbenes and canbenoids.

Unit V (A) — Application of cycloadditions in organic synthesis : Selection rules for cycloaddition [(2+2), (3+2), (4+2), (6+4)]. The Dienes, Heterdienes, Dienophiles and 1,3-Dipoles. Lewis Acid Catlysis, Modern methods to affect cycloadditions (use of high pressure, aqueous medium, ultrasound etc.).

(B) Asymmetric synthesis: Cram's rule and its variations, Chiral auxillaries, Chiral Lewis acid catalysis. Asymmetric Reductions. Chiral reagents (Grignards reagent, Organocuprates, organo irons).

Paper VII

2SA-3 : Biophysical Chemistry

Unit I Water and Biophysical Interactions: Structure and Interactions, Water as a solvent, proton mobility. Intermolecular interactions effecting conformation of biomolecules; non-covalent interactions e.g., ionic bonds, dipole-dipole interactions, hydrophobic interactions, hydrogen bonds, dispersion forces etc.

Unit II Bioenergetics and Statistical Mechanics in Biopolymers: Standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP. Chain configuration of macromolecules, statistical distribution end to end dimensions, calculation of average dimensions for various chain structures. Polypeptides and proteins structures, Introduction to protein folding problem.

Unit III Thermodynamics of Biopolymer Solutions: Thermodynamics of biopolymer solutions, osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system.

Unit IV Cell Membrane and Transport of Ions: Structure and functions of cell membrane, ion transport through cell membrane, inversible thermodynamic treatment of membrane transport. Nerve conduction.

Unit V Experimental Techniques for the Determination of Size, Shape and Molecular Mass of Biopolymers:

i) Viscosity: Measurement, relation to geometry and correlation with hydrodynamic properties.

ii) Diffusion: Fick's law of diffusion, diffusion coefficient and its interpretation, frictional coefficient.

iii) Ultra centrifugation: Svedberg equation, sedmentation equilibrium, density gradient sedimentation.

v) Osmotic Pressure: Second virial coefficient, molecular mass and geometry from O.P. data, Donnan membrane effect, Drug absorption.

2SA-4 : General Pharamacology

Unit I Introduction of Human Physiology in relation to drug action, Sources and nature of drugs, routes of administration, factors influencing doses and drug actions.

Unit II Pharmacodynamics : Mechanism of drug action and sites of drug action including membrane and receptor concepts.

Unit III Central nervous system : General anaesthetics, methods of giving anaesthesia, stages of anaesthesia, narcotic analgesics, sedatives & hypnotics, barbiturate poisoning and treatment.

Unit IV Autonomic Nervous System : Cholinergic drugs, adrenergic drugs, Drugs usedin myasthenia gravis. Gastrointestinal Tract : Antacids, laxatives and antidiarroeals.

Cardiovascular : Anti-anginals and antihypertensive drugs.

Unit V Respiratory system : Anti-asthmatic agents, expectorants and antitussive agents.

Kidneys : Diuretics and antidiuretics. Blood : Haematinics, coagulants and anti-coagulants Chemotherapy : Sulphonamides (General Pharmacology, mechanism of action) and penicillins, B-lactum antibiotics.

Semester II

2SA-5 Laboratory III

Inorganic Chemistry Practical

Exercise I: - Classical

A) Neutralization titration: - Determination of acidity, Determination of free carbondioxide, Determination of alkanility.

B) Complexometric titration: - Determination of temporary and permanent hardness. Determination of total calcium and magnesium hardness.

C) Precipatation titration: - Determination of chloride.

D) Redox titration: - Deternination of ferrous ions. Determination of copper.

