**3.1.1. Course Outcomes (SAR should include course outcomes of one course from each semester of study, however, should be prepared for all courses) (05)**

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| **Course : General Chemistry - [ BPH\_C\_101\_T ]** | |
| CO1 | 1) Draw and explain the structures of various molecules or ions based on the concept of ionic and covalent bonding. |
| CO2 | 2) Explain the Rate Law of a Chemical Reaction and Apply the knowledge of principles like Hammonds postulate, Reactivity and Selectivity Microscopic reversibility to predict the nature of reaction and product formation rate. |
| CO3 | 3) Differentiate the types of catalytic reactions and explain the role of catalyst. |
| CO4 | 4) Classify Gastrointestinal Agents, Topical Agents, Saline Cathartics,Expectorants, Emetics, Antidotes and explain their mode of action.Describe sclerosing agents and complexing agents |
| CO5 | 5) Classify electrolytes/ elements and elaborate their physiological role. Explain use of physiological ions in replacement.therapy, acid-base balance and combination therapy. |
| CO6 | 6) Explain the basic concepts of radiochemistry and biological effects of radiation; describe diagnostics and therapeutic uses of radiopharmaceuticals. |
| CO7 | 7) Define and identify basic salts which are drugs used widely in Pharmacy |
| CO8 | 08) Explain the use of Inorganic drugs in day to day life |
| CO9 | 9) list and name elements, provide their symbols and determine the number of protons, neutrons, electrons and nuclei in elements and compounds. |
| CO10 | 10) Know the role of elements and compounds in the processes of life. |

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| **Course : Dispensing & Community Pharmacy - [ BPH\_C\_102\_T ]** | |
| CO1 | Define and identify various dosage forms |
| CO2 | Solve problems relating to pharmaceutical calculations |
| CO3 | Have knowledge of different prescription types |
| CO4 | Identify and comprehend different steps involved in dispensing of formulations |
| CO5 | Understand principles involved in compounding of different dosage forms |
| CO6 | Identify physical and chemical incompatibilities among different active ingredients and formulations |
| CO7 | Understand the organization of community pharmacy, provide optimal patient care under the direct personal interaction/ counseling. |

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| **Course : Anatomy, Physiology & Pathology - [ BPH\_C\_103\_T ]** | |
| CO1 | Outline and categorize the various body structural levels (cells,tissues,organs and systems) and recall the structure,composition and functions of plasma membrane and method of movement of substances across plasma membrane. |
| CO2 | Explain anatomy,physiology of lymphatic system,recall and interpret the types of hypersensitivity reactions, and make use of the knowledge of the pathophysiology of AIDS and autoimmune diseases. |
| CO3 | Tell the composition and fuctions of blood,explain the process of hemostasis and blood coagulation as well as recall and apply the knowledge of pathophysiology of common haematological disorders. |
| CO4 | Comprehend the mechanisms of inflammation and repair. |
| CO5 | Recall the anatomy of skeletal,cardiac and smooth muscle,explain the transmission at the neuromuscular junction and energy metabolism in the muscle as well as the mechanism of skeletal muscle cotraction. |
| CO6 | Demonstrate various types of skeletal muscle cotractions. |

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| **Course : Biochemistry-I - [ BPH\_C\_104\_T ]** | |
| CO1 | Understand that some minerals are essential components of important molecules such as hormones and enzymes |
| CO2 | Describe the deficiency symptoms for each fat-soluble & Water soluble vitamin and state the conditions in which deficiencies are likely to occur |
| CO3 | Define the laws of thermodynamics and explain the concepts of Gibbs free energy |
| CO4 | Explain about the favorable and unfavourable reactions and role of ATP and NADH as energy carriers |
| CO5 | Describe structure of Nucleic acids, DNA and lipids with examples |
| CO6 | Describe commonly occurring carbohydrates, amino acids and fatty acids |
| CO7 | Describe higher order stuctures like oligo and poly saccharides/peptides and membrane lipids |
| CO8 | Describe the process of digestion, absorption, storage and retrieval of different cellular nutrients |

