SND College of Pharmacy, Babhulgaon, Yeola.

Program Outcomes for Pharmacy Program

The following Program outcomes of the course should be achieved by acquiring an in-depth knowledge & thorough understanding, necessary skills and developing the right attitude.

PO1. Pharmacy Knowledge:

Graduates will apply knowledge of Pharmaceutical and Medicinal chemistry, Pharmaceutics, Cosmetology, Pharmacology, Pharmacognosy and herbal medicines in the career .

PO2. Problem solving skill:

Graduates will apply the demonstrations skills on practical aspects of Synthesis of medicinally important organic compounds, along with Analysis and Quality assurance of formulation and development of various pharmaceutical dosage forms, while solving problems and making decisions during daily practice.

PO3. Communication:

The graduates will acquire excellent interpersonal oral communication and writing skills. They will be able to demonstrate knowledge and proficiency with current audio-visual presentation technologies and develop an ability to communicate scientific knowledge in non-expert/lay term by adopting various modes of scientific communications (e.g., abstract, manuscripts, project reports, oral and poster presentations etc). This will allow effective exchange of professional information

PO4.The Pharmacist and society:

Graduate should develop the attitude to apply current knowledge of Pharmacy in the best interest to assess society, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practices to serve community better.

PO5. Modern Tool Usage:

A graduate should Learn, select, and apply appropriate methods and procedures, resources, and modern pharmaceutical tools, software, and equipments to analyze & solve problems.

PO6. Research & development:

Graduates will be able to demonstrate a high-level of understanding of the key stages in drug discovery, development, and commercialization. This will lead to the manufacturing of drugs and pharmaceuticals considering its impact on the environment and surrounding.

PO7. Environment and sustainability:

Understand the impact of the professional Pharmacy solutions in societal and enviornmental contexts, and demonstrate the knowledge of Pharmacy, and need for sustainable development.

PO8. Ethics:

Graduates will swear by a code of ethics of Pharmacy Council of India in relation to community and shall act as integral part of a health care system. They will demonstrate honesty, integrity, ethical understanding, and respect for others and will carry out their professional responsibilities by adhering to high ethical standards.

PO9. Life-long Learning:

Recognize the need for, and have the preparation and ability to engage in independent and Life-long learning in the broadest context of technological change.

Program Specific Outcomes-

PSO1. Understand the nature and basic concept of Pharmacy, Human Anatomy and Physiology, Biochemistry Microbiology, Pharmaceutical Analysis, Drug Regulatory and Hospital Pharmacy.

PSO2. Set up procedure to develop and analyze Pharmaceutical formulation. Also validation process of formulation and production.

PSO3. Perform procedures as per standard laboratory procedures in the area of formulations, Human Anatomy and Physiology, Biochemistry, Organic and Inorganic Chemistry and Medical Chemistry

PSO4. Understand the applications of Pharmaceutical Sciences in developing of drug, its formulations and quality assurance, preclinical studies, post marketed studies of drug.

First year B. Pharm. (Sem-I &Sem-II)		
Course code	**Course name**	**Course outcomes**
BP101T.P	**Human anatomy and physiology-I**	Student should understand 1. Human body in deep with anatomy and physiology of each organ in detail. 2. Provide study of the different disease of studied organ. 3. Subject gives the relevance and significance of Human Anatomy and Physiology to Pharmaceutical Sciences. 4. basic terminologies used in anatomy and physiology 5. Study the role of Endocrine system involve in regulation and functions of hormones to control overall activity of human body. 6. The construction, working, care and handling of various materials, instruments, glasswares. 7. Practical like complete blood count, heart rate, B.P., Pulse rate, body temperature etc. which helpful in diagnosis of disease. 8. To study structural and microscopical aspects of various organs of human system. 9. To study related various parameters are use to check and regulate the normal functions of Human body. 10. Demonstrate with the techniques for identification, counting, determination of various integral components of the body.
BP102T.P	**Pharmaceutical analysis**	1. Illuminate relevance & significance of Analytical Chemistry to Pharmaceutical Sciences. 2. Clarify basic principles of data treatment and data handling. 3. Explain basic concepts and principles of aqueous acid base titrations. 4. Clarify need and basic principles of non-aqueous acid base titrations. 5. Clarify different terms, types and basic principles of precipitation titrations. 6. Explain concept and reaction conditions for complexation. 7. Clarify and understand the correct use of laboratory equipments with calibration of various apparatus used in Analytical Chemistry laboratory together with safety measures to be followed. 8. Develop practical hand in titrimetric analysis by estimation of analyte concentration in pure form and in formulation. 9. Principle and procedure used in different titration methods such as aqueous, non-aqueous, precipitation, complexometric, redox titration methods. 10. The principle with quantitative estimation of analyte by gravimetric analysis.

