BHAGWANT UNIVERSITY- AJMER

Institute Of Pharmaceutical Sciences and Research Centre

M.Pharm –Pharmaceutics

First semester

Paper No.	Subject	**Teaching Periods**			**Credit Points**
		L	**T**	**P**	
01MPP101	Methods in Pharmaceutical Research, Theory	3	1	0	4
01MPP102	Product Development, Theory	3	1	0	4
01MPP103	Biopharmaceutics and Pharmacokinetics, Theory	3	1	0	4
01MPP201	Methods in Pharmaceutical Research, Practical	0	0	6	3
01MPP202	Product Development, Practical	0	0	6	3
01MPP301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Second semester

Paper No.	Subject	**Teaching Periods**			**Credit Points**
		L	**T**	**P**	
02MPP101	Advances in Pharmaceutical Sciences, Theory	3	1	0	4
02MPP102	Novel Drug Delivery System, Theory	3	1	0	4
02MPP103	Advanced Pharmaceutics & Biotechnology, Theory	3	1	0	4
02MPP201	Novel Drug Delivery System, Practical	0	0	6	3
02MPP202	Advanced Pharmaceutics & Biotechnology, Practical	0	0	6	3
02MPP301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Third semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MPP 201	DISSERTATION SYNOPSIS a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
03MPP301	Discipline & extra curricular activities	0	0	4	1
	Total	17		4	18

Final semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04MPP 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
04MPP 301	Discipline & extra curricular activities	0	0	4	1
	Total	17		4	18

M. Pharm -Pharmaceutical Chemistry

First semester

Paper No.	Subject	Teaching Periods			Credit Points
		L	T	P	
01MPC02101	Methods in Pharmaceutical Research, Theory	3	1	0	4
01MPC02102	Advanced Medicinal Chemistry-I (Chemistry of Natural Products), Theory	3	1	0	4
01MPC02103	Drug Discovery and Development (CADD, QSAR & Receptor Based Drug Design), Theory	3	1	0	4
01MPC02201	Methods in Pharmaceutical Research, Practical	0	0	6	3
01MPC02202	Advanced Medicinal Chemistry-I (Chemistry of Natural Products), Practical	0	0	6	3
01MPC02301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Second semester

Paper No.	Subject	Teaching Periods			Credit Points
		L	T	P	
02MPC02101	Advances in Pharmaceutical Sciences, Theory	3	1	0	4
02MPC02102	Advanced Pharmaceutical Chemistry (Organic Name Reactions, Reaction Mechanism & Stereochemistry), Theory	3	1	0	4
02MPC02103	Advanced Medicinal Chemistry-II (Chemistry of Synthetic Drugs with Biochemical Approach), Theory	3	1	0	4
02MPC02201	Advanced Pharmaceutical Chemistry (Organic Name Reactions, Reaction Mechanism & Stereochemistry), Practical	0	0	6	3
02MPC02202	Advanced Medicinal Chemistry-II (Chemistry of Synthetic Drugs with Biochemical Approach), Practical	0	0	6	3
01MPC02301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Third semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MPC02 201	DISSERTATION SYNOPSIS a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
03MPC02 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

Final semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04MPC02 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
04MPC02 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

M.Pharm –Pharmacology

First semester

Paper No.	Subject	**Teaching Periods**			**Credit Points**
		L	**T**	**P**	
01MPL04101	Methods in Pharmaceutical Research, Theory	3	1	0	4
01MPL04102	Systemic Pharmacology-I, Theory	3	1	0	4
01MPL04103	Advanced Pharmacology, Theory	3	1	0	4
01MPL04201	Methods in Pharmaceutical Research, Practical	0	0	6	3
01MPL04202	Systemic Pharmacology-I, Practical	0	0	6	3
01MPL04301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Second semester

Paper No.	Subject	**Teaching Periods**			**Credit Points**
		L	**T**	**P**	
02MPL04101	Advances in Pharmaceutical Sciences, Theory	3	1	0	4
02MPL04102	Methods in Drug Evaluation, Theory	3	1	0	4
02MPL04103	Systemic Pharmacology-II, Theory	3	1	0	4
02MPL04201	Methods in Drug Evaluation, Practical	0	0	6	3
02MPL04202	Systemic Pharmacology-1I, Practical	0	0	6	3
02MPL04301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Third semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MPL04 201	DISSERTATION SYNOPSIS a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
03MPL04 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

Final semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04MPL04 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
04MPL04 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

M.Pharm (Quality Assurance)

First semester

Paper No.	Subject	**Teaching Periods**			**Credit Points**
		L	**T**	**P**	
01MPQ06101	Methods in Pharmaceutical Research, Theory	3	1	0	4
01MPQ06102	Standardization & Stabilization Methods (Drugs & Formulations including Herbal Products, Food & Cosmetics), Theory	3	1	0	4
01MPQ06103	Total Quality Management-I, Theory	3	1	0	4
01MPQ06201	Methods in Pharmaceutical Research, Practical	0	0	6	3
01MPQ06202	Standardization & Stabilization Methods (Drugs & Formulations including Herbal Products, Food & Cosmetics), Practical	0	0	6	3
01MPQ06301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Second semester

Paper No.	Subject	**Teaching Periods**			**Credit Points**
		L	**T**	**P**	
02MPQ06101	Advances in Pharmaceutical Sciences	3	1	0	4
02MPQ06102	Advanced Pharm. Analysis-Method Development, Theory	3	1	0	4
O2MPQ06103	Total Quality Management-II, Theory	3	1	0	4
02MPQ06201	Advanced Pharm. Analysis-Method Development, Practical	0	0	6	3
O2MPQ06202	Total Quality Management-II, practical	0	0	6	3
02MPQ06301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**16**

Third semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MPQ06 201	DISSERTATION SYNOPSIS a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
03MPQ06 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

Final semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04MPQ06 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
04MPQ06 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

M.Pharm (Pharmaceutical Management and Regulatory Aff

First semester

Paper No.	Subject	Teaching Periods			Credit Points
		L	T	P	
01MPM05101	Methods in Pharmaceutical Research, Theory	3	1	0	4
01MPM05102	Pharmaceutical Management-I (General, & Personnel), Theory	3	1	0	4
01MPM05103	Total Quality Management, Theory	3	1	0	4
01MPM05104	Drug Regulatory Affairs-I (National Regulatory Aspects), Theory	3	1	0	4
01MPM05201	Methods in Pharmaceutical Research, Practical	0	0	6	3
01MPM05301	Discipline & extra curricular activities	0	0	4	1
	Total	**12**	**4**	**10**	**20**

Second semester

Paper No.	Subject	Teaching Periods			Credit Points
		L	T	P	
02MPM05101	Advances in Pharmaceutical Sciences	3	1	0	4
02MPM05102	Pharmaceutical Management-II (Production), Theory	3	1	0	4
02MPM05103	Pharmaceutical Management-III (Finance, Project), Theory	3	1	0	4
02MPM05104	Drug Regulatory Affairs–II (Including International Regulatory Aspects), Theory	3	1	0	4
02MPM05105	Pharmaceutical Management-II (Marketing), Theory	3	1	0	4
02MPM05301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**5**	**16**	**21**

Third semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MPM05 201	DISSERTATION SYNOPSIS a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
03MPM05 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

Final semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04MPM05 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
04MPM05 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

M.Pharm (Pharmacognosy)

First semester

Paper No.	Subject	Teaching Periods			Credit Points
		L	**T**	**P**	
01MPG03101	Methods in Pharmaceutical Research, Theory	3	1	0	4
01MPG03102	Advanced Pharmacognosy, Theory	3	1	0	4
01MPG03103	Indian system of Medicine, Theory	3	1	0	4
01MPG03201	Methods in Pharmaceutical Research, Practical	0	0	6	3
01MPG03202	Advanced Pharmacognosy , Practical	0	0	6	3
01MPG03301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Second semester

Paper No.	Subject	Teaching Periods			Credit Points
		L	**T**	**P**	
02MPG03101	Advances in Pharmaceutical Sciences, Theory	3	1	0	4
02MPG03102	Herbal Drug Development & Standardisation, Theory	3	1	0	4
02MPG03103	Phytochemistry & Biotechnology Theory	3	1	0	4
02MPG03201	Herbal Drug Development & Standardisation, Practical	0	0	6	3
02MPG03202	Phytochemistry &Biotechnology Practical	0	0	6	3
02MPG03301	Discipline & extra curricular activities	0	0	4	1
	Total	**9**	**3**	**16**	**19**

Third semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
03MPG03 201	DISSERTATION SYNOPSIS a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
03MPG03 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

Final semester

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
04MPG03 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
04MPG03 301	Discipline & extra curricular activities	0	0	4	1
	Total	17	0	4	18

M. Pharm (COMMON PAPER)

First semester-

01MPP01 101, 01MPC02 101, 01MPL04 101, 01 MPQ06101, 01 MPM05 101, 01 MPG03 101	**Methods in Pharmaceutical Research, Theory (COMMON PAPER)**	**60 Hrs.**

UV–Visible spectroscopy: Brief review of electromagnetic spectrum, UV-Visible range, energy–wavelength–color relationships. Interaction of electro–magnetic radiation (UV-Vis) and matter and its effects, chromophores and their interaction with E.M.R. applications of UV.

Infra-Red spectroscopy: Nature of I.R. radiation, interaction of I.R. radiation with organic molecules and effects on bonds, molecular or infra-red spectra, brief outline of classical I.R. instrumentation and interpretation of spectra including saMPL04e preparation for spectroscopy, qualitative interpretation of I.R. spectra, quantitative methods and recent advances in I.R. spectroscopy including FTIR, ATR, etc.

Nuclear Magnetic Resonance spectroscopy: Fundamental principles of NMR (magnetic properties of nuclei: applied field and precession: absorption and transition frequency), chemical shifts concept, factors affecting chemical shift, isotopic nuclei, reference standards; Proton magnetic spectra, their characteristics, presentation, terms used in describing spectra and their interpretation (number position and intensity of signal), brief outline of instrumental arrangements and some practical details, signal multiplicity phenomenon in high resolution PMR; Spin-spin coupling, application of signal splitting and coupling constant data to interpretation of spectra, proton exchange reactions, decoupling and shift reagent methods.Brief outline of principles and application of FT-NMR with reference to ^{13}C-NMR, introduction to 2-D NMR techniques.

Mass Spectrometry: Basic principles and brief outline of instrumentation, ion formation and types; molecular ions, meta stable ions, fragmentation processes, fragmentation patterns and fragment characteristics in relation to parent structure and functional groups, relative abundances of isotopes and their contribution to characteristic peaks, mass spectrum; its characteristics, presentation and interpretation, chemical ionization mass spectrometry, GC-MS including recent advances in MS, Fast atom bombardment mass spectroscopy; analysis of drugs in biological saMPL04es by combined GC- MS.

Chromatography: Basic principles, instrumentation, methodological techniques and quantitative analysis of drugs and their metabolites using column chromatography, ion exchange chromatography, GC, GLC, HPLC and HPTLC.

Biostatistics: The application of the following in pharmacy shall be covered.
Mean, median and mode, standard deviation and coefficient of variation, students t-test, one way ANOVA, chi-square test, probability, frequency distribution, regression analysis.