Exercise II: - Synthesis

Preparation of inorganic compounds and their characterization by elemental analysis, M.W. determination, decomposition temperature and molar conductance studies (minimum 4)

1) $[Vo(acac)_2]$

2) Cis $K[Cr(C_2O_4)_2(H_2O)_2]$

3) $Na[Cr(NH_3)_2(SCN)_4]$

4) $Mn(acac)_2$

5) $K_3[Fe(C_2O_4)_3]$
6) $Hg[Co(SCN)_4]$
7) $K_3[Al(C_2O_4)_3](H_2O)_3$
8) $Ni(DMG)_2$

Exercise III: - Estimation

A) Quantitative Analysis of mixture of two cations.
Quantitative analysis of binary mixture of cations involving their chemical separation and separate analysis of one cation by gravemetric and volumetric or colorimetric. Certain model examples are given as follow-
1) Copper (II) and Nickel (II)
2) Copper (II) and Zinc (II)
3) Nickel (II) and Zinc (II)
4) Copper (II) and Iron (II)

B) Analysis of Limestone, Dolomite and Bauxite.

Laboratory III

Inorganic Chemistry Practical

Time: 6-8 Hrs. (One day examination) Marks: 50

1) Exercise-1: Classical	- 10 Marks
2) Exercise-2: Synthesis	- 10 marks
3) Exercise-3: Estimation	- 10 marks
4) Record	- 05 Marks
5) Viva-voce	- 05 Marks
7) Internal Assessment	- 10 Marks

Total Marks = 50 Marks

Semester II

2SA-6 : Laboratory IV

Inorganic and AnalyticalChemistry Practical

Practical worked 9 Hrs. per week Marks: 50

Quantitative Inorganic Analysis

1) Detection and determination of Ascorbic acid from biological sample.
2) Determination of Phosphates from plant samples by spectrophotometer.
3) Determination of Iron from pharmaceutical sample. Determination by complexometry.
4) Determination of Calcium from given drug sample by complexometry.

5) Determination of iron, calcium and phosphorus from milk powder.
6) Simultaneous Spectrometric determination of
   i) Chromium and Manganese
   ii) Titanium and Vanadium
   iii) Cobalt and Chromium
7) Analysis of stainless steel (Cr/Ni).
8) To determine the stability constant and stoichiometry of Ferric-thiocyanate complex by spectrophotometrically.
9) To study the stoichiometry and stability of Fe^{3+} salicylate complex by Job's and Mole ratio method spectrophotometrically.
10) Estimate the amount of copper (II) with EDTA photometric titration.
11) Determination of capacity of anion and cation exchange resin by column method.
12) To estimate the amount of magnesium and zinc in the given sample solution by ion exchange chromatography method.
13) Separation and estimation of Fe^{2+}, Co^{2+} and Ni^{2+} by anion exchanger.
14) Separation and estimation of Halide by anion exchanger.
15) Separation and estimation of-
   i) Cobalt and Nickel
   ii) Calcium and Zinc
   iii) Zinc and Magnesium by anion exchanger.
16) Separation and estimation of Fe^{3+} and Mg^{2+} by solvent extraction.
17) Solvent extraction by binary mixtures i.e. Al/Mg/Uo_2, Cu/Ni, Cu/Co etc. and quantitative determination by spectrophotometer.
18) Nickel/Molybdenum/Tungsten/Vanadium/Uranium etc. by extractive spectrometric method.
19) Separation and identification and quantitative determination of metal ions by paper chromatography.
20) Separation and identification of sugars/honey/halides by paper chromatography and determination of R_f Values.
21) Thin Layer Chromatographic separation.
   Identification and determination of R_f Values-
   a) Metal ions (Mn, Co, Ni, Cu, Zn, Cd, Pb, alkali metals etc.)
   b) Amino acids/ Organic compounds.
   c) Sulpha drugs in tablets and ointments.
22) Estimation of zinc/metals by flurimetrically.
23) Nephelometric determination of sulphate, phosphate and silver.
24) Potentiometric determination of the percentage of sodium carbonate in commercial washing soda.
25) Water Analysis:

i) Determination of hardness, alkanility, salinity, halides, fluride, nitrite, phosphate and sulphate

ii) Determination of DO, COD and BOD.

iii) Determination of toxic metals viz. As, Cd, Pb, Hg and Ni in water and waste water by suitable method.