BP103T.P	**Pharmaceutics- I**	Student should know about: 1. Different branches of pharmacy 2. Different compendia's 3. Alternative systems of medicine 4. Different types of dosage form, 5. Excipients used in pharmaceuticals & their preformulation studies 6. History of pharmacy profession. 7. Aromatic waters & Elixir. 8. Glycerites & Syrups 9. Monophasic liquid Powders
BP104T.P	**Pharmaceutical inorganic chemistry**	1. Significance of Inorganic chemistry to pharmaceutical sciences 2. Contents of official monographs in pharmacopoeias 3. Official methods of control like limit tests for pharmaceutical preparation 4. Types and use of official water, official gases 5. Different types of inorganic pharmaceuticals along with their preparation and quantification. 6. To analyze acid radicals 7. Basic radicals 8. Limit tests 9. Other qualitative tests such as swelling power, adsorption property etc. 10. Synthesis of inorganic compounds.
BP105T.P	**Communication skills**	1. Choose career and make appropriate decision 2. Comprehend the concept of communication 3. Describe the four basic communication skills – Listening, Speaking, Reading and Writing 4. Convert the conceptual understanding of communication into everyday practice 5. Illustrate role of skills in real-life work situations with case studies, role play, etc. 6. Identify the concept and components of personality, thereby to apply the acquired knowledge to themselves and to marchtowards excellence in their respective academic careers.
BP 106RBT.P	**Remedial biology**	The student shall be able to 1. Know the classification and salient features of five kingdoms of life 2. Understand the basic components of anatomy & physiology of plant 3. Know understand the basic components of anatomy &

		physiology animal with special reference to human
BP 106 RMT	**Remedial mathematics**	The student should be able to:- 1. Know the theory and their application in Pharmacy 2. Solve the different types of problems by applying theory 3. Appreciate the important application of mathematics in Pharmacy
BP 201T.P	**Human Anatomy & Physiology-II**	The Students should know: 1. Different mechanisms that governs the normal working of various organs and systems as a whole. 2. Basic fundamentals structural features of neurons, mechanism of neurotransmitters along with processes of neuroconduction and neurotransmission. 3. Structure of brains parts along with role of Autonomous Nervous System involves maintaining the body's order and stability. 4. Sense organs involve in our body to maintain homeostasis. 5. Organs and mechanism involve in respiration along with clinical significance and disorders of respiratory system. 6. The essentials of Urinary systems involve in regulation of Body functions & how all parts of the human body contribute to the maintenance of homeostasis. 7. Handling of various materials, instruments and equipments. 8. Clarify structural and microscopical aspects of various organs of human system. 9. Various parameters are use to check and regulate the normal functions of Human body. 10. 10.The techniques for identification, counting, determination of various integral components of the body.

BP202T,P	**Pharmaceutical organic chemistry – I**	The students will get knowledge about 1. Basic principles and concepts of organic chemistry 2. Classification , nomenclature 3. Principles of stereochemistry 4. Reaction intermediates 5. How Addition & Elimination Reactions are performed with respect to alkenes and alkynes 6. Different reaction involved in the formation of aromatic compounds. 7. Practicals will helpful for understanding safety measures in laboratory 8. Different laboratory techniques 9. Qualitative analysis of organic compounds 10. Synthesize different organic compounds along with reaction & mechanism.
BP203 T.P	**Biochemistry**	1. To know the metabolism process of various biomolecules like proteins, lipids, carbohydrates and nucleic acids. 2. To understand, classification, function, biological importance of them. 3. To know different qualitative tests & applications of various bio-molecules. 4. To understand the correlation of metabolism, process, steps involved in metabolism of biomolecules amongst them and 5. To understand correlation with other pharmaceutical sciences. To know importance of various vitamins , enzymes and deficiency threats of that. 7. To identify proteins, amino acids and carbohydrates by various qualitative as well as quantitative chemical tests. 8. To separate, identify and characterize proteins from various samples like egg, milk, etc and understand principle behind the technique. 9. To determine quantity of vitamine in fruit or juice e.g. Ascorbic acid. 10. To know action of salivary amylase on starch.

BP 204T	**Pathophysiology**	1. To understand Definitions and Terminologies of pathophysiology. 2. To gain through knowledge of the definition, epidemiology, etiology, clinical manifestations, pathophysiology, 3. Complications, diagnosis & plan of treatment for various diseases and disorders. 4. To understand the importance of different marker enzymes in body , 6. To know pathophysiological significance and estimation of various markers involved in liver, kidney and heart diseases. Student will eligible to understand clinical manifestations of diseases of different systems. 7. To understand different techniques for the estimation blood glucose, CRP etc and its clinical importance 8. Students will have knowledge of how to collect blood and method of preservations 9. They will able to know normal and abnormal constituents of urine and their biological significance.
BP205 T.P	**Computer applications in pharmacy**	1. Know the various types of application of computers in pharmacy 2. Know the various types of databases 3. Know the various applications of databases in pharmacy
BP 206 T	**Environmental sciences**	1. Create the awareness about environmental problems among learners. 2. Impart basic knowledge about the environment and its allied problems. 3. Develop an attitude of concern for the environment. 4. Motivate learner to participate in environment protection and environment improvement. 5. Acquire skills to help the concerned individuals in identifying and solving environmental problems. 6. Strive to attain harmony with Nature
Second year B. Pharm. (Sem-III & Sem-VI)		
BP301T.P	**Pharmaceutical organic chemistry –II**	The students will able to clarify- 1. Chemistry of organic compounds 2. method of preparation of organic compounds 3. chemical reactions of aldehyde, ketones, 4. method of preparation and chemical reactions of phenols sulphonic acid, alcohols and ethers, amines, 5. method of preparation and chemical reactions of carboxylic acid and it's derivatives 6. substitution nucleophilic reactions. 7. qualitative analysis of organic compounds 8. identification of organic compounds 9. derivative prepation 10. synthesis of different organic compounds along with reaction &