01MPP01201, 01MPC02201, 01MPL04201, 01MPQ06201, 01MPM05201, 01 MPG03201	**Methods in Pharmaceutical Research, Practical (COMMON PAPER)**	**60 Hrs.**

Experiments based on calibration and validation of analytical instruments.
Qualitative and quantitative analysis of pharmaceutical preparations and dosages having single component or in combination of following categories: (biological and microbiological methods excluded).

i) Alkaloids ii) Antibiotics iii) Steroidal hormones iv) Vitamins v) Barbiturates vi) Sulfa drugs.

U.V./ Visible spectrum scanning of certain organic compounds, absorption and correlation of structures, comparison e.g., chloramphenicol, analgin, paracetamol, sulphadiazine, Ibuprofen etc., effect of pH and solvent on UV spectrum of certain drugs.
Estimation of single drug (raw material/ formulations) by colorimetry involving different reagents.
Determination of UV cut off wavelength for different solvents.
Estimation of single drug (raw material/ formulations) by UV spectrophotometry.
Simultaneous estimation of paracetamol and ibuprofen and other combination formulations by UV spectrophotometry using simultaneous equations/ derivative spectroscopy/ multiwavelength spectroscopy etc.
Comparison of three different analytical methods for salbutamol or other drugs.
Calibration of IR spectrophotometer using polystyrene film and checking the performance of the instrument.
Recording IR spectra for known drugs and comparing with that of Pharmacopoeia, estimation of drugs using IR.
IR spectra of siMPL04e molecules and interpretation of the same.
Structural elucidation of at least 5 unknown compounds using UV, IR, NMR and Mass spectral data.
ive analysis, pesticide analysis, microbial content determination and evaluation by other advanced methods like UV, IR, GLC, HPLC, TLC, & HPTLC etc.

M.PHARM (PHARMACEUTICS)

First Semester

01MPP01102	**Product Development, Theory**	**60 Hrs.**

Preformulation: Introduction, organoleptic properties, purity, particle size, shape, and surface area.Solubilisation, surfactants and its importance, temperature, pH, co-solvency;Techniques for the study of crystal properties and polymorphism. Physicochemicalcharacteristics of new drug molecules with respect to different dosageforms.

Designing of Oral Pharmaceuticals: Formulation, evaluation, stability studies and recent advances in dosage forms; tablet, capsule, suspension, emulsion; microencapuslation, advances in coating techniques.

Development of Parenterals: Concepts, formulation, evaluation of large and small volume parenterals, environmental control and quality assurance in manufacturing.

Ophthalmic Preparations: Introduction, physiology of eye, formulation considerations and evaluation of ophthalmic products (ointments, suspension, eye drops, contact lenses, occuserts etc.), containers and closures.

Stability Studies: Basic concepts, consideration of physical and chemical stability studies, determination of shelf life, problems encountered during storage of dosages forms, ICH guidlines.

01MPP01202	**Product Development, Practical**	**60 Hrs.**

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Enhancement of solubility of the given drug by solid dispersion technique.
Formulation and evaluation of matrix tablet of given drug.
Formulation and characterization of topical gels of some anti-inflammatory drugs.
Comparison of release rate profile of conventional and sustained release tablets.
Preparation of microcapsules by different techniques and their evaluation.
Determination of shelf life of aspirin by accelerated stability studies.
Evaluation of spherical crystallization as a particle size enlargement technique for aspirin.
Formulation and evaluation of ophthalmic dosage forms.

Performance of physical stability and dissolution studies of the suspension of given drug.
Formulation and evaluation of suppositories of given drug.

01MPP01103	Biopharmaceutics and Pharmacokinetics, Theory	60 Hrs.

Absorption Of Drugs: Definition, Structure of cell membrane and composition, Gastrointestinalabsorption – Mechanism, Factors affecting drug absorption: Biological,Physiological, Physico-Chemical and Pharmaceutical dosage form factors;Methods of determining absorption: Invitro and Invivo methods.

Distribution Of Drugs : Definition, Distribution in blood and other fluids: cellular distribution, drugpenetration to CNS, placental transfer of drugs and blood flow; Volume ofdistribution, Plasma protein binding: Drug distribution and drug effects, Drug binding in tissues.

Biotransformation Of Drugs : Definition, Phase I and Phase II reactions and Factors affecting biotransformation.

Excretion Of Drugs: Definition, Renal and non- renal excretion.

Dosage Regimen : Multiple dosing with respect to IV and oral route, concept of loading dose, maintenance dose and accumulation index.

Pharmacokinetics:
A) Definitions, Basic considerations - zero order and first order kinetics.
B) A detailed study of open one compartment model and open Twocompartmentmodel
C) Non-compartmental methods-Area under first movement curve (AUMC), drug clearance, apparent volume of distribution, mean residence time (MRT) and its significance.
D) Concept of clearance- Organ clearance, Total clearance, Hepatic clearance and Renal clearance. (MRT) and its significance.
E) Non- linear Pharmacokinetics: Cause of non-linearity, Michaelis-menten equation, Estimation of Km and Vmax.

.M.Pharm (Pharmaceutical Chemistry)

First semester

01MPC02102	Advanced Medicinal Chemistry-I (Chemistry of Natural Products), Theory	60 Hrs.

Carbohydrates: Disaccharides, determination of structures, sucrose, maltose, lactose, polysaccharides, cellulose, starch, introduction to lignin, pectin, pectic substances.Fats, oils, waxes,; their general classification and chemistry.

Alkaloids: Classification, general methods of structural elucidation, chemistry and pharmacological activity of . Atropine and related compounds,Quinine and quinidine,. Reserpine, Morphine and related compounds, Papaverine, Ephedrine,Ergot and Vinca alkaloids.

Vitamins: Chemistry and medicinal and pharmaceutical uses of vitamin A, D, E, K, B1, B2, B6,B12 and Folic acid.

Purines: A brief account of chemistry and structural elucidation of uric acid, caffeine,theobromine and theophylline.

B– LACTUM ANTIBIOTICS.

Mechanism of action, penicillins, cephalosporins, monobactums carbapenems and penems, B-lactamase inhibitors and other B-lactam agents.

NON Beta-LACTUM ANTIBIOTICS.
Amino glycosides, macrolides, linomycins and polypeptide antibiotics.

STEROIDAL HORMONES :
Steroid receptor, natural hormones and currently used synthetic derivatives, SAR,comparison of activity, transformation of phytosterols into steroidal drugs.

01MPC02202	**Advanced Medicinal Chemistry-I (Chemistry of Natural Products), Practical**	**60 Hrs.**

1.Synthesis of compounds involving heterocyclic ring systems.
2 Qualitative analysis of mixture of organic compounds containing two compounds – methods.
3. Preparation of organic drugs or intermediate involving one-step reaction and two-step reaction.
4. Isolation, identification and quantitative analysis of certain natural constituents.

01MPC02103	**Drug Discovery and Development – Theory**	**60 Hrs.**

Drug Discovery
Drug discovery without lead, lead discovery: random screening, non random screening , clinical observation, rational approach to lead discovery

Drug Development:
Lead modification, identification of active moiety. SAR, structure modification to increase potency & therapeutic index : homologation, chain branching ring chain trans formation, bioisosterism and QSAR

Theoretical aspects of drug design:
Introduction, theoretic approach:property activity relationship, intrinsic activity,& linear free energy relationship,etc

Drug metabolism and drug design
Prodrug: design of prodrugto improve physical and biological properties of drug: enzyme concerned in activation of pro drug, modification leading to increased absorption of drug, modification leading to elimination of unwanted physical properties of a drug, , modification leading to increased duration of drug, etc

Metabolism: Introduction, different phases, metabolic pathways of different drugs, importance in drug design.

Enzyme Inhibitors And Drug Design
Introduction, Basic Concept, Types Of inhibitors. ExaMPL04e of reversible and irreversible enzyme inhibitors used as drugs
inals, cardiotonics), CNS (anesthetics, sedative–hypnotics, anticonvulsants, antipsychotics and CNS stimulants), immunosuppressants, immunostimulants, antibacterials, antivirals, antineoplastics, and malaria, tuberculosis, diuretics, antihistaminics, cholinergic and anticholinergics.

M.Pharm –Pharmacology

First semester

01MPL04102	Systemic Pharmacology–I, Theory	60 Hrs.

General Pharmacology: Mechanisms of action of drugs with special emphasis on receptors, their nature and other characteristics. Dose-response relations, plasma concentration-time curves, pharmacokinetic parameters and their inter-relationships. Zero and first order pharmacokinetics. One compartment and two compartment pharmacokinetic models. Adverse drug action, Drug interation , Therapeutic drug monitoring.

In-depth study, including mechanism of action, pharmacodynamic actions, adverse effects, drug interactions, indications, contra-indications, important therapeutic aspects and recent advances of drugs belonging to the following categories:

Drugs Acting on ANS: Cholinergic drugs, anti-cholinesterase drugs, anti-cholinergic drugs, adrenergic drugs, adrenergic receptor and neuron blockers, antiadrenergic.

Drugs Acting on PNS: Neuro-muscular blockers, local anesthetics.

Drugs Acting on CNS: Ethanol, general anesthetics, sedatives and hypnotics, anti-epileptics, narcotic analgesics, centrally acting muscle relaxants, Drugs used in mental illness.

Autacoids: Histamine, serotonin and their antagonists; eicosanoids, anti-inflammatory drugs, anti-gout drugs, drugs used in treatment of asthma.

Drugs Acting on Blood and Blood-forming Organs: Hematinics, anti-coagulants, haemostatic, fibrinolytics, anti-hypercholesterolemics.

Gastro-intestinal Drugs: Anti-ulcer drugs, laxatives and purgatives, emetics, anti-emetics.

Diuretics and anti-diuretics.

01MPL04202	Systemic Pharmacology–I, Practical	60Hrs.

Experiments involving action of drugs on autonomic effectors using preparations like frog/ mammalian heart, cat/ dog/ rat blood-pressure (major experiments), rat/ guinea pig/ rabbit intestine, rat uterus. The exercises should include investigations into mechanism of action of given autonomic drug.

Experiments to demonstrate/ detect the presence of the following actions in drugs: Sedation/ hypnosis, muscle relaxation, anti-convulsant action, anti-anxiety action, analgesic action, neuroleptic effect, anti-ulcer effect etc.

01MPL04103	Advanced Pharmacology, Theory	60Hrs

Mechanisms of free-radical and oxidative injury in biological systems. Involvement of such injury in pathological processes and states.

Nitric Oxide: Generation and role in physiology and pharmacology.

Immuno-modulation: Immune response, cell-mediated and humoral immunity. Immune-deficiency states. Pharmacology of immunomodulatory agents and their applications.

Ion-Channels: Various types of ion channels. Characteristics of sodium, potassium, calcium and chloride channels. Role of various ion channels in physiology and pathological states. Regulation of ion channels and drugs modifying ion-channel function.

Role of various central neuro-transmitters in physiology and pathological states. Agents modulating neurotransmitter function in brain (with special reference to acetylcholine, dopamine, nor-adrenaline, glutamic acid, aspartic acid, GABA and glycine)

Bio-active Peptides: Source, characteristics and pathological and physiological roles of VIP, gastrin, cholecystokinin, opioid peptides, melatonin, neurokinins, plasmakinins, angiotensin, interleukins, platelet activating factor, TNF-α and interferons.

