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  
5. Development - Conceptions of and approaches to development - The Roles of State and the Market in the Development  
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  
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 exemplified by plants and animals.
- Classification of Plant and Animal Kingdom with cognate examples from both the groups.
- Concept of species modernisation of the concept with the advantage of Genetic Technology.
- Study of Mammalian features with reference of Man and Rodants.
- Study of Gastrointestinal, Cardiovascular and Respiratory system of man and guineapig (excluding 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 disease 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 correlation of DNA and Genetic disease with Mendelian inheritance.
- Schematic representation of Brain and Spinal cord of man.

**AM/ME/T/2 SOLID MECHANICS**

Statics

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).
I. **Calculus**
   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.
   x) The Chi Square test.
   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 temperature scale, Heat and Work, First law of thermodynamics and some applications, Reversible and irreversible processes, Carnot cycle, Second law of thermodynamics, Concept of entropy, Thermodynamic relations.

**Ph/S/1 PHYSICS LABORATORY**

(Selected Experiments from the following)

1. Determination of Galvanometer resistance by half - deflection 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.
12. To determine co-efficient of viscosity by Capillary flow 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.

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 definition, significant figures. Rules of retaining significant digits, 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, Henderson-Hasselbach 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 H3PO4, NaOH, CaCO3, 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-Lussae 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, digestive washing of the precipitate, filtration, filter papers and crucibles, ignition, thermogravimetric curves, specific examples like barium sulphate, aluminium as aluminium oxide, 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:
- 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

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, determination of physical constants, group solubility, functional groups and preparation of derivatives.

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

Assay of inorganic pharmaceuticals acidimetry, 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 pharmaceutical 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.

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.
3. Problems related to thermophysics and thermochemistry.

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.
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 phytocuticals- qualitative test procedures; Phytomedicines with different dosage forms, their formulation and development.
3) Standardisation and quality control of natural products:-
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. Fluorides and general health, iodine as antigoiterogenic
4. Mineral II: Essential trace elements, transitional elements and their compounds, iron and the hematincs, 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

**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 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. Instrumental Analysis:-
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 drug 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 anticholinesterases
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**


**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 1948 and 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.
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, personal, 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.

Ophthalmic 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 administration 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, antiarrhythmics 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, Taxonomical, 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.
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.
7. Cultivation, collection, processing and storage of crude drugs: Factors influencing cultivation of medicinal plants. Types of soils and fertilizers of common use Pest
management and natural pest control agents. Plant hormones and their applications. Polyplody, 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.
10. Tannins: Study of tannins and tannin containing 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.

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

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:
Concept of synthesis of DNA & RNA, outline of recombinant DNA technology, cloning and their pharmaceutical applications and significance. Protein, peptide & gene deliveries: Their basics, success, limitation and application

NOVEL DRUG DELIVERY SYSTEMS:

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 nucleomimetics.

**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 anthelminthic drugs.

**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 bufadienoides, 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, hyoscyamus, datura, duboisia, coca and withania.
c) Quinoline and Isoquinoline: Cinchona, ipecac, opium.
d) Indole: ergot, rauwolfia, catharanthus, nux-vomica and phsysostigia.
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 containing 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.
8. Chemistry and biogenesis of medicinally important lignans and quassionoids, flavonoids.
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, toxoid
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.
10. Experiment on cabinet tray dryer and 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.
4. Sedatives, hypnotics and muscle relaxants.
5. Anti convulsive activity.
6. Local Anaesthetic activity.
7. Pyrogen testing
8. Drugs activity on smooth 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) Computers 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 and 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

1. INDUSTRIAL PHARMACY-II
2. NEWER DRUGS AND BIOTECHNOLOGICAL APPLICATION-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.