		mechanism.
BP302T.P	**Physical pharmaceutics-I**	Student should know about: 1. Different physicochemical properties of substance or drugs. 2. Factors affecting on it with proper examples 3. Mathematical problems related to them. 4. Phase rules 5. Solubility and factors affecting it. 6. Laws of thermodynamics 7. Critical solution temperature 8. Different factors affecting solubility of drugs. 9. Evaluate conc. by conductometic titration 10. Determination of molecular weight
BP 303 T.P	**Pharmaceutical microbiology**	1. Define microbiology & classify microbes into various categories 2. Aware about historical developments and contributions of scientists in the field of microbiology. 3. Know the recent advances in microbiology. 4. Compare and contrast the various structural features, biology & characteristics of microbes. 5. Know the modes of reproduction in bacteria, growth characteristics, requirements. 6. Describe isolation & counting methods of microorganisms. 7. To prepare and sterilize nutrient broth, nutrient agar, slants, stabs and plates. 8. Maintaining aseptic condition & handling inoculating loop, its sterilization and inoculation procedure. 9. Isolate microorganism by streak plate technique & count them by pour plate technique. 6. Observe motility of bacteria by hanging drop technique

BP 304 T.P	**Pharmaceutical engineering**	Pharmaceutical Engineering is the subject which renders knowledge related to: 1. It also deals with different factors associated with it. 2. Know various heat transfer techniques 3. Know about evaporation and its mechanism 4. Know types of crystallization 5. Study the principle, theory, mechanism, working and construction of equipments of different unit operations 6. Know about product manufacturing..
BP401T	**Pharmaceutical Organic Chemistry-III**	1. Molecular representations and their interconversions 2. Stereochemistry & its significance 3. Conformational analysis 4. Rearrangement 5. Pericyclic reactions 6. Chemistry of amino acids and polypeptides 7. Procedures for binary mixture separation and identification of compound by qualitative analysis 8. Synthesis of organic compounds by rearrangement reactions. 9. TLC 10. Column chromatography
BP402T.P	**Medicinal chemistry – I**	Student should understand 1. Significance of Medicinal Chemistry in Pharmaceutical Sciences. 2. Correlation of physicochemical properties affecting drug action and Pharmacokinetics. 3. The different types of receptors, forces involved in drug receptor interaction and their signal transduction mechanism. 4. General aspects of the design & development of drugs. 5. Study different classification, nomenclature, of diuretics and drugs acting on autonomic nervous system & cardiovascular system. 6. (MOA) mechanism of action structure activity relationship (SAR), adverse effects, therapeutic uses and recent developments in diuretics and drugs acting on autonomic nervous system & cardiovascular system. 7. Safety measures while working in medicinal chemistry laboratory. Use of various equipments in medicinal chemistry laboratory. Student should understand and develop skills in various purification techniques of solvents/liquids used in synthesis. 8. Prepare acid and basic salts of drugs and evaluate their physicochemical properties.

BP 403 T.P	**Physical pharmaceutics-II**	1. Understand Chemical and physical phenomena that govern the in vivo and invitro actions of pharmaceutical products. 2. Acquire sufficient knowledge of surface and interfacial tension between the surfaces. 3. Understand the different types of flow in order to identify and choose suitable flow characteristics for the formulation. 4. Understand reaction kinetics, reaction order, and discuss factors affecting the rate of the reaction 5. Describe the degradation and stabilization of medicinal agents as well as accelerated stability testing. 6. Know types, properties and applications of colloids in the formulations. 7. Evaluate viscosity, specific surface area, particle size distribution & derived properties of any material. 8. Predict surface tension of given liquid. 9. Calculate Krafft point, Cloud point, critical micelle concentration and HLB value of given surfactant. 10. Calculate energy of activation of acid hydrolysis

BP 404 T.P	**Pharmacology-I**	The subject 1. Helps to understand nature and sources of drugs and route of drug administration, 2. Process of drug discovery and development 3. Study in deep pharmacokinetic and pharmacodynamics of drugs, 4. Study varies types of receptor, drug receptor 4. Interaction, drug toxicity, drug interaction and adverse drug reactions. 5. Study rational drug treatment during pregnancy and lactation, pediatric patients & in geriatric patients
BP 405 T.P	**Pharmacognosy and phytochemistry -I**	1. Explain meaning & significance of Pharmacognostic parameters & Pharmacognostic study of crude drugs. 2. Explain the significance of secondary metabolites production in plants & other organisms & deduce their significance as medicinal molecules. 3. Explain primary metabolites its Pharmaceutical & industrial applications. 4. Define, classify, explain source, name & draw chemical structures, identify from the structure, organize the biosynthetic sequence, describe methods of extraction & underlying rationale of qualitative & quantitative analysis of Primary metabolites glycosides & tannin compounds of plant origin. 5. Decide on staining reagents required for specific part of plant 6. Draw morphological & microscopical diagrams & be able to label component / parts ..
Third year B. Pharm. (Sem-V &Sem-VI)		
BP501T.P	**Medicinal chemistry – II**	Student should understand 1. Significance of Medicinal Chemistry in Pharmaceutical Sciences. 2. Drug metabolism & its significance in drug discovery. 3. General aspects of the design & development of drugs. 4. Study different classification, nomenclature, of Local anesthetics, Oral Anti-hyperglycemics, Diagnostics nd drugs acting on Central nervous system. 5. (MOA) mechanism of action structure activity relationship (SAR), adverse effects, therapeutic uses and recent 6. developments in Local anesthetics, Oral Anti-hyperglycemics, Diagnostics and drugs acting on Central nervous system.

