First year First Semester

Hum/T/A HUMANITIES-A

English - 2 Pds/week - 50 Marks
Sociology - 2 Pds/week - 50 Marks

HUMANITIES

1.Basic writing skills
2.Report, Covering Letter & Curriculum-Vitae writing
3.Reading and Comprehension
4.Selected Short Stories

Text Book: ENGLISH FOR ALL

SOCIOLOGY

1.Sociology: Nature and scope of Sociology - Sociology and other Social Sciences - Sociological Perspectives and explanation of Social issues
2. Society and Technology: Impact of Technology on the Society - A case study
3. Social Stratification: Systems of Social Stratification - determinants of Social Stratification - Functionalist, Conflict and Elitist perspectives on Social Stratification
4.Work: Meaning and experience of work: Postindustrial society- Post-Fordism and the Flexible Firm
5.Development - Conceptions of and approaches to development - The Roles of State and the Market in the Development
6. Globalization: The concept of globalization - globalization and the nation state - Development and globalization in post colonial times.
7. Industrial Policy and Technological change in India - The nature and Role of the State in India
8. Technology Transfer: The Concept and Types of Technology Transfer-Dynamics of Technology Transfer
9. Technology Assessment: The Concept - Steps involved in Technology Assessment
10. Environment: Sociological Perspectives on Environment - Environmental Tradition and values in ancient India
11.The Development of Management: Scientific Management - Organic Organization - Net Work organization - Post modern Organization - Debureaucratization - Transformation of Management
12. Technological Problems and the Modern Society: Selected Case Studies - Electric Power Crisis, Industrial and/or Environmental Disaster, or Nuclear Accident.

Pharm/T/112 PHARMACEUTICS-I

Prescription: Parts of prescription, handling of prescription, posology .

Solutions: Formulation, aqueous and non aqueous vehicles, factors affecting rate of solution and solubility, methods to improve aqueous solubility, Formulation additives solution , elixir; linctus; mouthwash and gargles; Nasal and ear drops; lotion; stability of solution; syrup.
Powders: classification, advantages of powder formulations, milling, mixing and dividing of powders, factors influencing blending of powders, powders containing liquids, eutexia.
Galenicals: Different methods used in the preparation of the official galenicals like maceration, percolations, infusion, decoction, continuous hot extraction and digestion; aromatic water and spirits; different extractives ; resins and gums.

Pharm/T/113 PHARMACEUTICAL BIOLOGY-I

Origin and Evolution of Life in the light of mordan concept as examplified by plants and animals.
· Classification of Plant and Animal Kingdom with cognate exemples from both the groups.
· Concept of species modernisation of the concept with the advant of Genetic Technology.
· Study of Mammalian features with reference of Man and Rodants.
· Study of Gastrointestinal, Cardiovascular and Respiratory system of man and guineapig (excepting physiological action).
· Parasitism and host parasite relation with reference to Protozoal and Helminth species.
· Preliminary Concept of Bacteria and Virus; its role in threatening of the human life.
· Biology, Life history, Mode of infection and Socio-economic Problem arises out of the disese caused by:
(a) Entamoeba histolytica
(b) Plasmodium vivax, P. Falciparum
(c) Ascaris lumbricoides
(d) Ancylostoma duodenale (hook worm)
· Mendel's theory of inheritance; DNA morphology and corelation of DNA and Genetic disease with Mendelian inheritance.
· Schematic representation of Brain and Spinal cord of man.

AM/ME/T/2 SOLID MECHANICS

Statics
Introduction, Idealisation of Mechanics, Fundamentals of Vector Algebra, Application of Vectors in Statics, Equivalent system, Equilibrium, FBD concept.
Strength of Materials
Uniaxial Stress field, Thin pressure vessels, Torsion, Shear force and Bending moment, Bending stress in beams, Deflection in beams, Buckling of columns (Euler's formula).

Pharm/Math/T/115 MATHEMATICS-IP

I. Calculus

i) Differential Calculus: Successive differentiation, Leibnitz theorem. Rolle's theorem (statement only), Mean value theorem, Taylor's theorem. Indeterminate forms. Functions of two variables. Partial differentiation. Maxima and minima.

ii) Integral Calculus: Properties of definite integrals, Beta and Gamma functions.

iii) Ordinary differential equations: Second and higher order differential equations with constant coefficients.

II. Elementary Matrix Algebra

i) Introduction to matrix algebra.
ii) Determinants.
iii) Inverse of a matrix.
iv) Rank and equivalence.
v) Linear equations and linear dependence.

III. Laplace Transform (elementary treatment)

IV. Statistics : Overview of the following.

i) Frequency Distribution
ii) Measures of Central Tendency
iii) Measures of Dispersion
iv) Elementary Probability Theory
v) The Binomial, Normal and Poisson distributions.
vi) Elementary Sampling Theory.
vii) Statistical Estimation Theory.
viii) Statistical Decision Theory.
ix) Small Sampling Theory – Tests of Hypothesis and Significance.
x) The Chi Square test.
xi) Curve Fitting : The method of least squares.
xii) Correlation Theory.
xiii) Multiple and Partial Correlation.
xiv) Analysis of variance.
xv) Non-parametric tests and parametric.

Ph/T/1A PHYSICS IA

1. Use of vectors in particle mechanics, Unit vectors in spherical and cylindrical polar coordinates, Conservative vector fields and their potential functions - gravitational and electrostatic examples, Gradient of a scalar field, Equipotentials, States of equilibrium, Work and Energy, Conservation of energy, Motion in a central field and conservation of angular momentum.

2. Angular momentum of a system of particles, Torque, Moment of inertia , Parallel and Perpendicular axes theorem, Calculation of moment of inertia for (i) thin rod, (ii) disc, (iii) cylinder and (iv) sphere. Rotational dynamics of rigid body (simple cases).

3. Motion of fluids, Bernoulli's equation and its applications, motion of viscous fluids - Poiseuille's equation.
4. Simple harmonic motion, Composition of simple harmonic motion, Forced vibration and resonance, Wave equation in one dimension and travelling wave solution, Standing waves, Wave velocity and group velocity.
5. Assumption for the kinetic theory of gases, Expression for pressure, Significance of temperature, Deduction of gas laws, Qualitative idea of (i) Maxwell's velocity distribution. (ii) degrees of freedom and equipartition of energy, Specific heat of gases at constant volume and constant pressure.
6. Equation of state of a gas, Andrew's experiment, Qualitative discussion on van der Waal's equation of state, Critical constants, Law of corresponding states.
7. Macroscopic and microscopic description, Thermal equilibrium, Zeroth law of thermodynamics, Concept of international practical temperture scale, Heat and Work, First law of thermodymamics and some applications, Reversible and irreversible processes, Carnot cycle, Second law of thermodymamics, Concept of entropy, Thermodynamic relations.