Receptor signal transduction mechanisms, role of second messengers(cAMP,IP_3 etc).

Introduction to stem cell, gene therapy and molecular oncology.

M.Pharm (Quality Assurance)

First semester

01MPQ06102	**Standardization & Stabilization Methods-Drugs & Formulations including Herbal Products, Food & Cosmetics, Theory**	**60 hrs**

Biological standardization, general principles, scope and limitation of bioassays, procedures involved in the biological assay of some official drugs and vaccines.

Pyrogens: Production, chemistry and properties of bacterial pyrogens and endo-toxins, pyrogen testing of IP compared to that of BP and USP, LAL test.

Pre-Clinical drug evaluation; acute, sub-acute and chronic toxicity studies, LD50, ED50 determination, evaluation of compound for its biological activity, study of special toxicities like teratogenecity and mutagenecity.

Microbiological assay of antibiotics and vitamins.

Extraction, isolation, purification, identification and therapeutic importance of following markers (Phytopharmaceuticals); Artemisine, Reserpine, Vinca alkaloids, Podophyllotoxin, Ginseng Saponins, Diosgenin, Taxol, Guggulipids and Rutin.

Novel technologies used in the development of phytomedicines like polyploidy, hybridization, mutation, incorporation of plant growth regulators and tissue cultures.

Food products: Concepts of nutritional requirements at different age, sex and in different conditions of disease, pregnancy and lactation etc, different types of additives used, analysis of nutritional and other ingredients in ethical and non ethical foods.

Cosmetics: Ingredients used in various products such as creams, powders, lotions, hair products, nail polishes, lipsticks, depilatories and toiletries etc. and their analysis.

Formulation, stabilization and evaluation of tablets, capsules and liquid dosage forms, parenteral preparations, transdermal products, suppositories and controlled release products.

Containers and closures for pharmaceuticals: Types, performance, quality control tests; assuring quality of glass; types of plastics used, permeation, leaching, sorption, chemical reaction, biological tests, modification of plastics by drugs; different types of closures and closure liners; film wrapper; blister packs; bubble packs; shrink packaging; foil / plastic pouches, bottle seals, tape seals, breakable seals and sealed tubes; quality control of packaging material and filling equipment.

Flexible packaging, product package compatibility, transit worthiness of package.

01MPQ06202	Standardization & Stabilization Methods-Drugs & Formulations including Herbal Products, Food & Cosmetics, Practical	60Hrs

Sterility tests: Methodology and interpretation.
Microbiological assay of antibiotics and vitamins.
Bioassays.
Experiments involving use of microbiological techniques in analysis of drug substances, pharmaceutical aids and dosage forms.
Animal experiments for determination of activity, potency and toxicity of drug substance and dosage forms.
Animal experiments for assessing safety of packaging materials.
Pilot plant experiments.
Quality control testing for pharmaceutical containers, plastic materials, paper board, aluminum caps and rubber closures, of labels, label adhesives, of strip pack and blister pack and of corrugated boxes.
Parameter studies for physical stability of drugs.
Shelf life study of formulations.
Preparing protocols on various validation requirements.
Thin layer, paper and column chromatography.
Evaluation of crude drugs.
Evaluation/ standardization of extracts based on WHO guidelines.
Preparation and evaluation of herbal formulations and herbal cosmetics.
Isolation, separation, purification and identification of important phytoconstituents.

01MPQ06103	Total Quality Management-I, Theory	60Hrs

Concepts and philosophy of TQM, GLP, GMP (orange guide).
Drug regulatory and accrediting agencies of the world (USFDA, TGA, ICH, WHO, ISO etc.).
Good manufacturing practices.
Organization and personnel, responsibilities, training, hygiene.
Premises: Location, design, plant layout, construction, maintenance and sanitation, environmental control, utilities and services like gas, water, maintenance of sterile areas, control of contamination.
Equipments: Selection, purchase specifications, maintenance, clean-in-place, sterilize-in-place, methods (TP and STP).
Raw materials: Purchase specifications, maintenance of stores, selection of vendors, controls on raw materials and finished dosage forms.
Manufacture of and controls on dosage forms: Manufacturing documents, master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities.
In process quality controls on various sterile and non–sterile dosage forms; standard operating procedures for various operations like cleaning, filling, drying, compression, coating, disinfections, sterilization, membrane filtration etc.
Packaging and labeling control, line clearance, reconciliation of labels, cartons and other packaging materials.
Quality control laboratory: Responsibilities, good laboratory practices, routine control instruments, reagents, saMPL04ing plans, standard test procedures, protocols, non-clinical testing, controls on animal house.
Data generation and storage, quality control documents, retention saMPL04es, records and audits of quality control facilities.
Finished products release, quality review, quality audits, batch release document.
Warehousing design, construction, maintenance and sanitation, good warehousing practice, materials management.
Distribution and distribution records, handling of returned goods, recovered materials and reprocessing.
CoMPL04aints and recalls, evaluation of coMPL04aints, recall procedures, related records and documents.
Waste disposal, scrap disposal procedures and records.

M.Pharm (Pharmaceutical Management and Regulatory Affairs)

First semester

01MPM05102	**Pharmaceutical Management-I (General & Personnel), Theory**	

Pharmaceutical Management: Meaning, Evolution-scientific, administrative and human relation approach. Process of management: Planning, organizing, staffing, directing, coordinating and controlling–a preliminary idea of concepts, processes and techniques.

Fundamental concepts of production, financial, personal, legal and marketing functions with special reference to Pharmaceutical Management. Introduction to budgeting, costing, accounting, auditing and budgetary control. Entrepreneurship development.

Understanding organizations: Meaning, process, types of organization structures and departmentation, line/staff authority, promoting organizational culture. Organizations, pharmaceutical services and functioning of hospital pharmacy, bulk drug unit, formulation unit, Ayurvedic and Unani manufacturing units and testing labs etc.

Professional Mangers; Tasks, responsibilities and skills needed. Leadership; Styles and managing change. Decision Making; Types, procedures, evaluation and selection of alternatives, decision making under various situations. Management information and decision support systems and time management.

Personnel Management: Job Analysis, recruitment, selection, orientation and training, performance appraisal and compensation. Retrenchment, lay off and discharge.

Management of Industrial Relations: Industrial disputes, settlement of disputes through various routes such as bargaining, etc.

01MPM05103	**Total Quality Management (Theory)**	**60Hrs**

Concepts and Philosophy of TQM, GLP, GMP (orange guide)
Drug regulatory and accrediting agencies of the world (USFDA, TGA, ICH, WHO, ISO etc.).

Good manufacturing practices:
Organisation and personnel, responsibilities, training, hygiene.
Premises: Location, design, plant layout, construction, maintenance and sanitation, environmental control, utilities and services like gas, water, maintenance of sterile areas, control of contamination.

Equipments: Selection, purchase specifications, maintenance, clean-in-place, sterilize-in-place, methods (TP and STP).

Raw materials: Purchase specifications, maintenance of stores, selection of vendors, controls on raw materials and finished dosage forms.

Manufacture and controls on dosage forms: Manufacturing documents, master formula, batch formula records, standard operating procedures, quality audits of manufacturing processes and facilities.

In process quality controls on various dosage forms; sterile and non–sterile, standard operating procedures for various operations like cleaning, filling, drying, compression, coating, disinfections, sterilization, membrane filtration etc.,

Packaging and labeling control, line clearance, reconciliation of labels, cartons and other packaging materials.

Quality Control Laboratory: Responsibilities, good laboratory practices, routine controls instruments, regents, saMPL04ing plans, standard test procedures, protocols, non-clinical testing, controls on animal house.

Data generation and storage, quality control documents, retention saMPL04es, records and audits of quality control facilities.

Finished products release, quality review, quality audits, batch release document.

Regulatory Considerations for Pre-clinical and Clinical Evaluation: Pre-clinical requirements currently in use. Regulatory requirements of single dose and repeat dose toxicity studies. Study of specific toxicities such as mutagenicity, carcinogenicity and teratoginicity. Animal pharmacokinetics and toxicokinetics. Regulatory requirements of clinical evaluation, pharmacokinetics in man genetic polymorphism. Design and interpretation of clinical trials.
Quality assurance standards as per ISO.

Globalization of drug industry, present status and scope of pharmaceutical industry in India.
WHO and NABL certification, ICH guidelines for manufacturing and quality assurance of drug formulation.

01MPM05104	**Drug Regulatory Affairs–I (National Regulatory Aspects), Theory**	**60Hrs**

Origin, development, scope, objectives and nature of Pharmaceutical legislation in India. History and ethics of profession of Pharmacy.

A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the detailed study of the following Acts (with latest amendments)

The Narcotics Drugs and Psychotropic Substances Act.

Medicinal and Toilet Preparations (Excise Duties) Act, 1955.

The Pharmacy Act, 1948.

The Drugs and Cosmetics Act, 1940 and Rules there under.

Drugs (Price Control) Order in force.

Introduction to Intellectual Property Rights; Copy Right Act, Trade Mark Act, Patent Act and Biodiversity Act, WTO, TRIPS and TRIMS.

The Drugs and Magic Remedies (Objectionable Advertisements) Act, 1955.

Prevention of Cruelty to Animals Act.

Schedule U requirements- Product development stage documentation, factory procedures – Standard operating procedures and standard test procedures,

Legal Environment of Business- Need for government regulations; financial regulations, SEBI, BIFR, FEMA and others, Contract Act and Sale of Goods Act, Company Act, Corporate tax laws – Direct and Indirect.

Indian Patent Law: Critical evaluation of development of Indian Patent law with necessary changes. Comparison with US and EP Patent Law.

M.Pharm Pharmacognosy

First Semester

01MPG03102	Advanced Pharmacognosy, Theory	60Hrs

General Introduction to Pharmacognosy: Role of Pharmacognosy in the herbal industry.
Classification of herbal drugs with special reference to Chemotaxonomy.
Commerce and quality control of herbal drugs: International trade.
Quality control with reference to WHO guideline.
Common problems encountered maintenance of quality of crude drugs.
General aspects of cultivation and collection: Good practices in cultivation.
Plant growth regulators.
Weeds and pest control techniques.
Good practices in collection.
Pharmacological screening and review of literature for the following group of drugs *In vivo* methods of screening
a) Immunomodulatory drugs and its review.
b) Anticancer drugs and its review.
c) Antidiabetic drugs and its review.
d) Anti hepatotoxic drugs and its review
e) Hypolipidemic drugs and its review.
f) Antiinflammotory and analgesic drugs and its review.
Recent advances in Pharmacognosy High through put screening.
Role of biomarkers in crude drug analysis.
Drug discovery from plant sources.
Ethnobotany, Chemotaxonomy and Chemical ecology.

01MPG03202	Advanced Pharmacognosy practical	60Hrs

Evaluation of crude drugs
Macroscopic and microscopic evaluation.
Determination of ash value.
Determination of extractive value.
Determination of moisture content.
Determination of foaming index.
Determination of swelling index.
Determination of pesticide residue by HPLC.
Determination of microbial load.
Preliminary phytochemical screening of certain medicinal plants
Application of TLC and paper chromatography in phytochemical evaluation of crude drugs.
Isolation and estimation of phyto-constituents
Isolation of volatile oil from different sources and estimation of marker by GC and HPTLC.
Isolation of fixed oils from different sources and their physical, physiochemical and chemical evaluation.
Isolation of known marker compounds by column chromatography (Demonstrative)
Systematic analysis of crude drugs from unknown origin.