26) Preparation of standard buffers and measurements of pH.

27) Determination of glucose by glucometer.

Laboratory IV

Inorganic and Analytical Chemistry Practical

The Principal examination will be based on Inorganic Chemistry

Time: 6-8 Hrs. (One day examination) Marks: 50

1)	Exercise-1 (Based on Instrumental)	- 15 Marks
2)	Exercise-2 (Based on Separation method)	- 15 marks
3)	Record	- 05 Marks
4)	Viva-voce	- 05 Marks
5)	Internal Assessment	- 10 Marks

Total Marks = 50 Marks

Semester III

3SA-1 : Modern Pharmaceutical Analytical Technique I

Unit I UV-VISIBLE SPECTROSCOPY :

Brief review of electromagnetic spectrum and absorption of radiations. The chromophore concept, absorption law and limitations. Theory of electronic spectroscopy, absorption by organic molecules, choice of solvent and solvent effects, modern instrumentation – design and working principle. Applications of UV-Visible spectroscopy (qualitative and quantitative analysis), Woodward –

Fischer rules for calculating absorption maximum, Photometric titrations and its applications.

Unit II (A) Flame emission spectroscopy and atomic absorption spectroscopy :

Principle, instrumentation, interferences and applications in Pharmacy.

(B) SPECTROFLUORIMETRY :

Theory, instrumentation, advantages, relationship of chemical structure to fluorescence spectra, solvent effect, effect of acids and bases on fluorescence spectra, concentration effects, factors affecting fluorescence

intensity, comparison of fluorescence and UV-Visible absorption methods and applications in Pharmacy.

Unit III : INFRARED SPECTROPHOTOMETRY :

Introduction, basic principles, vibrational frequency and factors influencing vibrational frequency, instrumentation and sampling techniques, interpretation of spectra, applications in Pharmacy. FT-IR-theory and applications, Attenuated Total Reflectance (ATR).

Unit IV : NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY :

Fundamental Principles and Theory, Instrumentation, solvents, chemical shift, and factors affecting chemical shift, spin-spin coupling, coupling constant, and factors influencing the value of coupling constant, spin-spin decoupling, proton exchange reactions, FT-NMR, 2D - NMR, NMDR, NOE, NOESY, COSY and applications in Pharmacy, interpretation of spectra, C13 NMR-Introduction, Natural abundance, C13 NMR Spectra and its structural applications.

Unit V : MASS SPECTROSCOPY :

Basic principles and instrumentation, ion formation and types, fragmentation processes and fragmentation pattern, Chemical ionization mass spectroscopy (CIMS), Field Ionization Mass Spectrometry (FIMS), Fast Atom Bombardment MS (FAB MS), Matrix Assisted laser desorption / ionization MS (MALDI-MS), GC-MS, interpretation of spectra and applications in Pharmacy.

3SA-2 : Medicinal Chemistry I

Unit I Introduction to Pharmaceuticals, Historical Development, Classification of Drugs, Nomenclature of Pharmaceuticals, Drug metabolism reactions. 2. Structure, stereochemistry, nomenclature, mode of action, specific clinical applications and structure activity relationships of following classes of drugs and synthesis / commercial routes to specified drugs.

Unit II : QUANTITATIVE ANALYSIS OF STRUCTURE ACTIVITY RELATIONSHIP

a) History and development of QSAR.

b) Drug receptor interactions.

c) Physicochemical parameters.

d) Hansch analysis, Fee Wilson analysis, relationship between them.

e) Statistical methods – regression analysis, partial

least square analysis (PLS) and other multivariate statistical methods.

f) 3D QSAR approaches.

Unit II A) MOLECULAR MODELING IN DRUG DESIGN

Molecular mechanics, quantum mechanisms, known receptor sites, calculation of affinity, unknown receptors – pharmacophore models. Searching for similarity, molecular comparison, finding common pattern.

B) ANALOG DESIGN FROM LEAD MOLECULE.

Introduction, Bioisosteric replacement, rigid analogs, alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance.