Ph/S/1 PHYSICS LABORATORY

(Selected Experiments from the following)

1. Determination of Galvanometer resistance by half - deflection method.
2. Determination of Galvanometer resistance by Thomson's method.
3. To find high resistance by Galvanometer deflection method.
4. To measure mechanical equivalent of heat, J by electrical method (Joule's) using copper calorimeter (radiation correction to be done).
5. To compare to low resistance by drop of potential method.
6. To determine resistance per unit length of wire by using Carey Foster bridge.
7. To estimate strength of a current by using copper voltmeter.
8. a) To compare the EMF's of two cells by using a potentiometer
b) To measure current by using a potentiometer
9. To measure the horizontal components of earth's magnetic field intensity using deflection and vibrating magnetometers.
10. Determination of co efficient of linear expansion by optical lever method.
11. Determination thermal conductivity of metal by Searle's method.
12. To determine co-efficient of viscosity by Capillary flow method.
13. Determination of Young's modulus by Flexure method.
14. To draw mutual and anode characteristics of triode and hence too fine Rp, μ, and gm
15. To draw the transistor characteristics (NPN/PNP) in the given configuration and hence to find hi, hf
16. Determination of refractive index of the material of the glass prism by prism spectrometer (for at least two ?s)
17. Study of collisions in one dimension using a linear air track
18. Use of an air track for obtaining potential energy curves for magnetic interactions.
19. Study of oscillations under potential wells of various shapes using an air track.
20. Experiments on diffraction in single slit, double slit and plane grating using He- Ne

laser
a) To find the wavelength of a monochromatic light by single slit.
b) To find slit separation of a double slit.
c) To find number of rulings per cm of a plane grating
21. To find the wavelength of a monochromatic light by Newton rings.
22. Fabry-Perot interferometry: To find out separation of wavelength of sodium D1 & D2 lines.

Pharm/S/112 PHARMACEUTICAL BIOLOGY LABORATORY

· Identification of Invertebrate and Vertebrate species.
· Study of human Physiology by dissecting Mammalion species and demonstration by charts, models and slides.
· Study of Osteology of man and demonstration human skeleton and models.
Microscopic study and slide preparation of Monocot and Dicot root and Stem.
· Morphological study of Phytochemically important Plants, as used in Ayurvedic and Homeopathic medicines. Study of Blood Pressure, its measurement and complication

BED/ME/S/1 BASIC ENGINEERING DRAWING

Drawing primitives: instruments, letters, lines, title block, geometric curves & shapes, scale and dimension.
Projection: orthographic and isometric, sectional views.

WS/ME/S/12A WORKSHOP PRACTICE-XII (Machine Shop)

Introduction to machine tools - lathes, drilling machines, shaping machines, planning machines, slotting machines, milling machines, grinding machines; machine shop work involving different operations by using the above mentioned machines through making of jobs.
Experiments on: Study of the speed structure of a lathe, study of apron mechanism and calibration of feeds in a lathe.
Study and grinding of various cutting tools.

First Year Second Semester

Pharm/T/121 PHARMACEUTICS-II

4 pds/weeks Suspensions: Emulsions: definition, type of emulsion, theories of emulsification, pharmaceutical application, preparation and stability and preservation. Ointments: Classifications, ointment bases, preparation and dispensing of ointments. Paste: Bases of paste, preparation of paste. Jelly: Type of jelly, jelling agents and their properties, preperation of jellies. Lozenges: Definition and preparation.

Pharm/T/122 PHARMACEUTICAL CHEMISTRY-I (ORGANIC- 1)

1. Mechanistic aspects of organic reactions of different categories of aliphatic and aromatic compounds:
Hydro carbons, alcohols, alkyl and aryl halides, esters, carbonyl compounds, carboxylic acids and their derivatives, sulfonic acids, nitro compounds, amino compounds, diazonium salts, phenols.
2. Alicyclic compounds
3. Polynuclear aromatic hydrocarbons

Pharm/T/123 PHARMACEUTICAL CHEMISTRY-II

PHARMACEUTICAL ANALYSIS - I THEORY

Significance of quantitative analysis of quality control. Different technique of analysis prelimination and defination, significant figures. Rules of retaining significant digets, Types of errors, mean deviation, standard deviation, statistical treatment of small data sets, selection of sample, precision and accuracy. Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.

ACID BASE TITRATIONS

Acid base concepts, Role of solvent, Relative strengths of acids and bases, ionisation, law of mass action, common ion effect, ionic product of water, pH, hydrolysis of salts, Hendersen-Hassel bach equation, buffer solutions, neutralisation curves, acid base indicators, theory of indicators, choice of indicators, mined indicators, polyprotic system, polyamine and aminoacid system, aminoacid titration, application of assay of H_3PO_4, NaOH, $CaCO_3$, etc.,

OXIDATION-REDUCTION TITRATION

Concept of oxidation and reduction, redox reaction, strength and equivalent weights of oxidising and reducing agents, theory of redox titration, redox indicators, cell representations, measurement of electrode potential, oxidation reduction curves, iodimetry and iodometry, titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate, titanous chloride and sodium, 2,6-dichloro phenol indophenol.

PRECIPITATION TITRATIONS

Precipitation reactions, solubility products, effect of acids, temperature and solvent upon the solubility of a precipitate, argentometric titrations and titration involving ammonium or potassium thiocyanate, mercuric nitrate and barium sulphate, indicators, Gay-Iussae method, Mohr's method, Volhard's method and Fajan;s method.

GRAVIMETRIC TITRATIONS

Precipitation techniques, solubility products, the colloidal state, super saturation co-operation, post precipitation, digestional washing of the precipitate, filtration, filter papers and crucibles, ignition, thermogravimetric curves, specific examples like barium sulphate, aluminium as aliminium oxde, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, organic precipitants.

NON-AQUEOUS TITRATIONS

COMPLEXOMETRIC TITRATIONS

MISCELLANEOUS METHODS OF ANALYSIS

Diazotization titration, Kjeldahl method of nitrogen estimation, Karl-Fischer titration, oxygen flask combustion gasometry.

Pharm/T/124 PHARMACEUTICAL BIOLOGY -II

- Blood and Cardiovascular system:
- Composition, Function, grouping and coagulation of blood.
- Study of Lymph and other tissue and tissue fluid, blood volume, cardiac cycle.
- Preliminary idea of ECG, special nodal tissue and regional circulation, specially coronary circulation and its complication.
- Excretory system of man:
- Kidney and renal circulation. Anatomy of the functional unit of kidney and renal function test.
- Composition of urine, micturition and diseases.
- Endocrine system with particular reference to reproduction; Endocrine glands, function and diseases.
- Special Senses-in respect of Taste, Vision, Olfaction and Hearing.

Pharm/T/125 NUMERICAL METHODS AND COMPUTER PROGRAMMING

A) Introduction to computer programming--- introduction to computer system, program on logic and flow charts Programming numerical methods, Approximation of errors. Solution of linear system of equations. Matrix inversion, interpolation. Numerical differentiation and integration curves fitting . Numerical solution of ordinary differential equations.
B) Basic Languages: BASIC, FORTRAN, C++, DOS, WINDOWS.

Pharm/T/126 ENVIRONMENTAL SCIENCES AND CONTROL

Water resources, Quality and control: lakes , streams, oceans and ground water , elements of fluid dynamics of surface and ground water, waste water, sources and pollution, water treatment processes, river water monitoring, control and clean up methods.

Control of Air and Noise Pollution : Classification of pollutants and sources, description of noise pollution.
Control of Solid Wastes: Definition, Classification of Solid wastes, domestic, industrial and hazardous and waste disposal.
Environmental Conservation and Sustained development: Policies and strategies of sustainable development, sustainable natural resources management and biodiversity management. Environmental Microbiology and Biotechnology: Microorganisms in nature, Microbial biodiversity and bioremediation.
Environmental Health and Toxicology: Toxicology of metal pollutants, Non metal pollutants and air pollution effects on the respiratory system.
Environmental Impact Assessment (EIA) : Relation between development and environment, comparison between economic and ecological criteria, Relation between EIA and sustainable development.