01MPG03103	**Indian system of Medicines,Theory**	**60Hrs**

Ayurvedic System of Medicine• Principles with merits and demerits.
• Introduction on different dosage forms.
• Methods of preparation of Ayurvedic medicines.
• Standardization of Ayurvedic medicines.
• Problems in Standardization of Ayurvedic medicines.
Siddha System of Medicines• Principles with merits and demerits.
• Introduction on different dosage forms.
• Method of preparation of Siddha medicines.
• Standardization of Siddha medicines.
• Problems in Standardization of Siddha medicines.
. Unani System of Medicines• Principles with merits and demerits.
• Introduction on different dosage forms.
• Method of preparation of Unani medicines.
• Standardization of Unani medicines.
• Problems in Standardization of Unani medicine.
Homeopathy System of Medicines• Principles with merits and demerits.
• Introduction on different dosage forms.
• Method of preparation of Homeopathic medicines.
• Standardization of Homeopathic medicines.
• Problems in Standardization of Homeopathic medicine.
CoMPL04imentary Medicines:
• Medicinal sources—Herbal sources, Mineral sources, Animal sources, their collection, purification and processing• Rules and Regulations to Safeguard the CoMPL04imentary Medicines.formulations used in different CoMPL04imentary medicines.
Tribal medicine Principles, Importance, Merits and Demerits of Tribal Medicine

Second semester-M.Pharm (COMMON PAPER)

02MPP01101	**Advanced in Pharmaceutical Sciences, Theory**	**60 Hrs.**

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Pharmainformatics & Bioinformatics :- Introduction to information resources available on the internet for the various subjects in pharmacy.

Experimental Designs :- Introduction to full factorial designs, central composite designs, evolution of full and reduced mathematical models in experimental designs, applications of the experimental designs for the subjects mentioned under pharmainformatics.

Patents:- Definition, need for patenting, type of patents, condition to be satisfied by an invention to be patentable, introduction to patent search.The essential elements of patent; guidelines for prepration of laboratory notebook, non obviousness in patent, drafting of patent claims, brief introduction to trademark protection and WTO patents.

Introduction of various stages in process of drug development, scop and aim of preclinical and clinical trials for drug and dosage forms.

Pharmacopoeial methods for evaluation of crude drugs, mono or polyherbal formulation by F.O.M determination, L.O.D., ash values, extractive values, phytomorphology, microscopial methods, qualitative analysis, pesticides analysis, microbial content determination and evaluation by other advanced methods like UV, IR, GLC, HPLC, TLC & HPTLC etc.

Drug stability :- solution stability, solid stability, parameters for physical stability testing, protocol for physical stability testing program, accelerated studies and shelf life assignment.

Biological Evaluation of the following classes of drug: Analgesic, anti-inflammatory agents, tranquilizers, hypoglyceamic agents and diuretic agents.

Pilot Plant Scale up Techniques: Significance of pilot plant scale op phase, laboratory procedure and formulations, routine production procedure, discuusion on important parameters such as formulation, equipments etc, pilot study of dosage forms such as tablets, capsules and oral liquid.

M.Pharm (Pharmaceutics)

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Second semester

02MPP01102	Noval Drug Delivery System, Theory	60 Hrs.

Polymers Used In Controlled Drug Delivery Systems: Introduction, Polymer-classification, Applications for Polymers in formulation ofcontrolled drug delivery systems, Biodegradable and Natural polymers.

Sustained release drug delivery systems. (srdds): Introduction ; Rationale of SRDDS; Advantages and Disadvantages of SRDDS; Factors influencing the design and performances of SRDDS; Physicochemical properties of a drug influencing design and performance, Microencapsulation, Evaluation and Stability studies of SRDF.

Parenteral controlled release drug delivery Systems :- Basic concepts and Approaches for injectable controlled release formulations, Development of Injectable controlled - Release formulations.

Transdermal Drug Delivery Systems (Tdds): Permeation through skin, Factors affecting permeation, Basic components of TDDS, Formulation approaches used in development of TDDS and their evaluation, Permeation enhancers.

Controlled Release Oral Drug Delivery Systems: Introduction, Design and Development of oral controlled release drug administration : Dissolution controlled, Diffusion controlled (Reservoir devices, Matrix devices), Membrane permeation controlled, Osmotic pressure controlled, Gel diffusion controlled, pH controlled, Ion - exchange controlled delivery systems.

Occular drug delivery system Formulation and evaluation of occular controlled drug delivery systems, Ophthalmic inserts and insitu gels.

Targeted Drug Delivery System:- Concepts, Advantages and Disadvantages, Targeting of drugs through nanoparticles, liposomes, resealed erythrocytes, microspheres, magnetic microspheres and monoclonal antibodies. Brief study on colon targeting.

02MPP01201	Noval Drug Delivery System, Practical	90 Hrs.

1. Preparation of albumin microspheres by heat stabilization technique and their practical size determination.
2. Preparation and evaluation of microcapsules by different microencapsulation techniques.
3. Study on diffusion of drugs through various polymer membranes.
4. Preparation of resealed erythrocytes, loading of various drugs and the study on therelease pattern.
5. Study on In-vitro dissolution of various sustained release formulations of marketted products.
6. Preparation of various drug formulations by solid dispersion technique and their evaluation.
7. Preparation of matrix tablets using various polymers, like polyvinyl alcohol, polyvinyl pyrrolidone etc., and studying their release patterns.
8. Preparation of various polymer films, loading of drugs and studying the release pattern.
9. Film coating of drug pellets for granules with sodium CMC and the study on Invitro dissolution.

02MPP01103	Advanced Pharmaceutics & Biotechnology, Theory	60 Hrs.

Introduction to Bio-informatics. ;Optimization of fermentation processes-Ethyl Alcohol, Antibiotics, Vitamins, Amino-acidsand Pharmaceutical solvents-raw materials, process and process validation .

Industrial Safety: Industrial hazards and their prevention, fire, accidents, mechanical and electrical equipments, industrial effluent testing and treatment.

Biotechnology: Introduction, importance and application of pharmaceutical biotechnology, enzyme kinetics, enzyme inhibition, pharmaceutical applications of enzymes, immobilization of cells and enzymes, application of immobilization, immobilization in design of novel drug delivery systems and drug targeting.

Tissue Culture: Introduction, types of culture, micropropogation, protoplast microinjection, animal cell culture, pharmaceutical applications of animal tissue culture, production of commercially useful compounds by animal cell culture, growth of cell in bioreactor and production of active principles, bioreactor, tissue culture based pharmaceutical industries.

Recombinant DNA Technology and Genetics: Basic concepts of DNA, protein synthesis and targeting, genetic recombination, gene transfer methods in prokaryotes and eukaryotes, techniques of genetic engineering, applications of recombinant DNA technology in proteins, vaccines, hormones production, genetic disorders and gene therapy.

02MPP01202	Advanced Pharmaceutics & Biotechnology, practical	60 Hrs.

1.Different types of staining
2.Isolation and identification of actinomycetis from different sources
3. Isolation and staining of bacteria
4. Preparation of solid and liquid media
5.Bacterial growth kinetics
6. DNA estimation by spectrophotometric method
7. Protein estimation
8.Isolation and detection of different types of DNA

M.Pharm (Pharmaceutical Chemistry)

Second semester

02MPC02102	Advanced Pharmaceutical Chemistry (Organic Name Reactions, Reaction Mechanism & Stereochemistry), Theory	60 Hrs.

Synthetic tools:
Catalytic hydrogenation, dehydrogenation, metal hydrate reduction. Reduction with hydrazine and its derivatives, Birch reduction, Clemmenson's reduction. Meerwin - Pondroffreduction, oxidation with perchloric acid, lead tetra acetate, mercuric acetate and selenium oxide.Beckmann rearrangement, Schmidt rearrangement, Darzen's reaction.

Reaction Mechanism: Kinetics, inductive, resonance and steric effects upon reactivity of molecules, nucleophilic substitution reactions in aliphatic systems: SN_1, SN_2. Aromaticity, electrophilic & nucleophilic substitution and aromatic systems, E1, E2 mechanisms,

Stereochemistry:
a) Optical isomerism**:**

Stereoisomerism, Definition, Tetrahedral carbon, chirality, relative and absolute configurations and sequence rule. Conventions used in stereochemistry., racemic modifications, properties, resolution of racemic modifications and conformational analysis. Walden inversion and stereo mutation. Asymmetric synthesis, stereospecific and stereo-selective synthesis.

b**)** Geometrical isomerism**:** Nature, rotation about a carbon-carbon double bond. Modern theory of double bonds,Nomenclature of isomers and determination of configuration. Stereochemistry of cyclic compounds.

Heterocyclic Chemistry: Synthetic approaches for attaching heterocyclic ring systems in drugmolecules having five membered and six membered heteroaromatic rings and fused ring systems.

Photochemistry: Theory, energy transfer, characteristics of photoreactions and typical photoreactions.

02MPC02201	**Advanced Pharmaceutical Chemistry (Organic Name Reactions, Reaction Mechanism & Stereochemistry), Practical**	**60 Hrs.**

1.Preparation of organic drugs or intermediate involving one-step reaction
2. Synthesis of at least five compounds involving heterocyclic ring systems
3. Systematic qualitative analysis of organic compounds including preparation of derivative

02MPC02103	**Advanced Medicinal Chemistry-II (Chemistry of Synthetic Drugs with Biochemical Approach), Theory**	**60 Hrs.**

Survey of recent advances in following areas, brief chemistry, and synthetic approach to marketed drugs, mode of action, SAR, of following classes of drugs: Cardiovascular (antihypertensives, antiarrythmics, antianginals, cardiotonics). CNS (anesthetics, sedative hypnotics, anticonvulsants, antipsychotic and CNS stimulants, Immunosuppersants, Immunostimulants, antibacterials, antivirals, antineoplastics and malaria, tuberculosis, diuretics, antihistaminics, cholinergic and anticholinergics.

02MPC02202	**Advanced Medicinal Chemistry-II (Chemistry of Synthetic Drugs with Biochemical Approach), Practical**	**60 Hrs.**

1.Synthesis of selected drugs from course content involving One Or two steps of synthesis and study spectral analysis of drug synthesized (at least 8 drugs).
2.Establishing the pharmacopoeial standards of drugs synthesized.
3.Identification test including I.R. spectrum
4.Identification and estimation of drug metabolites from biological fluids
(3 experiments).

M.Pharm (Pharmacology)

Second semester

02MPL04102	**Methods in Drug Evaluation, Theory**	**60 Hrs.**

Introduction to various stages in the process of drug development. Scope and aims of pre-clinical and clinical evaluation.

Fundamental techniques in estimation of enzymes and other endogenous substances in different tissues and body fluids.

Blind neuro-pharmacological screening and methods of determination of LD_{50}. Importance of LD_{50}.