		6. Various drug used for various diagnosis test. 7. How to determine molar refractivity of compounds. & Separate solvents by Steam distillation technique. 8. Mechanism and how to carry out Dean stark azeotropic water separation. 9. Synthesize, recrystallize and understand reaction mechanisms involved in synthesis of medicinally important organic compounds & microwave assisted organic synthesis. 10. How to handle FTIR & Interperating IR graph.
BP 502 T	**Industrial PharmacyI**	1. Understand the concepts of solid dosage form design & formulation strategies. 2. Explain tablets as a dosage form, physico-chemical principles guiding tablet formulation, various tablet additives, manufacture & evaluation, equipments, defects in tabletting & remedies. 3. Learn the concept, types, pharmacopoeial specifications, techniques & equipments used in tablet coating. 4. Describe capsules, types, additives, size selection, manufacturing & .evaluation, equipments, &defects. 5. To understand the concept of technology transfer. 6. State the correct use of various equipments in Pharmaceutics laboratory relevant to tablets, capsules &coating. 7. Explain formulation, evaluation and labeling of tablets &capsules.Estimation of alkali metals by flame photometry 8. To understand rational behind use of formulation ingredients. 9. To learn the equipments and apparatus needed for the preparation as per SOP. 10. Select the suitable packaging material (container-closure) for the preparation.
BP503.T.P	**Pharmacology-II**	1. Autonomic Nervous system it's General Considerations, Sympathetic and Parasympathetic Nervous system with neurotransmitters. 2. Cholinergic, Anti-cholinergic, Adrenergic, Anti-adrenergic system and drugs study with its Biosynthesis, Storage, Release and Metabolism. 3. Pharmacology of Ganglion Stimulating and Blocking drugs and Neuromuscular blocking. 4. Endocrine Pharmacology Functions, Receptor and mechanisms of Hormone. 5. Biosynthesis, Mechanism of Action and Pharmacology of Adreno-corticosteroids and corticosteroid antagonists, Thyroid and antithyroid drugs and Insulin, Oral hypoglycemic agents, Glucagon. 6. Study in detail with Androgens, Antiandrogens, Anabolic Steroids, Estrogens, Progestins, contraceptives, Specific Estrogen Receptor Modulators (SERMs), Aromatase Inhibitors, antiprogestin. 7. To Introduce instruments commonly used in experimental pharmacology. 8. Study the animal Care and handling of common laboratory animals, as per (CPCSEA, OECD), biochemical reference

		values in various Animal species and routes of drug administration. 9. Study of various methods for collection of blood, body fluids and urine from experimental animal's physiological salt solutions, drug solution and use of molar solution. 10. Recording Concentration Response Curves (CRC) of Acetylcholine, Histamine, Physostigmine and Atropine.
BP504 T.P	**Pharmacognosy and phytochemistryII**	Student will be able to define & classify alkaloids. 1. Explain source, name & draw chemical structures. 2. Identify from the structure, organize the biosynthetic sequence in formation of major group of alkaloids, terpenoids & resins. 3. Describe methods of their extraction. 4. Explain underlying rationale of qualitative & quantitative analysis of alkaloids, terpenoids & resins . 5. Contribution of alkaloids , terpenoids & resins in modern drug discovery, & their currently marketed semisynthetic derivatives 6. Able to Judge the quality of crude drugs by different means & explain the significance of same in commerce & industry. 7. Identify the parts of plants from its morphological & microscopical features by applying experimental knowledge of morphology & anatomy obtained in theory classes. 8. Able to conduct extractions/isolations & explain significance of use of various chemicals & physical conditions. 9. Identify unorganized crude drugs using morphological, chemical, physical & microscopical characteristics.
BP 505 T	**Pharmaceutical jurisprudence**	1. Basic principles, purpose, significance and relevance of Pharmaceutical laws in India. 2. Study of qualifications for membership of the Board and it's responsibilities inspection method. 3. Study of various laws governing the manufacturing, sale, research & usage of drugs. 4. Knowledge about Patents and various regulatory systems. 5. Aim, Objectives and Salient features of various acts related to pharmacy.