Recommended Books:

I) Environmental Science : Prof. Subhas Santra. Dept of environmental science, Kalyani university.
II) Microbial Ecology, Atlas & Bartha
III) Environmental toxicology, Wright & Wellbourn.

Pharm/S/121 PHARMACEUTICS LABORATORY - I

Preparation of the following will be exemplified during laboratory session: Solution, Powder, Galenical, Suspension.

Pharm/S/122 PHARMACEUTICAL CHEMISTRY LABORATORY - I (ORGANIC)

Identification of organic compounds based on detection of elements, determintion of physical constants, group solubility, functional groups and preparation of derivatives.

Pharm/S/123 PHARMACEUTICAL CHEMISTRY LABORATORY - II (ANALYSIS-I)

Assay of inorganic pharmaceuticals accidimetry, alkalimetry, permanganometry, iodometry, dichromatmetry, internal & external indicators, argentometry using Mohr's method and adsorption indicators, Assay gravimetric, complexometric and non aqueous titration methods, Assay of inorganic pharmaceuticals involving multistep operations, Limit test.

Pharm/S/124 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Experiments in tune with the theoretical subject "Pharm/T/125".

Second Year First Semester

Pharm/T/211 PHARMACEUTICS- III

PHYSICAL PHARMACY

Pharmaceutical additives:
Organoleptic additives like colouring, flavouring, and sweetening agents, Surface active agents, film balance, surfactant and drug activity; surfactants and pharmaceutical products, wettings, solubilizing agents, emulgents, detergents, and antifoaming agents; Preservatives and
Kinetics: Physical degradation of pahrmaceutical products, loss of volatile constituents, loss of water, absorption of water, crystal growth, polymorphism, color change; factors influencing chemical degradations like hydrolysis, oxidation, isomerisation, polymerisation, decarboxylation etc.; methods of reducing physical and chemical degradations; chemical kinetics and their application to decomposition of pharmaceutical products; accelerated tests for physical, chemical and photochemical stability; stability aspects of formulations, marketed products, and clinical supplies.
Rheology and rheology of disperse system: Newtonian liquids; non-newtonium materials; yield value; plastic; pseudoplastic, dilatant and thixotropic flow, viscosity of suspending agents , effects of temperature and concentration of dispersed phase on viscosity; reological properties of suspension and emulsions, gels and paste.
Complexation: Metal complexes; organic molecular complexes, occlusion compounds; methods of analysis,; thermodynamic treatment of stability constants; complexation and drug action; protein binding; physical properties of drug molecules.

Pharm/T/212 PHARMACEUTICAL CHEMISTRY - III

a) Introduction to heterocyclic chemistry nomenclature with special reference to fused ring system and drugs.
b) Five membered ring containing one and two hetero atoms and related drugs.
c) Six membered ring containing one and two hetero atoms and related drugs.
d) Fused ring system:
Indole, benzofuran, benzimidazole, quinoline, isoquinoline, pteridine, quinazolone, purine, 1,4-benzodiazepine, b- lactam ring, coumarins, thioxanthanes and their related compounds.

Pharm/T/213 PHARMACEUTICAL CHEMISTRY - IV (PHYSICAL)

1. Properties of real gases.
2. Properties of solids
3. Thermodynamics: The first law, Thermochemistry, The second Law, Free energy functions and applications.
4. Homogenous and Heterogenous chemical equilibria.

5. Solutions of non-electrolytes
6. Solutions of electrolytes
7. Ionic equilibria.
8. Buffered and isotonic solutions.
9. Solubility and distribution phenomena
10. Reaction kinetics
11. Adsorption and surface phenomena
12. Rheology; Viscosity.
13. Colloids.
14. Electrochemistry.

Pharm/T/214 PHARMACEUTICAL CHEMISTRY - V

Aromatic halogen compounds, Aromatic sulfonic acids, Aromatic nitro compounds, Aromatic amines, Diazo compounds, Aromatic alcohols and phenols, Aromatic aldehyde and ketones, Aromatic acids, Polynuclear hydrocarbons, Introduction to heterocyclic compounds.

Pharm/T/215 INTRODUCTION TO PHARMACEUTICAL ENGINEERING

1. Units and their conventions, Dimensional analysis, graphical calculus, Different graph papers -Logarithmic Semilogarithmic, triangular; Alignment charts.
2. Problems related to stoichiometric and composition relations, vapour pressure. Concept of material balance. Wet and dry bulb thermometry, dew point, and use of humidity chart. Problems on humidity. Concept of heat balance.
3. Problems related to thermophysics and thermochemistry.
4. I) Fluid statics, Measurement of pressure drop-- Simple, differential, inclined etc. , Fluid Dynamics -- Types flow, Reynolds number, Bernoulli's theorem, Fluid friction, pipe roughness, sudden contraction and engagement, pipes ands pipe fittings, Flow measuring devices-Orificemeter, venturimeter, rotameter, piles tubes, weirs, pumps-centrifugal , gear, reciprocating, gear peristaltic etc.
II) Non Newtonian Fluid flow - preliminary concept of plasticity number, modified Reynolds number etc.

Pharm/T/216 PHYSIOLOGY

1. RESPIRATORY SYSTEM: Anatomy of the respiratory pathway, mechanism of respiration, lung capacities and volume, carriage of the respiratory gases, control of respiration, abnormal forms of respiration.
2. NERVOUS SYSTEM: CNS (Conduction of nerve impulse, synapse, reflex action, postural equilibrium, condition reflex, sleep, cerebrum and cerebrospinal fluid). ANS (classification), general arrangement, autonomic ganglia, sympathetic and parasympathetic systems.
3. DIGESTIVE SYSTEM: Physiology of digestion and absorption, liver and pancreas.

4. Body temperature and regulation, pyrexia and hyperthermia.
5. Membrane and excitable tissues.

Pharm/S/211 PHARMACEUTICS LABORATORY - II

1. To study on the effect of complexing agents on the solubility of sparingly water soluble drug.
2. To study on the effect of co-solvent on the solubility of sparingly water soluble drugs.
3. To study on the effect of surfactant on the solubility of sparingly water soluble drugs.
4. To determine the bulk density and void porosity of powdered drugs.
5. To study the effect of lubricants on angle of repose of granules / powdered drugs.
6. Quantitative analysis of Salicylic acid using Spectrophotometer.
7. To study particle size distribution of granules by sieve method.
8. Determination of critical micelle concentration of surfactants.
9. Determination of HLB value of a surfactant.
10. Evaluation of physical stability of suspension.
11. To study the effect of pH on the solubility of a slightly soluble weak acid.
12. Determination of dissolution of tablets.
13. Determination of rate constant and half life of pseudo first order reaction.
14. Determination of second order reaction rate constant of ethyl-acetate in sodium hydroxide.
15. Determination of shelf-life of aspirin in 0.1(N) HCl using accelerated stability study.

Pharm/S/212 PHARMACEUTICAL CHEMISTRY LABORATORY - III

(Organic Synthesis & analysis)

A) Preparation and Purification of Drugs and their intermediates like Methylsalicylate , Benzilic acid , Antipyrine, Sulphanilamide, 4-Methylcoumarin, Nicotinic acid and Nicotinamide, Phenylbenzoate, Benzylhydrol, Iodoform, Paracetamol Phenacetin e.t.c.
B) Preparation and purification of Inorganic pharmaceuticals like Ferrous Sulphate , Sodium chloride, Sodium benzoate, Sodium salicylate, Disodium hydrogen citrate, Calcium gluconate, Magnesium trisilicate, potassium acetate, Ferrous ammonium citrate.