Unit IV PRODRUG DESIGN.

Introduction, chemical bond, gastro intestinal absorption, parenteral administration, distribution, transdermal absorption, pharmacokinetic and biopharmaceutical aspects, rationale of prodrug design and practical considerations.

Unit V Medicinal Chemistry of following group of drugs

a) Antiviral agents and agents under development of HIV infection.
b) Antineoplastic agents.
c) Antihypertensive agents.
d) Prostaglandins, leukotrienes and other eicosanoids.

3SA-3 : Advanced Organic Chemistry I

Unit I Techniques in drug development and synthesis will be dealt at advanced level. These include a deep knowledge of the following topics: 8 Hours

a) Chemical bonding (localized, delocalized and Bonding weaker than covalent)
b) Reaction intermediates (carbocations, carbanions, free radicals, carbenes and nitrenes)
c) Various types of mechanisms and methods of determining them.
d) Acids and Bases.
e) Effect of structure on Reactivity.

Unit II Detailed knowledge to be imparted in the following topics:

a) Substitution reactions (aliphatic neucleophilic, aromatic electrophilic, aliphatic electrophilic, aromatic nucleophilic and free radical).

b) Addition reactions (both carbon-carbon and carbon-heteroatom multiple bonds).
c) Elimination reactions and Rearrangement reactions.
d) Oxidation – reduction reactions and the reagents used for such reactions.
e) Protection and deprotection of various groups.

Unit III.a) Chirality and the importance of chiral drugs.

b) Techniques for preparing chiral drugs (chirality pool, enzymatic transformation and asmmetric synthesis).
c) Symphoria : Introduction, neighbouring group effects with reference to stereo chemistry, intra molecular neucleophilic attack, rate of reaction anchimeric assistance.

Unit IV Synthetic methodologies for obtaining drugs:

a) Disconnection approach.
b) Synthones for carbon-carbon bond formation.
c) Difunctional compounds.
d) Selective functional group interconversions (FGI).
e) Retrosynthetic analysis.

Unit V A study of the following reactions of synthetic importance:

a) Birch reduction.
b) Mannich reaction.
c) Meerwin-Pondroff's reduction.
d) Oppeneaur oxidation.
e) Beckmann rearrangement.
f) Grignard reaction.
g) Hoffman rearrangement.
h) Ozonolysis.
i) Reformatsky reaction.
j) Michael reaction.

3SA-4 : Natural Products of Medicinal Interest

Unit I Alkaloids- General introduction and classification, isolation and purification methods, general methods employed for determining the structure of alkaloids, constitution of morphine, reserpine and quinine.

Unit II Steroids- General introduction, stereochemistry, nomenclature and structure elucidation of sterols (cholesterol), sapogenin (diosgenin) and cardiac glycosides.

Unit III A) Flavonoids - Detailed chemical account of rutin and quercetin. 8 Hours.

B) Triterpenoids – A general chemical treatment and structural elucidation of terpenoids.

Unit IV A) β - LACTUM ANTIBIOTICS.

Mechanism of action, penicillins, cephalosporins, nocardicins and monobactums, carbapenems and penems, â-lactamase inhibitors and otherâ-lactum agents.

B) NON β - LACTUM ANTIBIOTICS.

Amino glycosides, macrolides, linomycins and polypeptide antibiotics.

Unit V AWARENESS OF THE ACTIVE CONSTITUENT OF CERTAIN CRUDE DRUGS USED IN INDIGENOUS SYSTEM. 6 Hours.

a. Diabetic therapy – Gymnema sylvestre, Salacia reticulate, Pterocarpus marsupiam, Swertia Chirata, Trigonella Foenum – graccum.
b. Liver dysfunction – phyllanthus niruri.
c. Antitumor – curcuma longa Linn.