BP601T.P	**Medicinal chemistry – III**	1. General aspects of the design 2. Development of drugs including history. 3. Classification, nomenclature, 4. Structure activity relationship (SAR). 5. Mechanism of action, adverse effects, therapeutic uses and recent developments in therapeutic categories such as NSAIDs, steroidal anti-inflammatory drugs, narcotic & non-narcotic analgesics, antipyretics, autacoids and drugs acting on respiratory & GI tract. 6. Design a drug synthesis. 7. Make correct use of various equipments & take safety measures while working in medicinal chemistry laboratory. 8. Develop skills involved in thin layer chromatography techniques and purification of synthesized compounds by column chromatography. 9. Synthesize, recrystallize and understand reaction mechanisms involved in synthesis of medicinally important organic compounds. 10. To interpret the spectral characterizations made by IR and 1H-NMRs of synthesized compounds.
BP602 T.P	**Pharmacology-III**	1. Pharmacology having 1.knowledge drug including classification, structure activity relationship (SAR), mechanism of action, adverse effects, therapeutic uses. 2. Study General Anesthesia and Local Anesthetics with Stages and Principles of Anesthesia and clinical uses of its 3. Alcohols and alcoholism including Pharmacology of Alcoho 4. to study the Psychopharmacological drugs in detail 5. Pharmacology of Non-steroidal anti-inflammatory drugs ,Rheumatoid Arthritis, Osteoartritis and Gout 6. Pharmacology of drugs used in Gastrointestinal tract disorders, Respiratory tract disorders 7. Practical use to Determine of unknown concentration of Histamine, Ach using by Matching bioassay method 8. Determine of unknown concentration of Histamine, Ach using by Bracketing bioassay method. 9. Determination of unknown concentration of Histamine, Ach using by Interpolation bioassay method. 10. To Study of analgesic activity of drugs using Eddy's hot plate analgesiometer, actophotometer ,rotarod.
BP 603 T.P	**Herbal drug technology**	1. Explain various difficulties in standardization of herbal material, new approaches evolved, and steps in development of plant monograph. 2. Explain need & significance of plant material authentication, new approaches used with their merits & demerits. 3. Explain various factors affect on level of secondary metabolites, effect of post harvesting manipulations, and changes during storage etc& methods to control these modification. 4. Explain various guidelines issued by WHO in relation with cultivation, collection, storage etc.

		5. Explain concept of health & pathogenesis, philosophical basis, diagnosis & treatment aspects of Ayurveda, Unani, Siddha &Homoepatic system of medicine. 6. Method of preparation of Ayurvedic dosage forms; significance of novel drug delivery of natural products; herbs used in cosmetic preparation & methods of their formulations 7. Prepare, label & evaluate herbal/TSM formulations 8. Evaluate marketed cosmetic & nutraceutical formulations 9. Conduct preformulation parameters & understand underlying rationale 10. Conduct in vitro assays for correlation with biological
BP 604 T	**Biopharmaceutics and pharmacokinetics**	1. Understanding the concept of biopharmaceutics and its applications in formulation development. 2. Learning various compartmental models and non compartmental analysis methods. 3. Studying pharmacokinetic processes and their relevance in efficacy of dosage form 4. Learning various compartmental models and non compartmental analysis methods 5. Understanding concept and mechanisms of dissolution and in vitro in vivo correlation 6. Methods of assessing bioavailability.
BP 605 T	**Pharmaceutical biotechnology**	1. Define Biotechnology & its state its scope in pharmacy 2. Know the basics of biotechnology techniques and the various systems used. 3. Know the method of genetic engineering for production of rDNA products including monoclonal antibodies. 4. Know the information about the application of genetic engineering in animals. 5. Have a knowhow of enzymes and their uses by immobilization. Illustrate use of Fermenter for production of fermentation products and information about their purification by downstream process.

BP606T	**Pharmaceutical quality assurance**	Student should understand 1. The significance of quality assurance techniques & quality in pharmaceutical manufacturing 2. Current Good Manufacturing Practices in pharmaceutical industry. 3. Various aspects of documentation, SOPs and records 4. The role of validation in assurance of quality in pharmaceutical industry. 5. Quality by design, QBD. 6. ICH guidelines in stability testing and QMS.
Final year B. Pharm. (Sem-VII &Sem-VIII)		
BP701T.P	**Instrumental methods of analysis**	The students will able to get knowledge of Spectroscopic (FTIR, NIR, Raman, Atomic Emission) & Chromatography (Gas, Flash, Super critical fluid chromatography) techniques in terms of – 1. Principles 2. Instrumentation 3. Factors 4. Applications 5. Use in Pharmaceutical industry Practicals will helpful for understanding 6. Spectrophotometric estimation of two-component formulations by simultaneous analysis 7. Q-Method 8. IR-Spectral interpretation of aliphatic, aromatic compounds.
BP 702 T.	**Industrial pharmacyII**	1. Explain suspensions, emulsions & semi-solids types, formulation development, manufacturing, excipients used, evaluation of suspensionsetc. 2. Describe layout for manufacturing 3. Explain disperse systems, its classification, theories of dispersesystems, 3. thermodynamic v/s kinetic stability considerations 4. Describe emulsions, their physico-chemical properties, theory of emulsification, HLB value & phase inversion temperature, Kraft point, cloud point, excipients,formulation evaluation of emulsions; cracking, coalescence, stability & Stresstesting Explain semi-solids, anatomy & physiology of skin. 5. Formulation of Suspensions, emulsions & semi-solids, 6. Prepare the labels so as to suit the regulatory requirements 7. Describe use of ingredients in formulation and category of formulation.

BP 704T	**Novel drug delivery systems**	1. Describe the Fundamental Concept of Modified Drug Release and Pre requisites of drug candidates, along with various approaches and classification 2. Basic concept of optimization. 3. Describe. Introduction, formulation, merits, demerits, application and evaluation of Novel Drug Delivery Systems. 4. Explain Therapeutic Aerosols along with typical formulations from, metered dose, intranasal and topical applications. 5. Explain concept of microencapsulation, merits, demerits and application, Types of Microencapsulation and Evaluation of microcapsules. 6. Describe Polymers with respect to introduction to polymers, classification, types, selection, application and examples 7. Formulation, evaluation of sustain release, transdermal, gastroretentive formulation 8. Microencapsulation technique 9. Evaluation of marketed preparation 10. Optimizations studies by 2^3 factorial designTo interpret the spectral characterizations made by IR and 1H- NMRs of synthesized compounds.