Methods of biological evaluation of drugs of the following classes:

Autonomic drugs, local anaesthetics, anticoagulants, antihypertensives, drugs acting on heart, vasodilators, bronchodilators, diuretics, skeletal muscle relaxants, drugs effecting learning and memory, psychopharmacological agents, analgesics, anti-inflammatory agents, hypnotics, anticonvulsants, anti-diabetic drugs, anti-fertility agents, anti-ulcer drugs, immunomodulators.

Bioassays: Definition, principle, advantages over other assays, graded and quantal bioassays, matching, bracketing, interpolation, three point and four point assays. Methods of bioassay of adrenaline, nor-adrenaline, acetylcholine, histamine, angiotensin, d-tubocurarine, insulin, digoxin, oxytocin, estrogen, thyroxine, corticotrophin and somatotrophin

Introduction to high-throughput screening and modern techniques like ligand-binding studies and use of tissue-culture in biological evaluation of drugs.

Clinical Trials: Aim, requirements, design, stages and outcomes

02MPL04201	**Methods in Drug Evaluation, Practical**	**60 Hrs.**

Experiments designed to familiarize the student with the process of systematic screening of unknown drugs for their pharmacological activity and mode/ mechanism of action.

Exercises in bioassays of drugs by graphical method, matching method, studied in theory.

Calculation of pA2 value of antagonists using isolated preparations.

02MPL04103	**Systemic Pharmacology, Theory**	**60 Hrs.**

In-depth study, including mechanism of action, pharmacodynamic actions, adverse effects, drug interactions, indications, contra-indications and important therapeutic aspects and recent advances of the drugs belonging to the following categories:

Drugs Acting on CVS: Cardiac glycosides, anti-anginal drugs, anti-arrhythmics, anti-hypertensives, drugs used in treatment of MI.

Hormones and Hormone Antagonists : Insulin and oral hypoglycemic agents, thyroid hormones and anti-thyroid drugs, growth hormone, oxytocin, anti-diuretic hormone, corticosteroids, gonadotrophins, estrogens, anti-estrogens, progestins, anti-progestins, testosterone and other androgens, anti-androgens, anabolic steroids.

Anti-microbial Drugs: Mechanisms of anti-microbial action and microbial resistance. Antibiotics and synthetic anti-microbial drugs. Penicillins, cephalosporins, other β-lactams, use of β-lactamase inhibitors, aminoglycosides, tetracyclines, chloramphenicol, macrolides, vancomycin, bacitracin, lincomycin, clindamycin, sulphonamides, trimethoprim and pyrimethamine, quinolones and fluoroquinolones, urinary antiseptics.

Drugs used in the treatment of malaria, amoebiasis, giardiasis, trichomoniasis, trypanosomiasis, leishmaniasis, anthelmintics, and pediculocidal agents.

Drugs used in the treatment of tuberculosis, leprosy, mycobacterium avium coMPL04ex infections, syphilis, gonorrhoea, chancroid and lymphogranuloma venereum.
Anti-retroviral and other anti-viral drugs.

Anti-neoplastic agents.

Anti-fungal agents.

02MPL04202	Systemic Pharmacology, Practical	60 Hrs.

Experiments to demonstrate/ detect the presence of the following actions in drugs anti-inflammatory action, effect on learning/memory, antiulcer effect.

Exercises in bioassays of drugs by two point, three point assay, four point assay.

Dose response curve of following drugs like acetylcholine and other unknown drugs.

M.Pharm (Quality Assurance)

Second semester

02MPQ06102	Advanced Pharmaceutical Analysis-Method Development, Theory	60Hrs

Chromatographic Techniques: HPTLC detection methods, quantitative methods in TLC; programmed multiple development techniques.
Gas Chromatography: Instrumentation, packed and open tubular column, column efficiency parameters, the Van Deemter equation, resolution, liquid stationary phases, derivatisation methods of GC including acylation, perfluoroacylation, alkylation and esterification. Detectors: FID, ECD, TCD, NPD. A critical comparison of sensitivity, selectivity and field of applications of these detectors. ExaMPL04es of applications of GC in pharmaceutical analysis.
Liquid Chromatography: Comparison of GC and HPLC, instrumentation in HPLC, analytical, preparative and micro-bore columns, normal and reversed-phase packing materials, reverse-phase HPLC, HPLC–tryptic mapping, size exclusion, ion-exchange amino acid analysis, amino acid sequence analysis, hydrophobic interaction chromatography, column selection, mobile phase selection, efficiency parameters, resolution. Detectors in HPLC: refractive index, photometric and electrochemical; comparison of sensitivity, selectivity and field of applications of these detectors. HPTLC–instrumentation and applications.
Supercritical Fluid Chromatography (SFC).
X-ray Diffraction Methods: Introduction, generation of X-ray, elementary crystallography, Miller indices, X-ray diffraction, Bragg's law of X-ray powder diffraction, X-ray powder diffractometer, obtaining and interpretation of X-ray powder diffraction data.
Radiochemical Assays: Sodium iodide, cyanocobalamin and quality control of radiopharmaceuticals.
Radioimmune assays of drugs and hormones.
Immunological Assays: ELISA, immunoblotting, immumofluorescence, immunoaffinity.
Enzyme Analysis: Pepsin, papain, hyaluronidase.
Principles and procedures involved in using the following reagents in pharmaceutical analysis: 2,6–dichloroquinone chlorimide, 1,2–napthaquione-4-sulfate, 2,3,5-triphenyltetrazolium salt, 3–Methyl-1,2-benzothiazoline hydrazone hydrochloride (MBTH), Folium ciocalteu reagent, p-dimethylamino benzaldehyde/ cinnamaldehyde (PDAB), (PDMAC), Ninhydrin reagent.
Polarography: AC pulse polarography and square wave of polarography.
Thermal Methods of Analysis: Introduction, TCA, DTA and DSC theory, instrumentation of thermographs and application.
Analysis of drugs obtained from genetic engineering: Vaccines, sera and toxoids.
Electron Spin Resonance: Principle, instrumentation, interpretation of spectra and applications.
Laser: Basic principles, classification, instrumentation and application of Laser.

Reference standards: Source, preparation, characterization, usage, storage and records.

02MPQ06201	Advanced Pharmaceutical Analysis-Method Development, Practical	60Hrs

Gradient elution techniques in column chromatography.
Two dimensional paper chromatography and TLC.
Separation by electrophoresis.
Experiments using HPLC, GC, HPTLC: Determination of chromatographic parameters– capacity factor, selectivity, resolution, efficiency of column, HETP, asymmetric factor. Effect of polarity of mobile phase on retention of saMPL04es in normal/ reversed phase mode in HPLC, Estimation of single component or multicomponent drugs in formulations–using different methods of quantitative analysis (Direct comparison method, calibration curve method, internal standard method).
Experiments based on application of the following reagents in pharmaceutical analysis: 2,6– dichloroquinone chlorimide, 1, 2–napthaquione -4- sulfate, 2,3,5-triphenyltetrazolium salt, 3 – methyl -1,2- benzothiazoline hydrazone hydrochloride (MBTH), Folium ciocalteu reagent, p-dimethylamino benzaldehyde (PDAB)/ cinnamaldehyde (PDMAC), ninhydrin reagent.
Qualitative and quantitative determination of various drugs in biological fluids (blood, urine) – barbiturates, sulpha drugs, adrenaline, amphetamine, hydantoins, morphine, pethidine, diazepam.

Case studies on Q. C. lab planning and analytical reporting of raw materials, in process and finished goods.

02MPQ06103	Total Quality Management-II, Theory	60Hrs

Validation and calibration of equipments and instruments.
Elements of validation, benefits, types of process validation, validation protocol, process characterization and optimization.Validation of processes: Mixing, granulation, drying, compression, filtration, filling.

Validation of sterilization methods and equipments: Dry heat sterilization, autoclaving, membrane filtration, gaseous sterilization and sterilization by radiation. Validation of system and analytical procedures (as per ICH or Pharmacopoeia).Validation of air handling equipments and facilities in sterile and non-sterile areas, cleaning validation.Validation of water purifying systems (demineralised water, distilled water and water for injection).

Validation and security measures for pharmaceutical data processing:
Validation of computer aided instruments.Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.Loan license (contract manufacture) auditing.

Recent amendments to Drugs and Cosmetic Act and other relevant rules:
Relevant provisions of Consumer Protection Act, Environmental Protection Act, Factories Act. Introduction to Patent Act.Certification and licensing procedures.Quality, safety and legislation for cosmetic products. Quality, safety and legislation for herbal products.

Approval of New Drug: Investigational new drug (IND) submission, format and content of IND, content of investigator brochure, clinical research protocols, objective and protocol design, FDA guidelines for clinical trials, reviews and approval of a clinical study, general consideration of the new drug approval (NDA), specific requirements, content and format of NDA, manufacturing and control requirements of NDA.

Schedule U requirements.
Product development stage documentation.
Factory Procedures: Standard operating procedures
Standard test procedures.
Manufacturing documents.
Cleaning methods.
Retention saMPL04es and records.
Quality control documentation.
Batch release documents.
Distribution records.
CoMPL04aints and recalls.

02MPQ06202	**Total Quality Management-II-Practical**	**60 Hrs.**

Practicals are based on theory.

M.Pharm (Pharmaceutical Management and Regulatory Affairs)

Second semester

02MPM05102	**Pharmaceutical Management-II (Production), Theory**	**60Hrs**

Production Management: Fundamentals of production, organization, economic policy, manufacturing economics, production capacities, production lines and job balancing, visible and invisible inputs, methodology of activities. Development of efficient work methods, quality control and management of R&D.

Production planning and control, production processes - mass, job and project; plant location and lay out; work study (preliminary idea only), materials management- purchase, inventory control and store keeping. Productivity management: Concepts, problems, tools and techniques for improvement. Operation research techniques by PERT and CPM.

Considerations for design of large scale manufacturing units including intricate design criteria for units to manufacture sterile and non-sterile products with special reference to tablets, capsules, and injections.

Design and development of packaging units including recent advances in packaging techniques for various types of sterile and non-sterile dosage forms.

Warehousing design, construction, maintenance and sanitation; good warehousing practice, materials management.

02MPM05103	**Pharmaceutical Management- III (Finance, Project), Theory**	**60Hrs**

Introduction to financial management, financial planning and control, working capital management, management of fixed assets.

Concepts and techniques of financial management decision, concepts in evaluation – time value of money, valuation of a firm's stock, capital assets pricing model, investment in assets and required returns, risk analysis, financing and dividend policies, capital structure decision, working capital management, management of cash, management of accounts receivable, inventory management.

Banking and finance: Service and functions of bank, finance planning and sources of finance, short, intermediate and long term financing, tools of financial analysis, financial ratio analysis, funds analysis and financial forecasting, operating and financial leverages. General principles of insurance.
Accounting & Finance: Financial accounting, GAAP, cost accounting, budgetary control, valuation of inventory and assets, modern trends, role of internal auditing, internal versus external auditing, accounting control and information systems.

Evaluation of investment decisions by pay back period, accounting rate of return, net present value methods, break even analysis.

Project definition, preparation of feasibility assessment and selection, project reporting, conventional project appraisal; limitations, towards a new framework. Projections, profitability, cost and benefit analysis, appraisal criteria – financial, economic and social. Risk analysis.