Semester III

3SA-5 : Laboratory V

Organic Chemistry Practical

Unit I: - Organic Syntheis

Typical preparations from which the single and two stage preparations can be chosen are

1) Toluene- p-nitrotoluene- p-nitrobenzoic acid- p-aminobenzoic acid.
2) Benzene- Acetophenone-Acetophenone oxime-Acetanilide.
3) Benzaldehyde-Benzoin-Bezil-Benzilic acid.
4) Nitrobenzene-m-di-nitrobenzene-m-nitroaniline-m-nitrophenol.
5) Phthalic acid-Phthalic anhydride-Phthalimide-Anthranilic acid.
6) Anthranilic acid-Phenylglycine-orthocarboxylic acid-indigo.
7) Aniline-Acetanilide-p-bromoacetanilde- p-bromoaniline.
8) Aniline-Acetanilide-p-nitroacetanilde- p-nitroaniline.
9) Benzophenone- Benzophenone oxime-Benzanilide.
10) Aniline-Phenyl thiourea-2-amino benzothiazole.
11) Phthalic anhydride-O-benzoyl benzoic acid-anthraquinone.
12) Chlorobenzene-triphenyl carbinol-trityl chloride.

Unit II: - Extraction

Extraction and analysis of following natural products

a) Eugenol from Cinnanan leaf oil or cloves.
b) Piperine from black pepper.
c) Cucumarin from turmeric.
d) Pectins from organe peels.
e) Carrotene from Carrots.
f) Alkaloid from Cinchone bark.
g) Diosgenin from Diascoria tubers.
h) Caffeine from tea powder.
i) Casein from milk.
j) Lactose from milk.
k) Nicotine from Tobacco.
l) Lycopene from Tomatoes.

Laboratory V

Organic Chemistry Practical

Time: 6-8 Hrs. (One day examination) Marks: 50

Distribution of marks

1) Unit-I - 15 Marks
2) Unit-II - 15 marks
3) Record - 05 Marks
4) Viva-voce - 05 Marks
5) Internal Assessment - 10 Marks

Total Marks = 50 Marks

Semester III

3SA-6 : Laboratory VI

Advanced Medicinal Chemistry Practical

Unit I: - Synthesis, Purification and Identification of some of the following drugs

a) Sulfanilamide
b) Uracil
c) Phenytoin
d) Ibuprofen
e) p-amino salicylic acid
f) Paraacetamol
g) Dapson
h) Benzocaine
i) Hydrazine

j) Sulfadiazine

Unit II:- Screening for the following activities

a) Analgesic activity
b) Anti Inflammatory activity
c) Acute toxicity studies
d) Antibacterial and Antifungal activity
e) Free radical seavenging and anti-oxidant activity.

Unit III: - Spectral Interpretation

Structure elucidation of organic compounds on the basis of spectral data. (UV,IR,^{13}C NMR and Mass). (Minimum 12 compounds are to be analyzed during regular practical).

Laboratory VI

Advanced Medicinal Chemistry Practical

Time: 6-8 Hrs. (One day examination) Marks: 50

Distribution of marks

1)	Unit-I	- 10 Marks
2)	Unit-II	- 10 marks
3)	Unit-III	- 10 marks
4)	Record	- 05 Marks
5)	Viva-voce	- 05 Marks
6)	Internal Assessment	- 10 Marks

Total Marks = 50 Marks

Semester IV

4SA1 : Medicinal Chemistry II

Unit I : STEREOCHEMISTRY AND DRUG ACTION

Realization that stereoselectivity is a pre-requeisite for evolution. Role of chirality in selective and specific therapeutic agents. Case studies, Enantio selectivity in drug adsorption, metabolism, distribution and elimination.

Unit II: A STUDY OF THE MANUFACTURE OF THE FOLLOWING DRUGS

a) Paracetamol. b) Diphenhydramine. c) Indomethacin. d) Sulphamethoxazole. e) Pheniramine maleate.

Unit III Antibacterials

Penicillines, Cephalosporins, Tetracyclines, Aminoglycosides, Chloramphenicol, Macrolides, Lincomycins, Polypeptides antibiotics, Polyene antibiotics.