Pharm/S/213 PHYSIOLOGY LABORATORY

1.Identification of different visceral organs.
2.Histological studies of different visceral organs (i.e. liver, lungs, kidney, spleen, pancreas, endocrine glands, muscle- skeletal, smooth, cardiac, Spinal cord, cerebellum, cerebrum,, testes, ovary etc.)
3.Human physiology: TC, DC, Hb, ESR, Clotting time, Bleeding time, B.P., Fridility Index of REC, etc.
1. Experimental Physiology: Handling, weighing, numbering, anaesthetising and injection of mice/rat/rabbit.

2. Canulation of traches, artery, vein etc.
3. Heart Curve: Normal curve, effect of temperature, ions and neurohormonal substances on normal heart curve.
4. Muscle curve: Normal curve, effect of temperature, ions, load etc. on normal curve.

Second Year Second Semester

Pharm/T/221 PHARMACEUTICS- IV

Cosmetics: Shampoo, shaving products, hair oil, lipstics, antiperspirants, nail polish, nail polish remover.
Surgical dressings: Features of an ideal dressing, fibres, fabrics, impregnated fabrics, bandages, self adhesive, plasters compound dressings.
Suture, ligature and catgut: Absorbable and non-absorbable sutures and ligatures; preparation and sterilizations of surgical catgut; non-absorbable sutures; Blood and blood related products. Packaging materials;
Micromeritics: definition; particle size measurement; porosity, density of particles; packing arrangements; flow properties.
Radiopharmaceuticals: Biological half life, medicinal and pharmaceutical uses of radio isotopes, isotope dilution techniques, activation analysis.

Pharm/T/222 PHARMACEUTICAL CHEMISTRY - VI (NATURAL PRODUCTS)

Chemistry of natural products:

1) An introduction to medicine from natural resources Insight to alternative systems of medicine; Drug development from natural products. Role of natural product in primary health care and the aspects related to their safety and toxicity. Ethnobotany and aspects biodiversity for development of natural products.
2) Phytopharmaceuticals development and evaluation
General technique used for extraction and isolation; Isolation and characterisation of different classes of phytoceuticals- qualitative test procedures; Phytomedicines with different dosage forms, their formulation and development.
3)Standardisation and quality control of natural products:-
Secondary metabolites with therapeutic importance in natural products. Standardisation of raw materials and herbal products, Factors related to quality of natural products. WHO guidelines for assessment of natural products, Sampling procedures, morphological examination, microscopical evaluation, evaluation of assessment parameters based on WHO guidelines, modern techniques used for evaluation of natural products; HPTLC, HPLC and GC, Stability testing of herbal drugs.
1) Drugs from natural origin with Phytochemical and therapeutic importance:
Chemistry, test, isolation and characterisation and estimation of phytopharmaceuticals belonging to the group of Carbohydrate, Glycoside, Tannin, Saponin, Flavonoids, Lipids, Volatile oil and Resin, Alkaloids, Carotenoids, Steroids and Terpenoids. Pesticides of

natural origin and miscellaneous products. 5)Regulatory and legal parameters for drug development from natural resources; Various official monograph on natural products of therapeutic importance, regulation and guidelines on drug development from natural sources - Indian and global perspectives.

Pharm/T/223 PHARMACEUTICAL CHEMISTRY - VII (INORGANIC CHEMISTRY)

1. Water: Chemical properties, natural water, potable water, softened water, purified water, water for parenterals, selection of suitable water
2. Silicates in Pharmacy: General chemistry of silica, silicic acid, amorphous silica system, kaolin, bentonite, talc, magnesium trisilicate, soluble silicates, glasses etc.
3. Minerals I: Fluid electrolites and trace ions, fluid electrolyte replinisher, ionic structure and physiological suitability of electrolytes, calcemic and tonics. Flurides and general health, iodine as antigoiterogenic
4. Mineral II: Essential trace elements, transitional elements and their compounds, iron and the hematinics, mineral supplements
5. Germicide and related substances: General background, oxidising germicides, per oxides, halogen, and their oxo compounds
6. Radio isotopes & radio - opaque: Nuclear decomposition , uses of radio- isotopes
7. Inorganic cathartics

Pharm/T/224 APPLIED MICROBIOLOGY - I

Classification and nomenclature of microorganisms.
Strains and staining methods of microorganisms.
Microbiology of bacteria ,yeast , molds and viruses.
Micro structures of Bacteria
Cultivation and Growth of bacteria and fungi.
Bacterial metabolism
Isolation of pure culture and identification.
Principles of sterilization and methods.
Sterilization of pharmaceutical products.
Sterilization control and sterility testing.
Fundamentals of immunology; antisera, vaccines, toxoids.
Diseases and disease producing microorganisms; virulence factors.
Manufacture of immunological products and their quality control.
Microbial genetics and their role in industrial and medical microbiology
Mechanisms of genetic Control
Microbial assay of antibiotics ,vitamins and amino acids.

Pharm/T/225 APPLIED BIOCHEMISTRY - I

Basic elementary chemistry of carbohydrates, lipids , proteins and nucleic acids. Metabolism : basic concepts and designs Glycolysis, Citric acid cycle, Oxidative phosphorylation, Pentose phosphate pathway and glyconeogenesis, Glycogen and disaccharide metabolism. Fatty acid metabolism, Introduction to biological membranes. Food and nutrition: General considerations , Vitamines, Growth factors, Mineral proteins caloric malnutrition.

Pharm/T/226 INDUSTRIAL MANAGEMENT

Industrial management and record keeping: Principles of economics: Want ,Activity, Satisfaction of wants; Distribution under Laissez Faire and under socialism; public sector and private sector of Indian economy. Types of markets and goods; factors of production , optimization of factors inputs; Demands and supply ; Price determination; specialization, location of industry; concept of social cost.
Principles of management : Planning , organizing, staffing, Leading coordination and control: marketing, advertisements; Problems of uncertainty and risks; General principles of insurance. Inland and foreign trade, outlines of Factories Act and E.S.I. Act. Industrial organization; Limited liability system

Pharm/S/221 PHARMACEUTICAL CHEMISTRY LABORATORY - IV (PHYSICAL)

1) Determination of viscosity of a liquid using Ostwald Viscometer
2) Determination of Surface tension of a pure liquid using different methods.
3) Determination of Interfacial tension between two liquids by the drop count method
4) Determination of transition temperature of sodium carbonate by solubility method.
5) Determination of mutual solubility curve of phenol and water.
6) Determination of variation of refractive index with the composition of liquid mixtures.
7) To test the validity of Beer-Lambert law using
II) Photoelectric colorimeter.
8) Determination of end point in a typical titration by Conductometric method.
9) Determination of the specific and molecular rotation of a compound using polarimeter.
10) Determination of velocity constant of a first order reaction.
11) Determination of coefficient of an organic compound between two solvents.
12) Determination of equilibrium constant of the equilibrium KI + I2 = KI3 by partition method.
13) study on the absorption of acetic acid on charcoal-------- verification of Freundlich's adsorption isotherm.
14) Potentiometric titration.

Pharm/S/222 APPLIED BIOCHEMISTRY LABORATORY

Experiments of sugar: Test of reducing sugar, Colorimetric estimation of sugar, Chromatography on sugars.
Experiments on lipids: Saponification number , iodine number. Experiments on amino acids and proteins: Colorimetric estimation of proteins, Separation of amino acids by paper chromatography. Experiments on clinical Biochemistry: Blood Glucose Estimation, Cholesterol in Blood . Separation of plasma proteins by paper electrophoresis, Non protein nitrogen in blood, Separation of plasma proteins by fractionation .
Experiments on Vitamins from sources: Assay of thiamine, riboflavin and vitamin B12 .
Experiments on Enzymes : Effect on pH , Effect on temperature, Use of inhibitors.
Fundamental methods of analysis: Spectrophotometric , Fluorimetric and Electrophoretic.