02MPM05104	**Drug Regulatory Affairs-II (Including International Regulatory Aspects), Theory**	**60Hrs**

A detailed study of regulatory aspects that affect drug product design, manufacture and distribution in a developed country such as USA and in a developing country such as Brazil, Hatch Waxmann Act; Bolar Provisions and other FDA Regulations.
Regulatory aspects of pharmaceutical and bulk drug manufacture, regulatory drug analysis.
Loan license (contract manufacture).

Recent amendments to Drugs and Cosmetic Act and other relevant rules.

Certification and licensing procedures.

Documentation related to manufacturing, cleaning methods, retention saMPL04es and records, quality control, batch release documents, distribution records, coMPL04aints and recalls.

Quality, safety and legislation for cosmetic products and herbal products.

Approval of New Drug: Investigational new drug (IND) submission, format and content of IND, content of investigator brochure, clinical research protocols, objective and protocol design. FDA guidelines for clinical trials, reviews and approval of a clinical study, general consideration of the new drug approval (NDA), specific requirements, content and format of NDA, manufacturing and control requirements of NDA. New Chemical Entity (NCE).

International business and inland & foreign trade, procedure of exporting and importing goods. General international environment; political, legal, socio-cultural and economic factors, tax aspects, marketing factors, labour factors and economic integration. BOP analysis, foreign exchange control, governmental policies, international finance, economic community, IMF, managing multinationals/ globalization of operations.

Emerging Trends in Biotechnology Patenting.

Strategies for effective Patent Drafting. IP Issues in contract Manufacturing. Exporting to the US and Prelitigation Consideration

02MPM05105	**Pharmaceutical Management-II (Marketing), Theory**	**60Hrs**

Pharmaceutical Marketing: Evolution of marketing concept; production oriented, sales oriented, promotion oriented and consumer oriented (modern concept); market segmentation; concept of marketing, mix Role of 7 P's (Product, Price, Promotion, Place, Physical Evidence, Process, People) in Pharmaceutical Marketing Management, corporate planning & strategy, Pharmaceutical industrial marketing management. Pharmaceutical marketing environment. Product management. E-Pharma Marketing.

Product Planning: Selection of product, new product development and product differentiation, pricing, promotion – personal selling; salesmanship, qualities of salesman, management of sales force, advertising, publicity and window display, channels of distribution.

Marketing Research: Definition and importance, Pharmaceutical Marketing Research techniques, marketing information system, pharmaceutical marketing research area.

Market Demands and Sales Forecasting: Major concepts in the demand measurement, estimating current demands, geo-demographic analysis, estimating industry sales, market share and future demand, sales forecasting.

M.Pharm Pharmacognosy

Second Semester

02MPG03102	Herbal Drug Development and Standardisation,Theory	60Hrs

General Methods of Processing of Herbs: • Definition, sources, identification and authentification of herbs.
• Different methods of processing of herbs like collection, harvesting, garbling, packing and storage conditions.
• Methods of drying – Natural and artificial drying methods with their merits and demerits.

Methods of Preparation of Extracts:.
• Principles of extraction and selection of suitable extraction method.
• Different methods of extraction including maceration, percolation, hot continuous extraction, pilot scale extraction and supercritical fluid extraction with their merits and demerits.
• Purification and Recovery of Solvents.

Standardization of Herbal Raw materials and Extracts:
• Standardization of herbal raw materials including Pharmacognostical, physical, chemical and biological methods with exaMPL04es.
• Standardization of herbal extracts, physical, chemical and spectral analysis.
• Qualitative and Quantitative estimation of active principles from standardized extracts by HPTLC.
• Biological standardization -Pharmacological screening of herbal extracts and Microbiological evaluation of herbal extracts.
• Toxicity studies of herbal extracts.

Isolation and Estimation of Phytoconstituents: Different methods (including industrial) for isolation and estimation of phytoconstituents from the following drugs (with special emphasis on HPLC and HPTLC).
1. Hypericin / Hyperforin from Hypericum species.
2. Forskoline from Coleus forskoli.
3. Catechins from Green tea.
4. L-Hydroxy citric acid from Garcinia combogia.
5. L-Dopa from Mucuna pruriens.
6. Andrographolides from Andrographis paniculata.
7. Alicin from Garlic.
8. Piperine from Piper nigram / Piper longum.
9. Bacosides from Bacopa monnieri.
10. Berberine from Berberis aristata.

Herbal Formulation Development: • Selection of herbal ingredients.
• Different dosage forms of herbal drugs.
• Evaluation of different dosage forms.
• Stability studies of herbal formulations.
.

Herbal Cosmetics: Cosmetics preparations: Incorporating the herbal extracts in various cosmeticformulations like Skin care preparations (Creams and Lotions), Sunscreens andSunburn applications, Hair care preparations (Hair oils and Hair shampoos) andBeautifying preparations(Lipsticks, Face powders and Nail polish).

02MPG03201	Herbal Drug Development and Standardisation, Practical	60 Hrs.

PRACTICALS
1. Preparation of some important extracts by using Pilot Scale Extraction Plant.
2. Isolation and estimation of phytoconstituents by HPTLC listed in chapter 4.
3. Preparation of monoherbal formulations and its evaluations.
4. Preparation of polyherbal formulations and its evaluations.

5. Formulation and standardization of some important herbal cosmetics.
6. Volatile oil Analysis by Gas chromatography.
7. Spectroscopic analysis of some isolated compounds.
8. Estimation of phytoconstituents in mono and polyherbal formulations by HPTLC technique.

02MPG03103	**Phytochemistry & biotechnology, Theory**	**60Hrs**

Phytochemistry :
a. Introduction and general methods of phytochemical plant analysis, methods ofextraction, isolation, separation, identification and analysis of results.
b. Microbiological conversions, aberrant synthesis in Higher plants.
Genetics and comparative phytochemistry in pharmacognosy...
Microchemical Analysis :
A study of the elements of optical crystallography, using ordinary light microscope, the polarizing microscope, the polarizing microscope and various microtechniques useful in the identification of crude drugs and their constituents.
Fermentation Chemistry:
a. A detailed account of fermentation technology with exaMPL04es and applications.
b. Chemical aspects of the production of Pharmaceutically and economically important substances by microorganisms :
i) Penicillin ii) Dextrose from starch & cellulose substrates
iii) Vitamin B 12 iv) Ergot alkaloids
c. Yeast and its use, production of single cell proteins.
d. Industrial fermentation and pharmaceutical effluents – its treatment and legal requirement.

Plant Tissue Culture: A detailed study of plant tissue culture and its application in pharmacognosy :
a. Introduction, History and development of plant tissue culture.
b. Laboratory requirements and general techniques.
c. Tissue culture media, nutrients and mineral supplements.
d. Callus culture.
e. Isolated culture and genetic manipulation of plant protoplasts.
f. Secondary product formation by cell suspension cultures.
g. Hairy root culture and its applications.
h. Biotransformation.

02MPG03202	**Phytochemistry & biotechnology, Practical**	**60Hrs.**

1) Preliminary phytochemical screening and detection of various plant constituents such as
a. Carbohydrates.
b. Alkaloids.
c. Anthraquinones.
d. Flavanoids.
e. Polyphenolic compounds.
f. Lipids.
g. Proteins and Aminoacids.

2) Preparation of extracts enriched with active principles and studying their Stability.

3) Phytochemical analysis of isolated plant constituents by UV, HPLC and HPTLC.

4) UV analysis of some crude drugs and phytochemicals for identification and detection of adulterants.

5) Analysis of medicinally use oils by various methods.

6) Estimation of cineole, Eugenol, Citral and other terpenoidal compounds by suitable methods.

REFERENCE BOOKS (LATEST EDITION)

M.Pharm (Pharmaceutics, Pharmaceutical Chemistry, Quality Assurance, Pharmacology, Pharmaceutical Management and Regulatory Affairs , Pharmacognosy)

Methods in Pharmaceutical Research(01mpa101&01mpa201)

1. Instrumental Methods of Analysis by Scoog and West.
2. Spectrometric Identification of Organic Compounds by Silverstein et.al.
3. Instrumental Method of Analysis by Willard Dean & Merrit.
4. Text Book of Inorganic Chemistry by A.I. Vogel.
5. Pharmaceutical Chemistry, Vol. I & Vol. II by Becket and Stanlake.
6. Pharmaceutical Chemistry, Vol. I & Vol. II by L.G.Chatten.
7. Text Book of Pharmaceutical Analysis by K.A. Connors.
8. Pharmaceutical Analysis by Hiquchi, Bechmman, Hassan.
9. Methods of Drug Analysis by Gearien, Graboski.
10. Text Book of Biopharmaceutic Analysis by Robert Smith and James Stewart.
11. Pharmaceutical Analysis – Modern Methods, Part A and B by Munson James. W.
12. Quantitative Analysis of Drugs by Garrot.
13. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi.
14. IP/BP/USP.
15. Application of Absorption Spectroscopy of Organic Compounds by Dyer.
16. Analytical Profiles of Drug Substances by Florey [Volume 13].
17. Spectroscopy of Organic Compound by P. S. Kalsi; Wiely Eastern Ltd., New Delhi.
18. Absorption Spectroscopy of Organic Molecules by V. M. Parikh; Addision, Wesley Publishing Company, London.
19. Organic Spectroscopy by William Kemp.
20. Identification of Organic Compounds by Shriner et al.

Product Development (01MPP01102&01MPP01202)

1. Theory and Practice of Industrial Pharmacy by Lachmann et.al.
2. Modern Pharmaceutics by Banker G.S and I Thodes.
3. Pharmaceutics Dosage Forms & Drug Delivery System by Ansel H.C
4. Remington's Pharmaceutical Sciences.
5. Bentley's Textbook of Pharmaceutics by E.A Rawlins.
6. Physical Pharmacy by Martin.
7. Applied Production and Operation Management by Jamer R. Evans.
8. How to Practice GMP by Sharma R.P
9. Pilot Plants and Seals up of Chemical Process by W. Hoyle.
10. Pharmaceutical Packaging Technology by E.R Evans.
11. Pharmaceuticals Process Validation by Berry I.R and Nash R.A
12. Good Manufacturing Practices for Pharmaceuticals by Willing S.H and Stoker J.R
13. S.O.P Guidelines by Shah D.S

Biopharmaceutics and Pharmacokinetics (01MPP01103)

1. Biopharmaceutics and Clinical Pharmacokinketics by Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics by Robert E. Notari.
3. Biopharmaceutics by Swarbrick.
4. Textbook of Applied Biopharmaceuticals and Pharmacokinetics by Shargel.
5. Biopharmaceutics and Clinical Pharmacokinetics by John and Wagner.
6. Textbook of Biopharmaceutical Analysis by Smith R.V and Stewart J.T
7. Dissolution, Bioavailability and Bioequivalence by Abdou, H.M
8. Clinical Pharmacokinetics: Concepts and Applications by Rewland M. and Tozer T.N
9. Pharmaceutical Bioequivalence by Welling P.G
10. Remington's Pharmaceuticals Sciences.
11. Advanced Pharmaceutics by Bankers and Bhods.