Sulfonamides and Sulfones fluoroquinolines, Trimethoprim and other unclassified antibiotics. Antimycobacterials: Sulfanilamides, p-Aminosalicyclic acid derivatives, Thioamides, Thiourea, derivatives, Thiosemicarbonazones, Isoniazid, Kanamycin sulfate, Capreomycin, Rifaampin, Pyrazinamide, Anthionamide, Clofazimine, Cyclosporin, Dapsone, Sulfazem. Commercial synthetic/semi-synthetic routes to : 6-amino penicillanic acid, ampicillin, amoxycillin, production of penicillin, 7-amino cephalsporanic acid, cephalexin, ceftizoxime, cefaclor, cephslothin, Tetracyclins: doxycycline, nalidixic acid, sulfadiazine, Norflaxacin, Ciproflexacin, O-flaxacin, Amiflaxacin, Difloxacin, Chloramphenicol, Nitroflurantion, Sulfamethyoxazole, Acetysulfoxiazole, Trimethoprim.

Unit IV A) Antimalerials

Antimalarials: Cinchona alkaloids, 4-Aminoquinolines, 8-Aminoquinolines, 9- Aminoacridines, Biguanides, Pyramidines and Sulfones, Mefloquine, Sulfonamides. Commercial synthetic routes to : Chloroquine, pamaquine, primaquine, proguanil,

B) Amodiaquine, Mefloquine, Pyremethamine, Sontoquine.

Antiamoebic and antiprotozoal drugs: Antiamoebic and antiprotozoal drugs: Emetine hydrochloride, 8-Hydroxyquinoline, Iodochlorohydroxyquinol, Metronidazole, Diloxanide furoate, Bilamical hydrochloride, Hydroxystilbamidine isothinate, Pentamidine isothionate, Nifurtimox, Suramin sodium, Carbarsone, Glycobiarsol, Melarsoprol, Sodium stibogluconate, Dimercaprool, Diethylcabamazine citrate, Centarsone, Acetarsone, Antimony potassium tartarate, Bismuth sodium thioglycollate, Sulphonamide, Stibiophen. Bismuth sodium thioglycollamate, Furazolidone.

Commercial synthetic routes to : Metronidozole, Ronidazole, Flunidazole, Iodoquinol, Nifurfimax, Benzindazole, Tryparsamide.

Unit V Antifungal

Fatty acids and their derivatives (Propionic acid, zinc propionate, sodium caprylate, zinc caprylate, undecylenic acid, Zinc undecylenate, Triacetin), Salicylanilids, Salicyclic acid, Tolnaftate, pchloromethoxylenol, Acrisocrin, Fluconazole, Itraconazole, Haloprogin, Clotrimazole, Econazole, Miconazole, Ketoconazole, Flucytosine, Griseofulvin, Polyene antibiotics (Nystatin, Amphoetericin-B), Chlorophenesin, Dithranol. Commercial

synthetic routes to: Miconazole, Clotrimazole, Econoazole, Fluconazole, Griseofulvin, Ketoconazole, Nafttidine, Tolnaftate, Flucytosin.

4SA2 : Advanced Organic Chemistry II

Unit-I : Strategy in Organic Synthesis

Introduction, target selection, disconnection approach, functional group interconversion, synthons, reagents, retrosynthesis, chemoselectivity, regioselectivity, linear synthesis and concergent synthesis. One group disconnection, two group disconnections, strategic bonds, disconnection of strategic bonds in carboxylic and heterocyclic rings, bio mimetic approach, retro mass spectral fragmentation- case studies of (+) Disparlure, retronecine and longfoline.

Unit-II: Chiral drug synthesis

Introduction to Chiral drugs, importance of stereochemistry in drug action, concepts of eutomer, distomer and eudesmic ratio, stereospecific and stereoselective synthesis, Synthesis of Chiral drugs like Ibuprofen, Propranolol, ramipril, levofloxacin.

Unit-III: Modern synthesis method

A) Green synthesis: Introduction, Green reagents, green catalysts, ionic solvents, phase transfer catalysis in green synthesis, application of phase transfer catalyst in green synthesis of Heterocyclic compounds, Williamson's synthesis, Witting reaction.