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| **Course : Communication Skills & Ethics - [ BPH\_C\_105\_T ]** | |
| CO1 | List and identify verbs and the passive voice. |
| CO2 | Apply skills learnt to confidently stand in a group discussion. |
| CO3 | Observe the technical communication with the help of five c's. |
| CO4 | Apply skills learnt to leadership and ethics. |
| CO5 | Apply skills learnt to communicate effectively- technically/business wise. |
| CO6 | Appreciate and imbibe the importance of ethics, human values, honesty and integrity. |

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| **Course : General Chemistry Lab - [ BPH\_C\_106\_L ]** | |
| CO1 | Analyze inorganic mixtures qualitatively by semi-micro methods |
| CO2 | Identify different inorganic impurities in inorganic medicinal agents by performing pharmacopoeial test. . |
| CO3 | Prepare and purify inorganic pharmaceuticals |
| CO4 | Graduates will be able to understand the objective of their chemical experiments, properly carry out the experiments, and appropriately record and analyze the results. |
| CO5 | Graduates will know and follow the proper procedures and regulations for safe handling and use of chemicals |
| CO6 | Graduates will be able to communicate the concepts and results of their laboratory experiments through effective writing and oral communication skills |

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| **Course : Dispensing & Community Pharmacy Lab - [ BPH\_C\_107\_L ]** | |
| CO1 | Read prescriptions, identify commonly used latin terms in pharmacy practice. |
| CO2 | Calculate the quantities of active ingredients and excipients required for compounding the required quantity of formulation (expansion and reduction of formula) |
| CO3 | Compound, label and dispense extemporaneous formulations |
| CO4 | Understand patient counseling and patient education methods |

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| **Course : Anatomy, Physiology & Pathology Lab - [ BPH\_C\_108\_L ]** | |
| CO1 | Carry out or perform rbc count,wbc count,differential leucocyte count,esr,bleeding time,clotting time,blood group,heamoglobin content and blood pressure. |
| CO2 | Interpret the results of the performed experiments and correlate with clincial conditions. |
| CO3 | Identify and locate the bones in human skeleton. |
| CO4 | Identify and describe the various body tissues and organs based on the structure ad organizatio of cells. |
| CO5 | List the common diagnostic and biochemical test performed in various clinical conditions. |
| CO6 | Make use of common diagnostic and biochemical test mentioned in the syllabus in diagnosis and prognosis of the diseases. |

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| **Course : Anatomy, Physiology & Pathophysiology II - [ BPH\_C\_201\_T ]** | |
| CO1 | Explain the types of and mechanisms of cellular injuries and cellular adaptation. |
| CO2 | Compare and contrast between benign and malignant tumors. |
| CO3 | Classify malignant tumours and explain the etiology and pathogenesis of cancer. |
| CO4 | Discuss the biological effects of radiations. |
| CO5 | Explain the anatomy and physiology of the respiratory system, endocrine system, nervous system and the sensory organs. |
| CO6 | Comprehend the etiology, pathogenesis, signs, and symptoms of common diseases/disorders of respiratory system, endocrine system and nervous system. |

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| **Course : Biochemistry-II - [ BPH\_C\_202\_T ]** | |
| CO1 | Discuss carbohydrate metabolism with respect to different pathways, structures of intermediates, enzymes and cofactors involved, energy requirements/yields, regulation and drugs affecting metabolism |
| CO2 | Discuss lipid metabolism with respect to different pathways, structures of intermediates, enzymes and cofactors involved, energy requirements/yields, regulation and drugs affecting metabolism |
| CO3 | Discuss nucleic metabolism with respect to different pathways, structures of intermediates, enzymes and co-factors involved, energy requirements/yields, regulation and drugs affecting metabolism |