Advanced Pharmaceutics & Biotechnology (02MPP01103)

1. Theory and Practice of Industrial Pharmacy by Lachmann
2. Pharmaceutical Dosage From and Drug Delivery Systems by Ansel H.C
3. Bentley's Textbook of Pharmaceutics by Ratlines E.A
4. Science of Dosage Form by Aulton.
5. Remington's Pharmaceutical Sciences.
6. Modern Pharmaceutics by Banker G.S Et. Al.
7. Physical Pharmacy by Martin.
8. Drug Formulation Manual by D.P.S Kohli.
9. Encyclopedia of Pharmaceutical Technology (Vol. I to IV) by James Swarbrick and Boylan J.C
10. Herbal Indian Perfumes and Cosmetics by Ram V.A
11. Methods for Cutaneous Investigation by Robert L. Rietschel
12. Dispensing of Medication by Robert E. King.
13. Pharmaceutical Biotechnology by S.P Vyas and V.K. Dixit
14. Plant Biotechnology by K.G Ramawat
15. Biotechnology–Secondary Metabolites by K.G Ramawat
16. Biotechnology Fundamentals and Applications by S.S Purohit and S.K Mathur

Advances in Pharmaceutical Sciences including biostatistics (02aps101)

1. Pharmaceutical Statistics by Sanford Bolton; Marcel Dekker.
2. Pharmaceutical Statistics of Industrial Pharmacy by Lachman.
3. Text Book of Biopharmaceutic Analysis by Smithe, Stewart.
4. Methods in Biostatistics by Mahajan.
5. Fundamental of Applied Statistics by S. C. Gupta and C. K. Kapoor.
6. Mathematical Statistics by Kapoor and Saxena.
7. Statistics by Gofeti Radhakrishna.
8. Web Rsources in Pharmacy, In Pharma Publication, Bangalore.
9. Basic Statistics and Pharmaceutical Statistics Application by James E.De Muth; Marcel Dekker Inc.
10. Pharmaceutical Experimental Design by G.A. Lewis, D. Matheia, Roger Phan-Tan-Luu; Marcel Dekker Inc.
11. Pharmaceutical Experimental Design and Interpretation by N.A. Armstrong, L.K.C. James; Taylor & Francis.
12. Current Patent Acts of various countries.
13. Web Resources in Pharmacy by Mueen Ahmed K.K.

Novel Drug Delivery System ((02MPP01102&02MPP01201)

1. Encyclopedia of Controlled Drug Delivery, Vol. I & II Edited by Edith Mathiowitz.
2. Novel Drug Delivery Systems by Y.W Chien.
3. Targeted Therapeutic Systems by P. Tyle, B.P Ram.

4. Controlled Drug Delivery Fundamental & Applications by J.R. Robinson.
5. Drug Delivery Systems: Fundamental & Techniques by P. Johnson and J.G Lloyd.
6. Biopolymeric Controlled Released System by Donald L. Wise.
7. New Drug Delivery System by Joliano.
8. Controlled Drug Delivery, Vol. I & II by Stephen D. Bruck.
9. Microencapsulation and Related Drug Processes by Patrice B. Deasy.
10. Controlled and Novel Drug Delivery by N.K. Jain.
11. Remington's Pharmaceutical Sciences.
12. Liposomal Therapeutics by S.P Vyas and V.K Dixit
13. Interfacial Phenomena in Drug Delivery and Targeting by Graham Buckton.
14. Liposomes–A Practical Approach by H.H.C New.

Advanced Medicinal Chemistry-I (01MPC02102&01MPC02202)

1. Medicinal Chemistry by Burger.
2. Principles of Medicinal Chemistry by Foye.
3. Organic Drug Synthesis, Vol. 1, 2 & 3 by Lednicer.
4. Annual Reports in Medicinal Chemistry by Hans, Jurgen Hess.
5. Medicinal Chemistry Series by Ariens.
6. Progress in Medicinal Chemistry Series by Ellis and West.

Drug Discovery and Development (01MPC02103)

1. Introduction to the Principles of Drug Design by Smith & Williams.
2. Drug Design, Vol. VII by Ariens.
3. Progress in Pharmaceutical Research by Woodridge.
4. Annual Reports in Medicinal Chemistry, Academic Press Inc.
5. Comprehensive Medicinal Chemistry, Vol. 4.
6. Burger's Medicinal Chemistry, Vol. 1

Advanced Medicinal chemistry-II (02MPC02103)

1. Organic Chemistry, Vol. 2 by Finar
2. Steroids by Fieser and Fieser.
3. Organic Chemistry by Gilman.
4. Selected Organic Synthesis by Fleming.
5. Natural Product Chemistry, Vol. 1 & 2 by Nakanishi.
6. The Alkaloid, Chemistry and Physiology by Manske.
7. Medicinal Plant Glycosides by Sim.
8. Medicinal Plant Alkaloids by Sim.
9. IUPAC, Chemistry of Natural Products, International symposium.
10. Progress in the Chemistry of Organic Natural Products by Zechmeister.
11. Progress in Phytochemistry by Reinhold, Liwschitz.
12. New Natural Products and Plant Drugs with Pharmacological, Biological or Therapeutic Activity by Wagner, Wolff.
13. Organic Chemistry by Finar.
14. Modern Methods of Plant Analysis by Paech, Tracey.
15. Modern Methods of Plant Analysis by Geissman.
16. The Quantitative Analysis of Drugs by Garratt.
17. Practical Pharmaceutical Chemistry by Backett, Stenlake.
18. Symposium on Phytochemistry by Arthur.
19. Biosynthetic Pathways in Higher Plants by Pridham, Swain.
20. Metabolic Pathways by Greenbury.

21. Secondary Plant Metabolism by Margaret, Brain.
22. Pharmacognosy and Phytochemistry by Wagner, Horhammer.
23. Comparative Biochemistry of Flavonoids by Harbon.
24. Principles of Biochemistry by Lehninger.
25. Plant Biochemistry by Bonner.
26. Phytochemical Methods by Harborne.
27. The Chemical Investigation of Plants by Rosenthaler.
28. Organic Functional Group Analysis by Cheronis.

Standardization and Stabilization Methods (01MPQ06102&01MPQ06202)

1. Standardization & Stabilization Methods-Drugs & Formulations including Herbal Products, Food & Cosmetics.
2. Indian Herbal Pharmacopoeia, RRL, Jammu & IDMA, Mumbai; 1998.
3. British Herbal Pharmacopoeia, British Herbal Medicines Association; 1996.
4. Supplement to Cultivation and Utilization of Medicinal Plants, edited by Handa S.S. & Kaul, K.L.; 1996.
5. Analytical Microscopy by Wallies, T.E., J & A Churchill Ltd.
6. Plant Drug Analysis by Wagner, H. Bladt S. & Zgainski, Springer Verlog, New York.
7. Isolation and Identification of Drugs by Clark, E.C.G., The Pharmaceutics Press, London.
8. The Practical Evaluation of Phytopharmaceutics by Brain, K.R. and Turner, R.D., Wright-Scientechnics Bristol.
9. Modern Methods of Plant Analysis by Peach K. & Tracey, M.V., Narosa Publisher House, N.D.
10. Biological Standardization by Burn. Fininey and Godwin.
11. Modern Pharmaceutics by Rhodes & Banker.
12. Microbial Assays by Barton J. Wringht.
13. The International Pharmacopoeia, Vol. I, II, III, IV, 3rd Edition.
14. Basic Tests for Pharmaceutical Substances – WHO (1988)
15. Basic Tests for Pharmaceutical Dosage Forms – WHO (1991)
16. Evaluation of Drug Activities: Pharmacometrics (Vol. I & II) by D.R.Laurence.
17. Screening Methods in Pharmacology by R.A.Turner.
18. Animal and Clinical Pharmacologic Techniques in Drug Evaluation by Nodine and Siegler.

Total Quality Management-I (01MPQ06103&02MPQ06103)

1. Quality Assurance Standards as per ISO.
2. WHO And NABL Certification, Globalization of Drug Industry, Introduction to Export of Drugs and Import Policy.
3. ICH Guidelines for Manufacturing and Quality Assurance of Drug Formulation.
4. Present Status and Scope of Pharmaceutical Industry in India.
5. Guidelines for Developing National Drug Policies, WHO Publications, 1998.
6. Quality Assurance of Pharmaceuticals – A Compendium of Guidelines and Related Materials, Vol.–1; WHO Publications.
7. A Guide to Total Quality Management by Kaushik Maitra and Sedhan K. Ghosh.
8. GMP by Mehra.
9. How to Practice GMP by P.P. Sharma.
10. ISO 9000 and Total Quality Management by Sadhan K. Ghosh.
11. Good Manufacturing Practices for Pharmaceuticals - A Plan for Total Quality Control by Sidney H. Willing & James R Stoker. (Drugs & Pharm. Sciences) Vol. 78, Marcel Dekker Inc.
12. OPPI-Quality Assurance.
13. USP.

Systemic Pharmacology-I (01MPL04102&01MPL04202)

1. Applied Neuromuscular Pharmacology by B. J. Pollard
2. The Pharmacological Basis of Therapeutics by Alfred Goodman and Gilman's.
3. Essentials of Pharmacotherapeutics by F.S.K. Barar

4. Pharmacological and Pharmacotherapeutics by Satoshkar and Bhandarkar
5. Clinical Pharmacology by Laurance and Bennett.
6. Essentials of Medical Pharmacology by Tripathi.
7. Basic & Clinical Pharmacology by Bertram G. Katzung
8. Lewis Pharmacology by Crossland
9. Internal Medicine by Harrison
10. Modern Pharmacology by Charls Craig
11. Fundamentals of Experimental Pharmacology by M.N. Ghosh
12. Practical in Pharmacology by R.K. Goyal
13. Practical Pharmacology by Burn.
14. A Handbook of Experimental Pharmacology by Kulkarni
15. Pharmacological Experiments on isolated preparations. Perry WLME & Livingstone S. Ltd.
16. A Manual of Adverse Drug Interactions, 1997 by J.P. Griffin
17. Pharmacological Basis of Therapeutics by Goodman & Gilman
18. Pharmacology by Rang & Dale
19. Principles of Drug Action:Basis of Pharmacology by Goldstein A,Arnow, L, Kalman S M
20. Modern Pharmacology by Charles R.Craing P.Rober, E.Stitzel (editor)
21. Principles of Pharmacology by Paul L. Munson, Rober A Mucller, George R Breese
22. Hand Book of Experimental Pharmacology by Zaimis E & Others
23. Handbook of Drug Screening by Ramkrishna Seethala and Prabhavathi B. Fernandes
24. Methods of Drug Screening by Turner
25.Textbook of Pharmacology by V.N. Sharma

Advanced Pharmacology (01MPL04103)

1. Lewis Pharmacology by Crossland
2. Modern Pharmacology by Charls Craig
3. The Pharmacological Basis of Therapeutics by Alfred Goodman and Gilman's.
4. Medical Pharmacology and Therapeutics by Waller, Renwick and Hiller.
5. Textbook of Medical Physiology by Guyton.
6. Harpers Illustrated Biochemistry by Harpers
7. Medical Pathology by Devidson.
8. Ion Channel Pharmacology by Bernat Soria
9. Principles of Drug Action:The Basis of Pharmacology by Goldstein A,Arnow, L, Kalman S M
10. Pharmacology by Rang & Dale

Methods in Drug Evaluation (02MPL04102&02MPL04201)

1. Drug Discovery and Drug Evaluation by Vogel
2. Hand Book of Experimental Pharmacology by Zaimis E & Others
3. Handbook of Drug Screening by Ramkrishna Seethala and Prabhavathi B. Fernandes
4. Methods of Drug Screening by Turner
5. Clinical Research in Pharmaceutical Development by Barry Bleidt and Michael Montagne
6. Screening Methods in Pharmacology. Turner R.A.
7. Evaluation of Drug Activities: Pharmacometrics by Laurance D.R.
8. Methods in Enzymology.
9. Culture of Animal Cells by Freshney
10. Clinical Trials. Bio-informatics Institute of India.
11. Methods in Bio-statistics by Mahajan B.K.
12. Fundamentals of Statistics by Gupta S.C.
13. Fundamentals of Laboratory Technology by Godkar
14. Fundamentals of Experimental Pharmacology by M.N. Ghosh.