BP801T	**Biostatisitcs and research methodology**	Upon completion of the course the student shall be able to 1. Know the operation of M.S. Excel, SPSS, R and MINITAB ® , DoE (Design of Experiment) 2. Know the various statistical techniques to solve statistical problems 3. Appreciate statistical techniques in solving the problems.
BP 802T	**Social and preventive pharmacy**	Acquire high consciousness/realization of current issues related to health and 1. After the successful completion of this course, the student shall be able to: Evaluate alternative ways of solving problems related tohealth and 2. Have a critical way of thinking based on current healthcare development. 3. pharmaceutical problems within the country and worldwide. pharmaceutical issues

BP803ET	**Pharma marketing management**	1. Pharmaceutical business and management strategy. 2. Marketing research, product management. 3. Communication 4. Human resource and development needs. 5. Disaster management 6. Disaster preparedness, mitigation.Methods of assessing bioavailability.
BP804 ET	**Pharmaceutical regulatory science**	Upon completion of the subject student shall be able to; 1. Know about the process of drug discovery and development 2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals 3. Know the regulatory approval process and their registration in Indian and international markets Course
BP 805T	**Pharmacovigilance**	1. Why drug safety monitoring is important? 2. History and development of pharmacovigilance 3. National and international scenario of pharmacovigilance 4. Dictionaries, coding and terminologies used in pharmacovigilance 5. Detection of new adverse drug reactions and their assessment 6. International standards for classification of diseases and drugs 7. Adverse drug reaction reporting systems and communication in pharmacovigilance 8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle 9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation 10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India 11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning 12. CIOMS requirements for ADR reporting 13. Writing case narratives of adverse events and their quality
BP 806 ET	QUALITY CONTROL AND STANDARDIZATION OF HERBALS	1. know WHO guidelines for quality control of herbal drugs 2. know Quality assurance in herbal drug industry 3. know the regulatory approval process and their registration in Indian and international markets 4. appreciate EU and ICH guidelines for quality control of herbal drugs
BP 807 ET	**Computer aided drug design**	Upon completion of the course, the student shall be able to understand The concept of QSAR and docking 1. The role of drug design in drug discovery process 2. Design and discovery of lead molecules 3. The design of new drug molecules using molecular modeling software 4. Various strategies to develop new drug like molecules. 5. The design of new drug molecules using molecular modeling software

BP808ET	**Cell and molecular biology**	1. Summarize the Cell Cycle 2. Describe basic molecular genetic mechanisms. 3. Describe cellular membrane structure and function. 4. Describe protein structure and function. 5. Summarize the DNA properties of cell biology. 6. Describe the chemical foundations of cell biology. 7. Summarize cellular functioning and composition. 8. Summarize cell and molecular biology history.
BP809ET	**Cosmetic science**	1. Understand the concepts of cosmetics. 2. Explain formulation of cosmetics, manufacturing, equipments & evaluation. 3. Explain the concept of cosmeceuticals. 5. Explain formulation of cosmetics for hair, manufacturing & evaluation of hair shampoos, tonics. Describe formulation of cosmetics for eyes, manufacturing & evaluation of eye mascara, shadow. 6. Understand formulation of manicure products like nail lacquer, remover. 7. State the correct use of various equipments in Pharmaceutics laboratory relevant to cosmetics. 8. Perform formulation, evaluation and labelling of cosmetics 9. Describe use of ingredients in formulation and category of formulation. 10. Prepare labels as per regulatory requirements.
BP810 ET	**Pharmacological screening methods**	Student should know about: 1. Appreciate and demonstrate the various screening methods used in preclinical 2. Appreciate the applications of various commonly used laboratory animals. 3. research Appreciate and demonstrate the importance of biostatistics and researchmethodology 4. Design and execute a research hypothesis independently
BP 811 ET	**Advanced instrumentation techniques**	1. know analysis of drugs using various analytical instruments. 2. understand the calibration of various analytical instruments 3. understand the chromatographic separation and analysis of drugs. 4. understand the advanced instruments used and its applications in drug analysis

BP 812 ET	**Dietary supplements and nutraceuticals**	Student should understand 1. Understand the need of supplements by the different group of people to maintain healthy life. 2. Understand the outcome of deficiencies in dietary supplements. 3. Appreciate the components in dietary supplements and the application. 4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims..

M. Pharm. – First Year (Sem-I) Subject of Specialization		
Course code	**Course name**	**Course outcomes**
M. 1. 4.T	**Advanced Pharmaceutics (Theory)**	The Student should know about- 1. The concept of preformulation, Analytical techniques to characterize physical and chemical properties of NCE. 2. Polymer sciences-Applications, Thermal characterization and Rheology of polymers, Biodegradable polymers. 3. Stability of pharmaceuticals, Understanding of statistical aspects expiry period. Degradation pathways. 4. Excipients-Factors affecting the selection, drug-excipient and excipient-package interactions, Standardization of excipients, Co processed excipients. 5. The concept of Diffusion& Dissolution - Dissolution test, Dissolution model. 6. Micro encapsulation - methods, applications and evaluation 7. Optimization - Optimization process, classification , importance of experimental design, correlation & regression analysis,
M.1.5 P	**Advanced Pharmaceutics (Practical)**	In practical's student should know the- 1. Instruction to authors of any one of the highimpact factor journal 2. Preformulation study of tablets. 3. Intrinsic and saturation solubility. 4. Effect of pHon the apparent partition coefficient of a drug, 5. Determine the best compatible additive for a tablet dosage form. 6. Accerlated stability study, 7. To characterize polymers Rheologically and Thermally. 8. Study the dissolution kinetics of IR and ER dosage form 9. To interpret DSC, IR and PXRD from any reported data
M.1.12 T	**ADVANCED QUALITY ASSURANCE TECHNIQUES (CGMP & DOCUMENTATION) (THEORY)**	1. Responsibilities and Key Personnel. 2. Design, size, location and Construction of Equipment 3. Management of Rejected and Recovered Materials 4. Components of Q.A. 5. I.P.Q.C. of different formulations 6. Study of Mix-ups and Cross Contamination