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| **Course : Pharmacognosy-I - [ BPH\_C\_203\_T ]** | |
| CO1 | 1 student will be able to outline the alternative and complementary systems of medicine, classify drugs of natural origin |
| CO2 | 2 student will able to describe primary and secondary plant metabolites their biosynthesis, evaluation and therapeutic application |
| CO3 | 3 student will be able to understand the morphological and microscopic features of medicinal plants |
| CO4 | 4 student will be able to elaborate commercial production, collection, preparation, storage and factors affecting cultivation of medicinal plants |
| CO5 | 5 student will be able to describe chemistry, source, preparation, evaluation of carbohydrate containing crude drugs and their commercial utility as pharmaceutical aids and medicines |
| CO6 | 6 student will be able to describe the source, composition, preparation and applications of fibers, minerals, important protein and enzymes of natural origin. |

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| **Course : Hospital Pharmacy and Drug store Management - [ BPH\_C\_204\_T ]** | |
| CO1 | Appreciate the difference in the functions, layout, legal requirements, organization, drug procurement, storage and dispensing of medicines in a retail versus hospital pharmacy setting |
| CO2 | Appreciate the importance of documentation in the functioning of a pharmacy |
| CO3 | Understand the importance of a hospital level formulation and compounding of parenterals. |
| CO4 | Understand the importance and functioning of the hospital sterile supply services department. |
| CO5 | Appreciate the dangers/detection/reporting of fraudulent pharmacy practices. |
| CO6 | Appreciate the concept of rational drug therapy. |

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| **Course : Environment Sciences - [ BPH\_C\_205\_T ]** | |
| CO1 | Describe the basics of environmental sciences like need and purpose of study the subject, ecology, food chain and ecological pyramids, sustainable development |
| CO2 | Outline, environmental legislation, role of different ministries and environment control boards |
| CO3 | Classify and compare different sources of energies |
| CO4 | Relate technology to control pollution and economic benefits thereof, infer, the concept of green building, carbon credit and disaster management. |
| CO5 | Realize the environment related moral responsibilities and identify legal (environmental) aspects for becoming entrepreneur in future. |

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| **Course : Pharmacognosy Lab-I - [ BPH\_C\_206\_L ]** | |
| CO1 | 1 students will be able to carry out quantitative microscopy for leaf constants |
| CO2 | 2 students will be able to determine different extractive and ash values as per pharmacopoeial requirements |
| CO3 | 3 students will be able to identify diagnostic features of plants such as calcium-oxalate, starch and trichomes |
| CO4 | 4 student will be able to differentiate between different plant parts based on morphological and microscopic evaluation |
| CO5 | 5 students will be able to identify fibers and carbohydrates based on chemical evaluation |

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| **Course : Biochemistry\_1 Lab - [ BPH\_C\_207\_L ]** | |
| CO1 | Understand the principles and methods for the estimation of carbohydrates |
| CO2 | Understand the principles and methods for the estimation of amino acids and proteins |
| CO3 | Understand the principles and methods for the estimation of fats and lipids. |
| CO4 | Understand the principles and methods for the estimation of nucleic acids |
| CO5 | Understand the principles and methods for the estimation of enzyme kinetic parameters. |
| CO6 | Understand the principles and methods for the estimation of enzyme activity as diagnostic markers. |

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| **Course : Organic Chemistry I - [ BPH\_C\_301\_T ]** | |
| CO1 | Assign iupac and stereochemical nomenclature of compounds containing multiple functional groups |
| CO2 | Predict aromatic character, resonance and tautomerism of compounds |
| CO3 | Explain the various reaction intermediates along with its reactivity of compounds based on physicochemical properties (eg acidity, basicity, ionization etc.) |
| CO4 | Understand the factors affecting equilibria, rates and reaction mechanisms |
| CO5 | Explain the influence of structure on physicochemical properties and its application to various aspects of pharmaceuticals |