Third Year First Semester

Pharm/T/311 PHARMACEUTICS - V

Tablet: Types, definition, preparation, additives and components, methods of preparation, processing problems, evaluation, commercial processing equipments, formulation and manufacturing techniques of different important compressed tablets, manufacturing and design layout & flow design for tablet manufacturing.
Tablet coating: Sugar coating process, characteristics and requirements of uncoated tablet, equipments, film coating process-materials, solvents, plasticisers, coating solution, additives for film coating, air suspension coating and dip coating, film testings and film defects, electrostatic coating, laminated coating, physiological availability and tablet coating.
Capsules: Manufacturing area design, lay-out and flow diagram of capsule manufacture; hard gelatin capsules; materials for capsules; method of capsule production; capsule filling equipments; capsule filling operations; soft gelatin capsules, size and shape; methods of manufacture; nature of capsule shell and capsule content, soft gelatin capsule manufacturing and control. Microcapsules, nanoparticles, mucoadhesives, buccal and sublingual preparations, transdermal patches & other topical products, multiple emulsion and solid dispersion.

Pharm/T/312 PHARMACEUTICAL CHEMISTRY - VIII (ANALYSIS)

1. Extraction procedure including separation of drugs from excipients,
2.Chromatography:
Following techniques will be discussed with relevant example of Pharmacopoeial products -TLC, HPLC, GLC, HPTLC, Paper chromatography ,column chromatography.
3.Instrumentsl Analysis:-
Ttheory and application of the followinginstruments, Potentiometry , UV -Visible Spectrophotometry, conductimetry,NMR, Mass spectrometry, polarography, X-Ray diffraction analysis. Amperometry, Fluorimetry, Flame photometry, Atomic absorption Spectroscopy Radio Immuno assay.

4.Quality assurance. GLP, ISO 9000, TQM, Quality review and Quality Documentation
5. Regulatory control, regulatory drug analysis , interpretation of analytical data.
6. Validation , Quality audit, quality of equipment, validation of equipments, validation of analytical procedures.

Pharm/T/313 MEDICINAL CHEMISTRY - I

THEORY

BASIC PRINCIPLES OF MEDICINAL CHEMISTRY
Physicochemical aspects (Optical, geometric and bioisosterism) of dru molecules and biological action, drug receptor interaction including transduction mechanisms.

PRINCIPLES OF DRUG DESIGN (THEORITICAL ASPECTS)

Traditional analogues (QSAR) and mechanism based approaches (introduction of graph theory, applications of quantum mechanics, Computer aided drug designing (CADD) & Molecular modeling. Synthetic procedures of selected drugs, mode of action, uses , structure activity relationship including phytochemical properties of the following classes of drugs:
A) Drugs acting at synaptic and neuroeffector junction sites:
1) Cholinergics and anticholineesterases
2) Adrenergic drugs
3) Antispasmodic and antiulcer drugs
4) Neuromuscular blocking agents
B) Autocoids:
1) Antihistamines
2) Eicosanoids
3) Analgesic, Antipyretics, Antiinflammatory (Non steroidal) agents.
C) Drugs affecting uterine motility :
Oxytocics (including Oxytocin, ergot alkaloids and prostaglandins), Biochemical approaches in drug designing wherever applicable should be discussed.

Pharm/T/314 PHARMACOLOGY - I

1.General Pharmacology: Introduction, Routes of Administration of Drugs, Mechanism of action of Drugs (Absorption, Distribution, Metabolism and Excretion of Drugs). Screening and Testing of drugs; Drug Toxicity; Drug receptor interaction (Fundamental concept).
2.(a) Pharmacology of ANS : Neurohumoral transmission, Cholinergic and anticholinergic drugs, Neuromuscular and Ganglionic blocking drugs.
(b). Sympathomimetic amines and related substances: Drugs acting on the adrenergic system. Screening of adrenergic drugs, vasoactive drugs, Hypertension and its treatment and vasodilators.

Pharm/T/315 APPLIED BIOCHEMISTRY - II

Introduction to protein structure and function: Three dimensional structure, Stability and denaturation of proteins, Allosteric proteins, Amino acid degradation and urea cycle, Introduction to enzymes , Mechanism of enzyme action.
Storage, transmission and expression of genetic information , DNA, Genetic code, Gene protein relation. protein synthesis, control of gene expression, Gene rearrangement. Molecular diseases: Sickle cell anemia.
Enzyme & coenzymes,: Classifications, Enzyme kinetics, Michelis-Menton Equation, Modification of enzyme activity, Mechanism of enzyme action Protein and Nucleic acid metabolism: Metabolism of important amino acids, urea cycle, creatine,creatinine, phospholipids, Metabolism of cholesterol and bile acids, Role of hormones in metabolism, ketogenesis and ketolysis
Stucture and conformation of proteins, helix and sulunis? Protein ligand interaction as the basis of antibody receptor and enzyme action; Active site and allosteric site for enzymes. Feed back regulation and drug development; Enzymes in Pharmacopoeias. Sudy of metabolism in relation to drug development: Differential centrifugation and biofunction of organelles; Glycogen metabolism and cyclic AMP as second messenger; Nucleotide sugars, amino acid transformation , histamine , serotonin; Purine Biosynthesis and therapy of neoplasm; Cholesterol biosynthesis and steroidogenesis; Fatty acid synthesis Membrane structure and lipid bilayer Enzymatic basis of biotransformation of drugs cytochrome. Hormones : Mechanism of secretion, Mode of action of steroid hormones and protein and peptide hormones, their preparation & biochemical functions, Assay methods and role as a drug. Vitamines; Mode of action of vitamines, Assay methods from sources. Elements of molecular biology: DNA as hereditary material, DNA double helix, different types of functions of RNAs. Phage cycle and message transformation, Basic steps in replication, Transcription and translation, Genetic code.

Pharm/T/316 FORENSIC PHARMACY

A study of the dangerous drug act 1930, Opium Act, poison act, the Excise act and rule, the Drug and Magic Remedies act and such other acts as materially affect the pharmaceutical profession. Code of ethics for the pharmacists. Study of the various enquiry commission which have been set up by the Government of India or the State Governments to enquire into affairs of Drug Industry, trade or profession. A study of Drug Act, 1940 and Rules thereunder 1945 in the context of manufacture and sale of different drugs and their formulations. A survey of the Pharmacy Act 1948and its impact on the development of the pharmacy profession in India. Study of other relevent legislations affecting the profession of Pharmacy and the drug industry in India.

Pharm/S/311 PHARMACEUTICS LABORATORY - III

Preparation of the following will be exemplified - Tablet, Effervescent preparation, Coating, Capsules, Parenterals and Ophthalmic products.