Systemic Pharmacology-II (02MPL04103)

1. Principles of Pharmacology by Paul L. Munson, Rober A Mucller, George R Breese

2. Pharmacological Basis of Therapeutics by Goodman & Gilman
3. Pharmacology by Rang & Dale
4. Principles of Drug Action:Basis of Pharmacology by Goldstein, Arnow L, Kalman S M
5. Modern Pharmacology by Charles R, Craing P, Rober E, Stitzel (editor)
6. Essentials of Pharmacotherapeutics by F.S.K. Barar
7. Pharmacological and Pharmacotherapeutics by Satoshkar and Bhandarkar
8. Clinical Pharmacology by Laurance and Bennett.
9. Essentials of Medical Pharmacology by Tripathi.
10. Basic & Clinical Pharmacology by Bertram G. Katzung
11. Lewis Pharmacology by Crossland
12. Internal Medicine by Harrison
13. Textbook of Pharmacology by V.N. Sharma

Pharmaceutical Management-I (01MPM05102)

1. Marketing Management by Philip Kotlar; Prentice-Hall of India Ltd., New Delhi.0
2. Management and Organization by Louis A. Allen; McGraw Hill, Tokyo..
3. Corporate Strategy by Ansoff, H.T.; McGraw Hill, New York.
4. Modern Management by Hempran David R.; McGraw Hill, New York.
5. Management by Stoner and Freeman; Prentice Hall, New Delhi.
6. Motivation and Personality by Maslow, Abraham, Harper & Row, New York.
7. Management of Organizational Behavior, Utilizing the Human Resources by Harcey, Paul and Blanchard Kenneth; Prentice Hall of India, New Delhi
8. Organization Structure, Process and out comes V th Edition Richard. H. Hall
9. Principles and Methods of Pharmacy Management III rd Edition Harry A. Smith.
10. Management "Global Perspective Heinz Weihrich, Harold Koontz by Tata Mcgraw Hill".
11. Personnel Management and Industrial Relations by P. C. Tripathi.

Total Quality Management (01MPM05103)

1. Guidelines for Developing National Drug Policies; WHO Publications, 1998.
2. Quality Assurance of Pharmaceuticals–A Compendium of Guidelines and Related Materials, Vol.–1; WHO Publications.
3. A Guide to Total Quality Management by Kaushik Maitra and Sedhan K. Ghosh.
4. GMP by Mehra.
5. How to Practice GMP by P.P. Sharma.
6. ISO 9000 and Total Quality Management by Sadhan K.Ghosh.
7. Good Manufacturing Practices for Pharmaceuticals-A Plan for Total Quality Control by Sidney H. Willing & James R Stoker. (Drugs & Pharm. Sciences) Vol. 78; Marcel Dekker Inc.
8. OPPI-Quality Assurance.
9. USP.

Drug Regulatory affairs-I (01MPM05104)

1. Original laws published by Govt. of India.
2. Text Book of Forensic Pharmacy by Mithal B. M.; Vallabh Prakashan, New Delhi.
3. Laws of Drugs in India by Hussain.
4. Text Book of Forensic Pharmacy by Jain N. K.; Vallabh Prakashan, New Delhi.

Pharmaceutical Management-II (02MPM05102)

1. Management by Tripathi P. C. and Reddy P. N.; Tata Mc Graw Hill.
2. Business Organization and Management by Shukla M. C.; S. Chand and Company.
3. Business Organization and Management by Sherlakar S. A.; Himalaya.
4. Personnel Management by Filippo E. B.; McGraw Hill.

5. Marketing Management by Kotler Philip.; Prentice Hall of India.
6. Organizational Behavior by Rao and Narayan; Konark Publishers.
7. Personnel Management by Tripathi P. C.; S. Chand and Company.
8. Principle and Practice of Marketing in India by Memoria C. B.
9. Principles of Pharmaceutical Marketing By Mickey Smith C.B.S. Publications.
10. Marketing Hand Book Vol. II , Marketing Management by Edwin – E Bobrow, Mark – D. Bobrow.
11. Production and Operations Management by S.N.Chary

Pharmaceutical Management-III (02MPM05103)

1. Financial Management by Johnson, R.W.; The Ronald Press.
2. Fundamental of Financial Management by Van Horne, J.C.; Prentice Hall of India (P) Limited.
3. Stock Exchange and Investment Analysis by Briston, R. J.
4. Indian Financial System by Khan, M. Y.; Tata McGraw Hill.
5. Tax Planning for Industrial Projects by Agarwal R. K.; Hind Law Publishers, New Delhi.
6. Project Management by Chaudhary, S.; Tata McGraw Hill.
7. Project Management: A System Approach to Planning Scheduling and Controlling by Harold Kerzner; CRS Publishers and Distributors, Delhi.
8. Financial Management by Gupta And Sharma I st Edition 1996.
9. Accounting for Management Planning and Control III rd Edition Richard M. Lynch

Drug Regulatory Affairs-II (02MPM05104)

1. Original Laws of the Respective Country.
2. Original Laws published by Govt. of India.
3. Guidelines for Developing National Drug Policies; WHO Publications, 1998.
4. Export Marketing by Cherian and Parab; Himalaya Publishing House, Delhi
5. Handbook of Procedures, Import and Export Promotion; Government of India, New Delhi
6. International Financial Management–An Indian Perspective by Varshney, R.L. and Bhashyam, S.; Sultan Chand & Co., New Delhi.
7. International Financial Management by Weston, J. Fred and Brat W. Sorge.; New York, McGraw Hill.

Advanced Pharmacognosy(01MPG03102)

1. Trease and Evans Pharmacognosy, W.C. Evans.
2. Pharmacognosy, Varro E.Tyler, Lynn. R.Brady, James E.Robbers
3. Text Book of Pharmacognosy, T.E. Wallis, CBS Pub. Delhi.
4. Ramstad - Modem Pharmacognosy.
5. John - Dodds - Lorin - Experiments in Plant Tissue Culture.
6. CSIR- Cultivation and Utilization of Medicinal Plants.
7. Handa S.S. & Kaul. K.L. Supplement to cultivation & utilization of medicinal plants.
8. CSIR - Wealth of India, Raw Materials.
9. Bartz - Reinhard - Zenk - Plant Tissue Culture and its Biotechnical Applications.
10. Pharmacognosy, C.K. Kokate, A.P. Purohit, and S.B. Gokhale.
11. Quality Standards of Indian Medicinal Plants Vol-I, ICMR, New Delhi.
12. WHO guide lines for the quality control of Herbal plant materials.
13. The Practical evaluation of phytopharmaceutical by brain & turner.
14. Harborne - Comparative Biochemistry of Flavonoids.
15. Biological standardization by J.N.Barn, D.J.Finley and L.G. Good win.
16. Indian pharmacopoea, Indian Herbal Pharmacopoea and other pharmacopoeia.
17. Ayurvedic Formulary of India.
18. British Herbal Pharmacopoeia.
19. Screening methods of Pharmacology By Robert turner.

Indian System of Medicines(01MPG03103)

1. Ayurvedic Pharmacopoeia.
2. Ayurvedic Formulary of India, the Indian Medical Practitioners Co-operative Pharmacy and Stores Ltd, IMPC02OPS.
3. Hand Book on Ayurvedic Medicines, H.Panda National Institute of Industrial Research, Delhi-7.
4. Ayurvedic system of medicine, 2nd edition, Kaviraj, Nagendranath Sengupata, vol. I &II.
5. Siddha Pharmacopoeia by Dr.S. Chidambarathanu pillai, Ist edition.
6. Unani Pharmacopoeia.
7. Homeopathic Pharmacopoeia.
8. Homeopathic Pharmacy An introduction & Hand book by Steven B. Kayne.
9. Alternative medicine, by Dr. K.B. Nangia.
10. Aromatherapy, Valerie Gennari Cooksley.
10. Indian Herbal Pharmacopoeia vol. I &II Indian Drug Manufacturer's association,
11. British Herbal Pharmacopoeia British Herbal Medicine Association,1990 vol.I
12. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Business horizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
13. Screening methods of Pharmacology by Robert turner.
14. Toxicology and Clinical Pharmacology of Herbal Products, Melanie Johns Cupp.

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1. Herbal drug industry by R.D. Choudhary, Ist edition, eastern publisher, New Delhi: 1996.
2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine Business horizons, New Delhi, First edition, 2003. Robert Verpoorte, Pulok K Mukharjee.
3. Herbal Cosmetics - H.Pande, Asia Pacific Business press, New Delhi.
4. H.Pande, "The coMPL04ete technology book on herbal perfumes and cosmetics", National Institute of Industrial Research, Delhi.
5. Quality control of herbal drugs by Pulok K Mukarjee, Ist edition, Business horizons Pharmaceutical publisher, New Delhi, 2002.
6. PDR for herbal medicines, 2nd edition, medicinal economic company, New Jersey, 2000.
7. Indian Herbal Pharmacopoeia, Vol.1&2, RRL, 1DMA, 1998, 2000.
8. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae, 4th edition, Nirali Prakashan, 1996.
9. Text book of Pharmacognosy and Phytochemistry by rangare.
10. Plant drug analysis 2nd edition by Wagner, Bladt.
12. Biological standardization by J.N.Barn, D.J.Finley and L.G. Good win

PHYTOCHEMISTRY & BIOTECHNOLOGY

1. Pharmacognosy by G. E.Trease, W.C.Evans, ELBS.
2. Pharmacognosy by Varro E.Tyler, Lynn R.Brady, James E.Robbera.
3. Plant Physiology by Frank B.Salisburry, Cleon.W.Rose, CBS Pub. Delhi.
4. Antibiotics Isolation & Separation by M.L.Wenisten, G.H. Wagman.
5. Introduction to Biotechnology by Bullock, John.
6. Biotechnology of Higher plants by Gorden E. Russel
7. Modern Biotechnology by S.B. Primrose.
8. Plant cell culture – A practical approach by R.A. Dixon.
9. Plant cell culture technology by M.M. Yeoman.
10. Plant tissue culture by Dennis N.Butcher, David. S.Ingram.
11. Plant tissue culture by Pitman.
12. Plant tissue culture – theory & practice by S.S.Bhajwani, M.K.Razdan.

13. A Laboratory guide to Organic Natural Products by R.Ikan
14. Environmental Chemistry by Anil Kupur.D.
15. Basic gas chromatography by Menair, Bondhi.
16. Quantitative thin layer chromatography & its industrial application by Trieber.L.R.
17. Biotechnology of Industrial antibiotics by E.J.Vardamme.