M.1.13 P	**ADVANCED QUALITY ASSURANCE TECHNIQUES (CGMP & DOCUMENTATION) (Practical)**	1. Learning different programming languages in computer, writing programmes for simple Calculation 2. Physical and Chemical Examination of plastic containers. 3. Writing a MPCR / BPCR (For sterile & non-sterile products) 4. Writing a Product complaint document
M.1.6 T	**ADVANCED PHARMACEUTICAL CHEMISTRY**	1. General aspects of Stereochemistry & Chiral Techniques. 2. Mechanisms, stereochemistry and applications of enlisted individual reactions (Molecular Rearrangements, Reactions of importance, Multi-component synthesis). 3. Definition, terms and abbreviation, rules and guidelines of synthon approach including all types of disconnections with examples. 4. Green Chemistry approach to drug synthesis. 5. Introduction to Environment protection and effluent treatment aspects
M.1.7 P	**ADVANCED PHARMACEUTICAL CHEMISTRY (Practical)**	1. Make correct use of various equipments & take safety measures while working in medicinal chemistry laboratory. 2. Understand and develop skills in various experimental techniques such Fractional distillation, Vacuum distillation, Preparative chromatography-Column and TLC. 3. Synthesize, recrystallize and understand reaction mechanisms involved in synthesis of medicinally important organic compounds. 4. To interpret the spectral characterizations made by IR and 1H-NMRs of synthesized compounds. 5. Isolation and characterization of phytochemical principles (e.g. alkaloids, steroids) from natural origin.
M. Pharm. – First Year (Sem-I) Common Subject for All		
M. 1. 1 T	**Advanced Analytical Technique (Theory)**	The Student should know about- 1. Chromophores and their interaction with UV-visible radiation and their utilization in structural, qualitative and quantitative analysis of drug molecules. 2. Woodward-Fieser rule, use of schiff reagents for elucidation of structures. 3. The basic principle, instrumentation and different attachments to FTIR for sample handling. NIR: Principle and applications 4. What is Principles of FT-NMR with reference to ^{13}C NMR, free induction decay, average time domain and frequency domain signals. Spin-spin and spin-lattice relaxation phenomenon. 5. Basic principles and instrumentation (components

		and their significance). Ionization techniques (FAB, MALDI, SELDI, APCI, APPI, ESI and DART). Mass analyzers [Quadrupole, Ion Trap, FT-ICR, TOF and tandem mass (MS-MS)]. 6. Introduction to Scanning Electron Microscopy and Travelling Electron Microscopy.
M.1.2 P	**Advanced Analytical Technique (Practical)**	1. Study effect of solvent on wavelength maxima of drugs. 2. Multicomponent analysis by UV Spectrophotometry 3. The titrimetric method include potentiometric end point determination. 4. Interpretation of UV, IR, NMR and Mass spectra of some unknown intermediates and drugs
(M.1.3)	**Research Methodology**	1. Research 2. Literature survey and documentation 3. Technical writing 4. Presentation: (Specially for oral) 5. Project [cost] management 6. Research organizations and procurement of research grants: 7. Basic Definitions And Concepts: 8. Experimental design: 9. Descriptive D ata Analysis 10. Inferential data analysis
E.1.4	**Sterile Product Formulation & Technology**	The Student should know about- 1. Pre-formulation& formulation of SVPs & LVPs, ophthalmic products , Sustained release parenteral formulations. 2. Manufacturing of Parenterals –Guidelines: Overview of GMP and regulatory guidelines.Layout of parenteral facilities, FFS and BFS technology for parenterals.Environmental control: Temperature and humidity control, air handing systemsand their validation.Industrial sterilization: Large-scale sterilization processes, process selection,specifications, development and validation of process and equipment.Hazards associated with parenteral therapy
M. Pharm. – First Year (Sem-II) **Subject of Specialization**		
Course code	**Course name**	**Course outcomes**
M. 2. 2.T	**Formulations & Development (Theory)**	The Student should know about- 1. ICH Q8 (R2) Guidelines for pharmaceutical development 2. Basics of process automation of solid dosage form production 3. Mouth dissolving formulation & taste masked formulation. 4. Phase behaviour of surfactants in binary and ternery