Pharm/S/312 PHARMACEUTICAL CHEMISTRY LABORATORY - V (NATURAL PRODUCTS)

1.Estimation of alkaloid content in crude drugs and pharmaceutical formulations.
2.Estimation of functional groups like hydroxyl, acetyl, methoxyl, carboxyl, esters etc.
3.Qualitative identification tests for drugs and pharmaceuticals in official formulations.
4.Assay of drugs and bioactive substances using HPLC,GLC etc 5.Chromatographic Analysis

Pharm/S/313 APPLIED MICROBIOLOGY LABORATORY

Sterilization , Different methods; Moist Heat, Dry heat , Autoclave, Bacterial Filters. Sterility testing of injectables according to I.P., Microscopic examination of microbes including bacteria, yeast and fungi. Gram Staining of bacteria. Preparation of basic media for culture of microorganism, Liquid and Solid media; Growth on Slants and Petridish. Cultivation and isolation of bacteria; Bacterial counts; Fermentation reactions, Preparation and standardization of bacterial vaccines; Agglutination tests, Widel reaction, Evaluation of germicides: Rideal Walker Value. Assay of antibiotics: Cylinder Plates and Turbidity Methods; MIC of antibiotics.

Third Year Second Semester

Pharm/T/321 PHARMACEUTICS - VI

Parenteral products: Route of administration; selection of vehicles; added substances; containers; suspension and emulsion for injections; production-facilities, environmental control, personel, cleaning of containers and closures, sterilization of equipment, compounding the product, filtration of solutions, filling and sealing procedures, sterilization of products; various quality control test for parenteral products.
Opthalmic products: eye drops, eye lotions, eye ointments, formulation, additives, preparation, sterilizing, packaging, contact lens solutions. Aerosols: mode of operations, propellants, containers, valves, actuators and buttons, diptubes, packing, application and testing.
Biopharmaceutics: principle of pharmacokinetics, biological half life, first order , zero order, determination of biological half life, apparent volume of distribution,pre equilibrium, one compartment calculations, two compartment calculations, other factors affecting volume of distribution. Influence of route of adminstration of a substance on it's bioavailability.

Pharm/T/322 MEDICINAL CHEMISTRY - II

Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship including physico-chemical properties of the following class of drugs:

STEROIDS AND RELATED COMPOUNDS
Steroidal nomenclature and stereochemistry, androgens and anabolic agents, estrogens and progestational agents, adrenocorticoids.
DRUGS ACTING ON THE CENTRAL NERVOUS SYSTEM
General anaesthetics, local anaesthetics, hypnotics and sedatives, opioid analgesics, antitussives, anticonvulsants, antiparkinsonian drugs, CNS stimulants, psycho pharmacological agents, (Neuroleptics, antidepressent, anxiolytics).
DIURETICS, ANTICOAGULANT AND ANTIPLATELET DRUGS AND CARDIOVASCULAR DRUGS Antihypertensives, cardiotonics, antianginal, antiarrythmics and antihyperlipidemic drugs.

Pharm/T/323 PHARMACOLOGY - II

1.Sedative and Hypnotic agents.
2. Psychotropic drugs :Anti psychotic drugs; Anti anxiety drugs; Anti manic drugs; Anti depressant drugs; Psychomimetic drugs. The screening of Psychotropic drugs.
3. Anti epileptics, analeptics, convulsants and anti convulsants.
4. Analgesics: Narcotic analgesics; Narcotic antagonist; Screening of narcotic analgesics.
5. Anti-inflammatory drugs, anti arthritic and anti gout drugs.
6. Hormones:
(a). The Thyroid hormone: Drugs used in the treatment of thyroid disorders.
(b). Insulin: Drug used in diabetes.
(c). Anti fertility drugs.
(d). Adrenocortical steroids.

Pharm/T/324 PHARMACOGNOSY - I

1. Definition, history, scope and development of Pharmacognosy
2. Classification of drugs: Alphabetical, Morphological, Taxonamical, Chemical and Pharmacological classification of Drugs.
3. Systematic pharmacognostic study of the following:
a) Carbohydrates and derived products: Agar, guar gum,acacia, honey, Isapgul, pectin, Starch, Sterculia and Tracaganth.
b) Lipids, Beeswax, Castor oil, Cocoa butter, Cod liver oil, Hydnocarpus oil, kokum butter, Lard, Linseed oil Rice,Bran oil, Shark liver oil and Wool fat.
4. Pharmaceutical Aids: Study of Pharmaceutical aids like talc diatomite, kaolin, bentonits, gelatin and natural colors.
5. Resins: Study of Drugs Containing Resins and resin Combination like Colophony, podophyllum, Jalap, cannabis, capsicum, myrrh, asafoetida, balasam of tolu, balasam of Peru, benzoin, turmeric, ginger.
6. Pharmaceutical Aids: Study of pharmaceutical aids like talc diatomite, kaolin, bentonite, gelatin and natural colors.
7. Cultivation, collection, processing and storage of crude drugs: Factors inflencing cultivation of medicinal plants. Types of soils and fertilizers of common use Pest

management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants.
8. Fibres: Study of Fibres used in pharmacy such as cotton, silk, wool, nylon, glasswool, polyester and asbestol.
9. Volatile oils: General methods of obtaining volatile oils from plants, study of Volatile oils of Mentha, Coriander, Cinnamon, Cassia, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Spearmint, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamum, Valerian, Musk, Palmarosa, Gaultheria, Sandal wood.
10. Tannins: Study of tannins and tannin containg drugs like Gambier, black Catechi, gall and Myrobolan. The holistic concept of drug administration in traditional systems of medicine. Introduction to ayurvedic preparations like Arishtas, Asavas, Gutikas, Churnas, Lehyas, and Bhassmas.
11. Plant growth Regulators and Tissue culture and its application in Pharmacy.

Pharm/T/325 PHARMACEUTICAL ENGINEERING- I

Heat transfer: Heat transfer by conduction; Thermal conductivity conduction in series; Different problems on heat conduction; Heat transfer by convection; concept of film and overall heat transfer coefficients; Heat transfer from condensing vapour; Heat transfer to boiling liquids; Heat exchangers-- Shell and tube, Double pipe, Extended Surface; Heat transfer by radiation, Stefan's Law and Kirchoff's laws, practical applications. Problems on heat transmission.

Pharm/T/326 APPLIED MICROBIOLOGY - II

Types of antimicrobial drugs and their origin. Manufacture of antibiotics and chemotherapeutic antimicrobials by biotransformation. Mechanism of action of antibiotics Bacterial resistance to antibiotics. Microbial synthesis of nucleic acids and their components Microbial synthesis of amino acids, peptides and enzymes. Chemical disinfectants, antiseptics and preservatives - evaluation, mode of action of microbial resistance Manufacture of alcoholic beverages and enzymes of medical importance. Ecology of micro organisms affecting pharmaceutical industry. Microbial spoilage and preservation of pharmaceutical products. Pharmaceutical products of microbial origin. Production of therapeutic drugs by genetic engineering (Recombinant DNA Technology) Immobilization and fermentation technology.

Pharm/S/321 PHARMACEUTICS LABORATORY - IV

Preparation of the following will be exemplified -Emulsion, Ointment, including Non-staining Iodine ointment, Paste, Suppository, Pre-oral liquid preparation, liquid antiseptics.

Pharm/S/322 PHARMACEUTICAL CHEMISTRY LABORATORY - VI

(Synthesis of drugs 2 - 3 steps)

Preparation of drugs involving two three steps.

Pharm/S/323 PHARMACOGNOSY LABORATORY

1. Identification of crude drugs mentioned in theory
2. Microscopic studies of the crude drugs mentioned in theory
3. Preparation of herbarium sheets
4. Powder analysis of crude drugs mentioned in theory.
5. Extraction of crude drugs
6. Chemical group tests on the crude drugs.
7. Thin layer chromatographic studies of the herbal drug constituents.
8. Isolation, separation, Purification of various groups of Chemical groups of constituents of pharmacological significance.
9. Microscopic measurement of cells and cell contents: Starch grains, calcium oxalate crystals and phloem fibres, trichomes etc.
10. Determination of leaf constants such as stomatal index, stomatal number, vein islet number, vein termination number and Palisade ratio.