B) Microwave assisted synthesis: Introduction, Microwave reaction in water (Hoffmann elimination, hydrolysis and oxidation), Microwave reaction in organic solvents, solid state reactions, Advantages of Microwave technique.

Unit IV Photochemical reaction and catalysis

Photochemical Reactions:

Basic theory, orbital symmetry rules and their applications.

Catalysis:

Introduction, phase transfer catalysis in anhydride, epoxide, ester, nitryl, sulphide formation, ester hydrolysis and reduction reaction.

Unit V Pericyclic reactions:

Mechanism, Types of pericyclic reactions – cyclo addition, elctrocyclic reaction, sigmatrophic rearrangement.

4SA3 : Drug Development And Analysis

Unit I A) Introduction History and Objective of drug designing : Economic aspects of drug designing. Procedures followed in drug designing. Lead based methods.

Approaches to lead discovery. Drug discovery without a lead-de Novo drug designing.

B) Extra-thermodynamic parameters:

Electronic, Steric and Hydrophobic substituents constant. Structural and theoretical parameters. Bioisostreism. Hansch analysis, Free and Wilson method Physicochemical parameters, Craig Plot, Toplis operational scheme. Cluster analysis. Pattern recognition. Partition coefficient and its significance.

Unit II Drug designing

Molecular orbital calculations and chemical reactivity. Perturbation theories of drug action. Pullman's dipositive bond theory. Role of charge transfer processes in drug action. Conformational aspects and molecular orbital calculations. Molecular orbital approach to drug design with specific example of thiadiazine antihypertensives.

Unit III Drug Receptor - Interaction: Historical, Receptor theories and forces involved in drug receptor interaction. Stereochemical and conformational aspects of drug receptor interaction. Agonists and Antagonists. Designing or receptor antagonists. Receptor binding as a tool in designing biologically active steroids. Peptidomimetics : Peptidomimetics research, Rational design of Peptidomimetics, nonpeptide, ligands for peptide receptors, Applications of oligonucleotides in antiviral and antitumoral chemotherapy. Antisense nucleotides designing.

Unit IV Prodrug Approach : Basic concept, Common promoities. Reversal of prodrugs - chemical and enzymatic. Application of prodrug approach to alter taste and odour, reduction of pain at injection site, reduction of gastrointestinal irritability. Alteration of drug solubility, increasing chemical stability. Prevention of presystematic metabolism. Prolongation of drug action, site specific drug delivery. Reduction in drug toxicity. Alteration of drug metabolism.

Unit V Computer Aided Drug Designing : Computer requirement hardware, software, Data base and information retrieval techniques. Graphical description of chemical structure. Molecular interactions and interactive graphics. Modelling

in medicinal chemistry-uses and limitations. Logico structural approaches. Activity feature selection within a group of compounds, Activity profile selection. Topological and topographical descriptors.

Paper XVI

4SA-4 : Concept of Industrial Management and Intellectual Property Rights

UNIT – I: Concepts of Industrial Management

Nature and significance of management, functions of management, social responsibilities of management. New industrial policy. Multinationals. Nature, scope and significance of personnel functions in modern organizations. Human resource planning, recruitment and selection process, employees training.

UNIT – II: Intellectual Property Rights

TRIPs – Its scope and options, the changing R & D processes and IPR, The IPR tool kit, patents, the patenting process, patent cooperation treaty.

UNIT – III: Intellectual Property Protections of Living Species

Compatibility between conventions, protecting inventions in biotechnology, protections of traditional knowledge, biopiracy and documenting traditional knowledge, some case studies: The basmati rice issue, revocations of turmeric patent, revocation of neem patent.

UNIT – IV: Exercising and Enforcing of Intellectual Property Rights

Rights of an IPR owner, licensing agreements, criteria for patent infringement, case studies of patent infringement, IPR – a contract, unfair competitions and control, provisions in TRIPs, some case studies.