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| **Course : Physical Pharmacy I - [ BPH\_C\_302\_T ]** | |
| CO1 | Understand the various physical phenomena involved in designing of various formulations. |
| CO2 | Determine the various physical parameters of drugs and formulations. |
| CO3 | Predict and anticipate in process problems based on raw materials and manufacturing methods. |
| CO4 | Apply the knoledge of physical phenomena in selecting raw materials, including drug iactive ingredients of appropriate quality leading to stable formulations. |

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| **Course : Anatomy Physiology and Pathophysiology III - [ BPH\_C\_303\_T ]** | |
| CO1 | Explain the anatomy, and physiology of the reproductive system, cardiovascular system, urinary system and digestive system |
| CO2 | Comprehend the etiology, pathogenesis, signs and symptoms of common diseases of the reproductive system, cardiovascular system, urinary system and digestive system |
| CO3 | State the relevance of various body fluid compartments, electrolyte distribution and acid-base balance. |
| CO4 | Know the concept, significance and application of ecg |
| CO5 | Correlate sign and symptoms with diseases of the reproductive system, cardiovascular system, urinary system and digestive system |

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| **Course : Pharmaceutical Analysis I - [ BPH\_C\_304\_T ]** | |
| CO1 | Explain the role of pharmaceutical analysis in the field of pharmacy and industry and delineate between qualitative quantitative, manual, automatic and electrochemical methods of analysis. |
| CO2 | Describe volumetric, gravimetric, electrochemical and solvent extraction methods of analysis |
| CO3 | Solve numerical problems related to volumetric, gravimetric and solvent extraction methods of analysis and apply simple statistics to numerical data. |

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| **Course : Pharmaceutical Engineering - [ BPH\_C\_305\_T ]** | |
| CO1 | Understand mechanics of fluid, fluid flow, and its measurements |
| CO2 | Classify and describe pumps, heat measuring devices and conveyors |
| CO3 | Understand basic principles involved in unit operations such as crystallization, evaporation, distillation and refrigeration and will able to describe the equipment and accessories involved therein. |
| CO4 | Summarize construction material, discuss corrosion of equipment from pharmaceutical industry point. |
| CO5 | Define and categorize the different industrial hazards. |

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| **Course : Organic chemistry-I Lab - [ BPH\_C\_306\_T ]** | |
| CO1 | The learner will be able to; practice and follow safety rules and precautionary measures in laboratory. |
| CO2 | The learner will be able to; explain theoretical aspects of physical constant determination, detection of functional groups and log p |
| CO3 | The learner will be able to; characterize/identify/spot monofunctional or bifunctional organic compounds by physical constant, elemental analysis and functional group analysis |

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| **Course : Physical Pharmacy-I Lab - [ BPH\_C\_307\_T ]** | |
| CO1 | To determine the principle and methods for the determination of various physical parameters of drugs and formulations. |
| CO2 | To carry out various physical tests involved in characterization of drugs. |
| CO3 | To demonstrate testing of various physical parameters involved in pre-formulation and formulation evaluation. |

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| **Course : Pharmaceutical Analysis Lab-I - [ BPH\_C\_308\_T ]** | |
| CO1 | Employ practice of calibration and proper handling of volumetric apparatus, electronic analytical balance and safety measures in the laboratory. |
| CO2 | Demonstrate eye-hand co-ordination required for titrimetric analysis |
| CO3 | Perform and record, calculate and interpret data obtained for experiments related to volumetric, gravimetric and solvent extraction methods of analysis. |
| CO4 | Conduct and evaluate various tests mentioned in a pharmacopoeial monograph |

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| **Course : Organic Chemistry-II - [ BPH\_C\_401\_T ]** | |
| CO1 | Outline few methods of preparation for various functional group. |
| CO2 | Understand how and why c=o group reacts with nucleophiles (using molecular orbitals and curly arrows) to give varied products |
| CO3 | Predict the molecules that can be synthesized by reaction of c=c groups with electrophiles |
| CO4 | Understand reactivity aromatic system towards electrophiles and nucleophiles. |