Fourth Year First Semester

Pharm/T/411 PHARMACEUTICS- VII

PHARMACEUTICAL BIOTECHNOLOGY:
Conept of synthesis of DNA & RNA, outline of recombinant DNA technology, cloning and their pharmaceutical applications and sig nificance. Protein, peptide & gene deliveries: Their basics,success,limitation and application
NOVEL DRUG DELIVERY SYSTEMS:
Liposomes: fundamentals of manufacturing, evaluation, advantages & limitations, application, fusogenic liposomes. Niosomes & their fundamentals
Iontophoresis & sonophoresis : fundamentals, evaluation & applications. Prodrug and drug latentiation. Sterilizations of specific pharmaceutical product as per official compendia.

Pharm/T/412 MEDICINAL CHEMISTRY - III

1. Drug metabolism and concept of prodrugs.
2. Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship (including physiochemical aspects) of the following drugs (biochemical approaches in drug designing wherever applicable should be discussed).
i. Antibiotics : Detailed studies on penicillin, cephalosporins, macrolides, tetracyclines, chloramphenicol.
ii. Synthetic agents : sulphonamides, quinolines, fluroquinolones.
iii. Chemotherapeutic agents : Antiamoebic, antifungal, antimalarial, anthelmintics.

iv. Antiviral including anti HIV agents.
v. Diagnostic agents.
3. Aminoacids, peptide, neucleotide and related drugs.
a. Thyroid and antithyroid drugs.
b. Insulin and oral hypoglycemic agents.
c. Peptidomimetics and neucleomimetics.

Pharm/T/413 PHARMACOLOGY - III

1. Renal Pharmacology: Diuretics.
2. Local Hormones: 5-HT, GABA, Bradykinin and lipid derived eicosanoids.
3. Allergy; Concepts of allergy and Anti allergic drugs.
4. Respiratory pharmacology: Drugs used in the treatment of various disorders of the respiratory tract.
5. Chemotherapy:
a) Bacterial infections: Anti bacterial drugs (drugs acting on the cell wall, affecting protein synthesis, topoisomerase inhibitors, anti-tubercular drugs and miscellaneous agents).
b) Viral diseases: Anti viral drugs.
c) Protozoal diseases:
(i) Malaria and anti malarial agents.
(ii) Leishmaniasis and anti Leishmanic drugs
(iii)Drugs with trypanocidal activity.
(iv) Anti amoebic drugs.
(v) Helminthic infection and antihelminthic drugs.
6. Cancer chemotherapy.

Pharm/T/414 PHARMACOGNOSY - II

1. Quality control of Crude drugs; Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.
2. Phytochemical Screening:
a) Preparation of Extracts.
b) Screening of alkaloids, saponins, cardenolides and bufadienoildes, flavonoids and leucoanthocyanidins, tannins and polyphenols, anthroquinones, Triterpenoids cyanogenetic glycosides, aminoacids in plant extracts.
3. Plant bitters and sweeteners.
4. Biological sources, preparation, identification tests, and uses of the following enzymes: Diastase, papin, pepsin, trypsin, pancreatin.
5. Natural allergens and photosensitizing agents and fungal toxins.
6. Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substituents, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following alkaloid containing drugs.
a) Pyridine-piperidine: Tobacco, areca and lobelia.

b) Tropane: Belladona, hyocsyamus, datura, duboisia, coca and withania.
c) Quinoline and Isoquinoline: Cinchona, ipecac, opium.
d) Indole: ergot, rauwolfia, catharanthus, nux-vomica and physostigma.
e) Imidazole: Pilocarpine.
f) Steroidal: Veratrum and Kurchi.
g) Alkaloidal amine: Ephedra and Colchium.
h) Glycoalkaloid: Solanum
i) Purines: Coffee, tea and cola.
7. Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containg glycosides.
i) Saponins : Liquorice, ginseng, dioscorea, sarsaparilla and senega.
ii) Cardiovascular sterols: Digitalis, squill, strophanthus and thevetia.
iii) Anthroquinone Cathartics: aloe, senna, rhubarb, and cascara.
iv) Others: Psoralea, Ammi majus, Ammivisnaga, gentian, saffron, chirata, quassia.
8. Chemistry and biogenesis of medicinally important lignans and quassionoids, flavonoids.
9. Alkaloids; Chemistry, biogenesis, and pharmacological activity of Atropine and related compounds; Quinine, Reserpine, Morphine, Papavereine, Ephedrine, Ergot and Vinca alkaloids.
10. Marine pharmacognosy, novel medicinal agents from marine sources.
11. Herbal cosmetics.
12. Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs.

Pharm/T/415 ELECTIVE - I

1. INDUSTRIAL PHARMACY-I
2. NEWER DRUGS AND BIOTECHNOLOGICAL APPLICATIONS-I

Pharm/T/415A INDUSTRIAL PHARMACY-I

Bioavailability: the concept of bioavailability of drugs formulated as dosage forms, Generic Equivalence and inequivalence of oral product, Bioequivalence and therapeutic equivalence, Bioinequivalence, and therapeutic inequivalence. Illustrative examples.
Current G.M.P and Pharmaceutical processes validation; Scope and definition, organization and personnel etc.
Instrumentation in pharmaceutical industry: Measurement of temperature, pressure, density, humidity, viscosity, level and flow rate, and pollution control devices. Pilot plant study and scale-up techniques: Details of Pilot Scale-up methods, scope and uses.
Manufacturing or isolation of the following groups or categories from plants and animals; Secondary metabolites or drug constituents and secondary metabolites or Pharmaceutical Adjuvant. Sterilization in Pharmaceutical Industry and its control Fundamentals of immunology: toxins (bacterial, fungal etc.) preparation of antitoxins, toxiod

standardization; Manufacture of immunological products And their quality control, toxicity tests for vaccines and disinfectants.

Pharm/T/415A NEWER DRUGS AND BIOTECHNOLOGICAL APPLICATIONS-I

Modern concept relating to isolation, identification, and Synthesis of drugs. Definition: Evaluation: effects of carbohydrate, lipid, protein and nucleic acid metabolism; Genetic Engineering. Isolation, Purification and Standardization of biologically active compounds.

Pharm/S/411 PHARMACEUTICS LABORATORY - V

Evaluation of dosage form as per compendium.

Pharm/S/412 PHARMACEUTICAL CHEMISTRY LABORATORY - VII

(Drug Analysis-I)

1. Assay of antibiotics, (like Streptomycin , Penicillin e.t.c.) , Vitamins (like ascorbic acid), hormones by instrumental and other methods.
2. Assay of various classes by novel and classical methods e.g. INH,Sodium salicylate by iodimetry; Phenobarbitone, metronidazole, Ephedrine, e.t.c. by non aqueous titration; Hetrazan by extraction followed by residual alkalimetry; Paracetamol by UV spectrophotometry; Piperazine Citrate by Gravimetry; Sulpha drugs by potentiometric titrimetry etc.
3. Estimation of water content , alcohol content , ash content , fat content in medicinal and pharmaceutical agents.