UNIT-V: Role of Patents in the Pharmaceutical Industry

Recent changes in IPR laws impacting pharmaceutical industry, intellectual cooperation in the pharmaceutical industry, some case studies

Books Recommended

1. Fisher, Schoenfeldt, and Shaw, Human Resources Management, 3rd ed. , All India Publishers and Distributors, Channai (1997).
2. P.B. Ganguli, Intellectual Property Rights: Unleashing the Knowledge Economy, Tata Mc Graw Hill (2001)

3. Steve Smith, The Quality Revolution, 1st ed., Jaico Publishing House (2002).
4. T.R. Bhanga and N.K. Agrawal, Industrial Engineering and Management Science, 10th ed.,Romesh Chandra Khanna ,Khanna Publishers (2002).
5. Harold Koontz and Heinz Weihrich, Essential of Management, 5th ed., Tata Mc graw Hill Publishers
6. P.C. Tripathi and Reddy, Principle of Management 2nd ed., Tata Ltd. Company, New Delhi (1996).
7. M..Adhikary,Economic Environment of Business,6th ed., Educational Publishers, New Delhi (1996).
8. Derek Biddle and Robin, Human Aspects of Management, 2nd ed., Delhi (1997).
9. Jean F. Hartley and Geoffrey, Employee Relations, 1st ed., Efficient Offset Delhi (1998).
10. C.B. Mamoria, Personal Management, 12th ed., Himalaya Publishing Mumbai (1994)

Semester IV

4SA5 : Laboratory 5

Advanced Medicinal Chemistry Practical

Unit I: - Pharmaceutical Chemistry

Preparation, evaluation and packing of liquid oral like solution, suspension and emulsions, ointments, eye drops, eye ointments etc.

Experiments to illustrate- Preparation, Stabilization, Physical and Biological evaluation of pharmaceutical products like powder, capsule, tablets and surgical dressing etc.

Formulation of oral S.R. products and their evaluation by invitro dissolution profile.

Unit II: - Organic Estimation

1) Estimation of Nitrogen.
2) Estimation of Sulphur.
3) Volumetric analysis of Ibuprofen in tablets.
4) Analysis of ascorbic acid in given tablets.
5) Spectrophotometric determination of paraacetamol in given tablets.
6) Analysis of ampicilline trihydrate.
7) Analysis of citric acid.
8) Determination of Vitamin B_1 in given tablets.
9) Determination of B_2 in given tablets.

10) Determination of Tetracycline in given capsule.
11) Determination of Phenobarbitone in given cough syrup.
12) Determination of Chloremphenicol in given capsule.
13) To perform I.P. monograph of tablets.
14) To perform I.P. monograph of hard gelatin capsules.

4SA6 : Advanced Medicinal Chemistry Practical

Time: 9-12 Hrs. (Two days examination) Marks: 50

Distribution of marks

1)	Unit-I	- 15 Marks
2)	Unit-II	- 15 marks
3)	Record	- 05 Marks
4)	Viva-voce	- 05 Marks
5)	Internal Assessment	- 10 Marks
	Total Marks	= 50 Marks

M.Sc. Pharmaceutical Chemistry
Semester IV
4SA6 : Project Work

The students will develop utilities such as analytical spectra, simultation programmes that will supplement laboratory exercises in their subject of specialization. For this variety of small research project designed by the teacher based on interest of the students and capabilities should be worked out.

The project will be evaluated by external and internal examiners.

Study Tour: Educational / Industrial Tour is compulsory for M.Sc. Chemistry.

1) Semester I / II: - Visit to local industry.
2) Semester III / IV: - Educational tour to visit the Industry / Research laboratory.

4SA6 : Project Work

Distribution of marks

1) Project Work	- 40 Marks
2) Internal Assessment	- 10 Marks
Total Marks	= 50 Marks

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INDEX

M.Sc.Part-I & Part-II (Semester I to IV) Examinations in Pharmaceutical Chemistry (Prospectus No. 20111242)