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| **Course : Physical Pharmacy-II - [ BPH\_C\_402\_T ]** | |
| CO1 | Identify order of reactions, pathways of drug degradation and types of drug complexes |
| CO2 | Describe fick’s laws of diffusion, mechanism of drug dissolution and absorption |
| CO3 | Acquire understanding of drug complexes, protein binding and their applications |
| CO4 | Gain knowledge of the basic principles of coarse and colloidal dispersions |
| CO5 | Apply basic principles of drug characterization to biopharmaceutical aspects of drug delivery |

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| **Course : Pharmaceutics-I - [ BPH\_C\_403\_T ]** | |
| CO1 | Describe the status of pharma industry in india and elaborate on the different official compendia, recall the various types of dosage forms, routes of administration and describe the alternate systems of medicine |
| CO2 | Explain the concepts and need for gmp & qa and preformulation. |
| CO3 | Summarize the packaging of pharmaceuticals |
| CO4 | Explain the formulation considerations, unit operations, q.a. aspects of monophasic systems, and powders |
| CO5 | Classify, describe the various biological products, viz. sutures & ligatures, blood products and plasma volume expanders |

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| **Course : Pharmacology-I - [ BPH\_C\_404\_T ]** | |
| CO1 | Define the scope, general principles and applications of pharmacology. |
| CO2 | Understand the factors modifying drug action. |
| CO3 | Comprehend pharmacokinetic and pharmacodynamic principles along with ability to compare and contrast various routes of administration with advantages and disadvantages |
| CO4 | Classify receptors and elucidate their role in drug/neurotransmitter/hormone action. understand the mechanisms of drug action. |
| CO5 | Explain autonomic transmission and discuss the pharmacology of drugs acting on ans and rationalize their therapeutic applications. |
| CO6 | Explain the pharmacology of drugs acting on cardiovascular system and as diuretics and discuss their use in associated diseases |

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| **Course : Microbiology - [ BPH\_C\_405\_T ]** | |
| CO1 | Describe the classification of microorganisms and list some of the common diseases caused by them. |
| CO2 | Communicate the terms and scientific concepts related to microbiology. |
| CO3 | Recognize the use different microscopic techniques, staining techniques, and differential media for the identification of some common disease causing microorganisms. |
| CO4 | Describe different methods for the control of growth of microorganisms and methods of preservation/sterilization of pharmaceutical products. |
| CO5 | Describe the importance of microbial testing and microbial limit tests for some pharmaceutical products. |

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| **Course : Physical Pharmacy\_2 Lab - [ BPH\_C\_407\_L ]** | |
| CO1 | Determine reaction rate constant, order of a reaction for different reactions |
| CO2 | Predict shelf life by carrying out accelerated stability studies |
| CO3 | Calculate physical parameters such as stability constants, molecular weight, and critical micellar concentration |
| CO4 | Demonstrate skill to handle modern tool usage (brookfield viscometer) |

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| **Course : Pharmaceutics\_1 Lab - [ BPH\_C\_408\_L ]** | |
| CO1 | Prepare monophasic liquid systems and powder systems, justify the components and method of preparation. |
| CO2 | Demonstrate the properties of the developed dosage forms and biological products, comment on the quality. |
| CO3 | Perform experiments as per glp and record in the journals |

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| **Course : Pharmacology\_Lab-I - [ BPH\_C\_409\_L ]** | |
| CO1 | Perform in vitro experiment on cock ileum (tissue) to evaluate effect of drug (ach) and its dose on response (contraction) to comprehend and infer drug effects on receptors and its outcomes. |
| CO2 | State the principles behind plotting dose-response of drugs/agonist/antagonist and its applications |
| CO3 | Define pa2 value and calculate pa2 value of antagonist |
| CO4 | Summarize the impact of drugs on eye and gi and discuss their potential therapeutic utility. |
| CO5 | Observe and explain the mechanisms of action of neurotransmitters, drugs and ions on isolated frog heart. |
| CO6 | Knowledge of animal handling techniques and understanding of ethical guidelines governing animal experimentation. |