Pharm/S/413 PHARMACEUTICAL ENGINEERING LABORATORY

EXPERIMENTS:

1. Determination of viscosity of an oil by Redwood viscometer.
2. Determination of flash points of solvents and mineral oil by Pensky Marten's apparatus.
3. Experiments on Reynolds Apparatus-determination of critical point.
4. Particle size measurement by Stoke's law.
5. Experiment on Filtration-determination of specific cake and filter medium resistance
6.Experiment on leaf filter unit- preparation of rate curve.
7.Experiment on Shell and tube heat exchanger-determination of O.H.T.C.
8.Experiment on Fluidized bed apparatus-determination of pressure drop at different fluidized bed heights.
9.Experiment on pot mill-determination of Rittinger's law and Kick's law coefficient.
10. Experiment on cabinet tray dryerand vacuum tray dryer.
11. To study the performance of laboratory fluidized bed dryer.

12. To study the performance of laboratory spray dryer.
13. Experiment on batch crystallizer.
14. Experiment on batch distillation to verify Rayleigh's equation.
15. To study the performance of laboratory bubble cap rectification column.
16. To study the performance of laboratory colloid mill. In addition to these experiments, students have to draw line drawings of different laboratory equipments like vacuum tray dryer, pot mill, fluidized bed apparatus, leaf filter setup, bubble cap column, spray dryer etc. in drawing plates.

Pharm/S/414 PHARMACOLOGY LABORATORY

1. Drugs acting on the eyes.
2. Narcotic analgesic activity.
3. Non-Narcotic analgesic activity.
4. Sedatives, hypnotics and muscle relaxants.
5. Anti convulsive activity.
6. Local Anaesthetic activity.
7. Pyrogen testing
8. Drugs activity on smooth muscle.
9. Drug activity on Skeletal muscle.
10. Drug activity on perfused heart.
11. Blood pressure

Fourth Year Second Semester

Pharm/T/421 PHARMACEUTICS - VIII

Regulations of clinical trials: Ethical guidelines, regulatory guidelines & legislation, clinical trial directives, GMP.
Intellectual property rights (IPRs) with reference to the Patents act: What is a patent? Criteria adopted for grant of a patent, when should an application for patent to be filed, essential documents needed to be submitted by a potential patentee. An opposition under the Indian Patent Act, 1970, cost of filling a patent, where to apply?
Pharmacokinetics: Fick's law, two compartment open model, two compartment closed model, one compartment open model, active transport, zero order kinetics, first order kinetics in active transport.
Hospital pharmacy practice: Professional aspects of hospital pharmacy organizations and administration, functions, standards, planning, legal aspects, formulary.

Pharm/T/422 MEDICINAL CHEMISTRY - IV

1. Theoretical aspect of rational drug design
a) Receptor mediated drug action: Second messenger theory and transducer mechanism

b) Influence of structural variations and physicochemical properties on drug action.
c) The drug development process.
d) An introduction to Classical QSAR: Free Wilson Model; LFER Model; Fujita Ban Model; Topological structure representation.
e) An introduction to computational Chemistry: Molecular mechanical and quantum mechanical tools
f) Computres in Medicinal Chemistry: Calculations of molecular properties; Conformational analysis, Pharmacophore identification; Docking procedure; Receptor mapping
2. An introduction to Combinatorial synthesis, Deconvolution techniques and High Throughput Screening(HTS).
3. Hormones
4. Vitamins
5. Immunosuppressants.

Pharm/T/423 PHARMACOLOGY - IV

1. Bioassay and biological standardization of drugs.
2. Drugs that act on blood and blood forming tissues.
3. Drugs acting on cardiovascular system: Anti arrhythmic drugs, Cardiotonic drugs, Anti anginal drugs and Anti hypertensives.
4. The drugs acting on Gastro Intestinal Tract, biliary system. Inflammatory bowel disease.
5. Respiratory pharmacology: Drugs used in treatment of various disorders of the respiratory tract.

Pharm/T/424 PHARMACEUTICAL ENGINEERING - II

1. Interphase mass transfer:Theories: Concept of mass transfer co-efficient, packed tower operations, different packing materials. Diffusional operations in gas and liquid systems. Problems on interphase mass transfer and diffusional operations.
2. Distillation: Raoult's and Henry's laws; Boiling point diagram; Relative volatility and and equilibrium diagram of binary mixture; Batch distillation and rectification; details of different rectification columns; Ma-Cabe Theile design method for plate calculation. Overall and Murphee plate efficiencies; Steam distillation; vacuum distillation, Azeotropic distillation. Problems on distillation.
3. Extraction:
I) Solvent extraction; Equipments
II) Leaching : Equipments Problems on solvent extraction
4. Drying: Classification of dryers: Theory of drying-constant and falling rate periods, EMC,CMC, FMC. Drying rate curves; Shrinkage and case hardening; Drying Equipments-Atmospheric tray, Vacuum tray, Fluidized bed, Rotary spray and pneumatic dryers, Infra red and freeze drying. Problems on drying.
5. Unit operations such as milling, mixing, filtration and centrifugation

6.Materials of construction: Metals ands alloys for fabrication. Materials other than metals and alloys; Selection of lining materials; metallic and organic surface coatings, corrosion problems.
7.Unit processes:
I) Introduction of the basic unit processes, Alkylation, Esterification, halogenation, hydrolysis, Nitration, oxidation as well as reduction.
II) Introduction to fermentation technology, Design of fermentors.
8. Basic instrumentation and control in pharmaceutical industry. Equipments for the measurement of a) Temperature b) Pressure c) Flow d) Level e) Density f) Humidity g) Level

Pharm/T/425 ELECTIVE - II

Pharm/T/425A INDUSTRIAL PHARMACY-II

Stability studies of Pharmaceuticals: Stability program at preformulation and formulation stages of Pharmaceuticals, Stability prognosis for marketed batches of products. Physics of tablet compression: Physicochemical and physicomechanical properties of granules affecting the degree of compression, Static and dynamic factors involved in compression, Binding mechanisms in compression, Illustrative examples. Fermentation technology: Aerobic and anaerobic fermentation batch and continuous fermentation, fermentor designs, fermentor accessories, products of fermentation. Fundamentals of Reactor design The design aspects of reactors used in the production of synthetic chemicals of pharmaceutical uses by nitration, amination, halogenation, oxidation, hydrolysis, esterification, alkylation etc. Principles and equipment involved for processing any categories under "A" and for the following topics: Size reduction of tissues, dehydration or drying, solvent and solubility, filtration, Preservation of Extractives or Isolates, Packaging or Labeling. Ecology of Microorganisms affecting Pharmaceutical is processing: Aspect of microbiological technique in Pharmaceutical Industry. Microbiological Aspects of fermentation for drugs of microbial origins. Production of therapeutically useful substance by recombinant DNA technology.

Pharm/T/425B NEWER DRUGS AND BIOTECHNOLOGICAL APPLICATION-II

Modern Concept relating to design and analysis of drugs including GMP. Mechanism at the cellular, enzymatic and molecular level, development of diagnostic kits, future perspectives. Screening of Newer drugs.

Pharm/T/426 GENERAL VIVA-VOCE

Based on all the theoretical and sessional subjects of B.Pharm course.

Pharm/S/415
Pharm/S/421 PROJECT / SEMINAR

Syllabus : pertaining to the syllabus covered under theory for final year

Pharm/S/422 PHARMACEUTICS LABORATORY - VI

Cosmetic preparations, Creams and gels, Shampoo, After-shave lotion, Body powder, Face powder, Face compacts, Nail polish, Nail polish remover, Lipsticks, Perfumes.

Pharm/S/423 PHARMACEUTICAL CHEMISTRY LABORATORY - VIII

(Drug Analysis - II)

Assay of various classes of drugs using modern techniques.