		systems. 5. Factors affecting phase behaviour. Micellization, micelle structure. 5. Pharmaceutical aspects of solubilisation in nonaqueous systems 6. Semisolid formulation with special reference to penetration enhancers. Emulgels, semisolids based on Liposomes, Niosomes. 7. Inhalation products 8. Regulatory perspective of selection and evaluation of Pharmaceutical packaging materials 9. Nutraceuticals 10. Veterinary Dosage Forms 11. Introduction to QBD (Quality by Design
M.2.3 P	**Formulations & Development (Practical)**	In practical's student should know the- 1. Determination of stability constant of beta-cyclodextrin complex of drug using phase solubility analysis 2. Optimization of designing of dosage forms by 3^2 factorial designs. 3. Compare the dissolution efficiency of a drug in plain and its solid dosage form. 4. Compare the dissolution profile of two marketed solid oral preparation by f1 and f2 factor. 5. Prepare and evaluate transdermal drug delivery system and compare the release of drug through treated egg membrane Or treated cellophane membrane. 6. Prepare liposome and determine particle distribution and drug entrapment efficiency. 7. Plot the ternary phase diagram in the formulation development of emulsion. 8. Interpret IVIVC for any dosage form.
M.2.14 T	**PHARMACEUTICAL VALIDATION (Theory)**	1. Write about Scope of Validation,Validation Life cycle 2. Facility Qualification and Consideration of Validation aspects during facility design 3. Media fill test and Validation of existing equipment in Pharma Industry 4. Cleaning of Equipment and it's Validation 5. Bioanalytical and stability indicating method Validation. 6. Processes Validation Following formulations - Tablet, Capsules, Ampoules & Vials, Ointment/Creams and Liquid Orals
M.2.15 P	**PHARMACEUTICAL VALIDATION (Practical)**	1. Validation of analytical method-Performance 2. Validation of equipment- Dissolution test apparatus, Powder Mixer (Dry),Tablet Compression Machine, Coating pan 3. Study of Validation of at least two analytical instruments. 4. Study of Cleaning validation of one equipment.

M.2.5 T	**ADVANCED MEDICINAL CHEMISTRY**	1. General aspects of Microorganism in drug development. 2. Molecular concept of drug-target interactions. 3. Advances in receptors of enlisted classes, SAR studies of drugs and ligands belonging to classes including mechanism of action. 4. Synthesis of drugs describing reaction conditions mechanism and strategies involved in the synthesis. 5. Introduction to gene theropy with suitable examples, scope, techniques and application. Introduction to Biomolecules (human insulin, tissue plasminogen activator (TPA), interleukins, interferons, growth harmones, monoclonal antibodies, and factor VIII etc
M.2.6 P	**ADVANCED MEDICINAL CHEMISTRY (Practical)**	1. Make correct use of various equipments & take safety measures while working in medicinal chemistry laboratory. 2. Demonstration of computer aided drug design techniques using suitable software. 3. ADMET prediction using suitable software. 4. Microwave assisted Synthesis & Synthesis based on ultrasonic technique, 5. Synthesis, recrystallize and understand reaction mechanisms involved in synthesis of medicinally important organic compounds. 6. To interpret the spectral characterizations made by IR and 1H-NMRs of synthesized compounds.
M. 2.4	**Novel Drug Delivery System**	The Student should know about- 1. Fundamentals of Controlled Release Drug Delivery 2. Oral controlled drug delivery systems 3. Parenteral controlled release system 4. Mucosal drug delivery models 5. Transdermal drug delivery system 6. Bioavailability and bioequivalence 7. Vesicular Drug Delivery System 8. Particulate Drug Delivery System 9. Site specific drug delivery system 10. Ocular Drug Delivery 11. Protein & peptide drug delivery system 12. Regulatory consideration in controlled release
M.2.16	**Quality Planning & Analysis**	1. Basic concepts of Quality 2. Quality Improvement and Cost Reduction 3. Control of Quality 4. Developing: Quality Culture 5. Manufacturing 6. Statistical Process control 7. Inspection, test and Measurement 8. Inspection and test sampling plans 9. Quality Assurance General Concepts
M.2.7	**Drug Design**	1. Role of drug design in drug discovery with its various approaches.

		2. Quantitative Structure-Activity Relationships (QSAR) with details. 3. Drug design based on antagonism and enzyme inhibition. 4. Basic concept of computational chemistry 5. Computer-Aided Drug Design: Ligand based Drug Design or Analog-based approach: 2D-QSAR, 3D-QSAR, Pharmacophore modelling. 6. Structure-based drug design or Receptor-based approach. 7. Drug metabolism based drug design. 8. Recent Advances in drug discovery
M. Pharm. – First Year (Sem-II) Common Subjects		
M.2.1	**Drug Regulatory Affairs**	1. Drug Regulatory Aspects (India) – 2. Good Manufacturing Practices (GMP) 3. D rug Regulatory Aspects (International & highly regulated markets) 4. Introduction to IPR & Patents 5. Patenting in India – 6. Patent search, Patent analysis & Patent drafting. 7. Allied Patents Related Issues: 8. Indian IP case studies-
E.1.7	**TRADITIONAL SYSTEMS OF MEDICINE & AYURVEDIC ORMULATIONS**	1. Ethnopharmacognosy - General account. 2. A brief idea about Ayurveda. Chinese systems of medicine. Unani system of medicine. Homeopathy. 3. Comparative account of drugs used in above systems of medicine. 4. Ayurvedic dosage forms-Basic idea. 5. The formulation and evaluation of Ayurvedic dosage forms: Churna, Bhasma, Kwatha Asava,Arishta, Avaleha, Gutika, Vati, Rasa, Rasayana, Taila, Ghrita, Guggulu, Arka.Ayurvedic Cosmetic formulations, 6. Standardization of Ayurvedic dosage forms using: a) Physical methods b) Chemical methods c) Biological methods.