PROGRAM: MASTER OF SCIENCE (M.SC.)

PROGRAM OUTCOMES (POs)

At the end of the Program students will be able to:	
PO1	**Apply** the theoretical and practical skills in industry.
PO2	**Identify** the methods and concepts to be employed in teaching.
PO3	**Develop** ideas and implement at workplace.
PO4	**Adopt** necessary course of action for specific problems.

PROGRAM SPECIFIC OUTCOMES (PSOs)

M.SC. -PHARMACEUTICAL CHEMISTRY

At the end of the Program students will be able to:	
PSO1	**Apply** synthetic knowledge.
PSO2	**Apply** the principles and methods of quality control analysis.
PSO3	**Develop** novel ideas pertaining to designing of drug molecules.
PSO4	**Apply** the knowledge of formulation in formulating drugs.
PSO5	**Apply** the knowledge of quality assurance in industry.

M.SC. -ORGANIC CHEMISTRY

At the end of the Program students will be able to:	
PSO1	**Apply** synthetic knowledge.
PSO2	**Apply** the principles and methods of spectroscopic analysis.
PSO3	**Develop** novel ideas in photochemical and pericyclic reactions.
PSO4	**Apply** the knowledge of stereo chemical aspects in the synthesis of chiral molecules.
PSO5	**Apply** the knowledge of Organometallics and heterocyclic chemistry in synthesis.
PSO6	**Identify** the natural product sources and its analysis.

COURSE OUTCOMES(COs)

SEMESTER I

1. PCO -401: (Topics In Physical Chemistry) (3 credits)

At the end of the course students will be able to:

CO1	**Explain** concepts of magnetism.
CO2	**Illustrate** Jablonskii's diagram.
CO3	**Describe** the structural characterization of nanoparticles.

2. ACO- 401:(ANALYTICAL TECHNIQUES) (3 credits) At the end of the course students will be able to:	
CO1	**Evaluate** the statistical approach used in data handling.
CO2	**Classify** different chromatographic techniques.
CO3	**Explain** the working and applications of simple and integrated chromatography.
CO4	**Classify** different solvent extraction techniques.
CO5	**Explain** different Principle and working of electroanalytical and radio analytical techniques.
CO6	**Describe** the structural characterization of nanoparticles.
3. HCC-401 :(Pharmaceutical Chemistry –I) (3 Credits) At the end of the course students will be able to:	
CO1	**Classify** drugs.
CO2	**Write** the IUPAC names, structure and synthesis of drugs.
CO3	**Explain** the physic-chemical properties, structure activity relationship (SAR and mechanism of action of various types of drugs.
4. HCC-402 :(Laboratory Course In Pharmaceutical Chemistry) (2 Credits) At the end of the course students will be able to:	
CO 1	**Analyze** the Pharmaceutical drug.
CO 2	**Synthesize** different Pharmaceutical drugs.
5. OCC-401 :(Structure, Reactivity, Stereochemistry And Reaction Mechanism) (3 Credits) At the end of the course students will be able to:	
CO1	**Describe** different types of molecular orbitals.
CO2	**Predict** the aromaticity of organic compounds.
CO3	**Explain** structure and reactivity of organic compounds based on the concept of acidity and basicity.
CO4	**Apply** various concepts of stereochemistry in organic reactions.
CO5	**Explain** the structure, generation and stability factors of reactive intermediates.
CO6	**Apply** the methods for determining the reaction mechanisms.
CO7	**Write** the mechanism for elimination and nucleophilic substitution reactions.
6. OCC-402 :(Laboratory Course In Organic Chemistry) (2 Credits) At the end of the course students will be able to:	
CO1	**Perform** the purification techniques and synthesis in organic chemistry.
CO2	**Apply** the knowledge of thin layer chromatographic technique in organic reaction analysis.
CO3	**Explain** the mechanism of various organic reactions.
CO4	**Isolate** the active moiety from natural sources.

7. ICC-401:(General Inorganic Chemistry) (3 Credits) At the end of the course students will be able to:	
CO1	**Explain** structure of atoms and molecules.
CO2	**Apply** bonding theories to predict the shapes of compounds.
CO3	**Classify** symmetry elements and point groups.
CO4	**Explain** the structure of solids and roles of elements in biological systems.
CO5	**Calculate** CFSE and **Interpret** the electronic spectra of coordination compounds.
CO6	**Predict** the stability of organometallic compounds using 18 electron rule.
CO7	**Classify** acids and bases.
8. ICC-402:(Laboratory Course In Inorganic Chemistry) (2 Credits) At the end of the course students will be able to:	
CO1	**Perform** inorganic synthesis.
CO2	**Characterize** the synthesized compounds.
CO3	**Determine** the metal content by titrimetry / gravimetry /colorimetry.

SEMESTER II

9. PCC-401:(General Physical Chemistry) (3 credits) At the end of the course students will be able to:	
CO1	**Explain** the Concepts involved in thermodynamics and chemical Kinetics.
CO2	**Explain** electro chemistry and quantum chemistry concepts.
10. PCC-402: (Laboratory Course In Physical Chemistry) (2 Credits) At the end of the course students will be able to:	
CO1	**Analyze** redox potentials.
CO2	**Apply** the concepts of chemical kinetics to determine order of the reaction.
CO3	**Analyze** the three component systems using phase rule concepts.
11. ACC-401 :(Concepts In Analytical Spectroscopy) (3 Credits) At the end of the course students will be able to:	
CO1	**Explain** the applications of molecular and atomic spectroscopy.
CO2	**Evaluate** the utility of spectroscopic methods for qualitative and quantitative analysis.
CO3	**Interpret** the spectra and **predict** the structure of unknown compounds.
12. ACC-402 :(Laboratory Course In Analytical Chemistry) (2 Credits) At the end of the course students will be able to:	
CO1	**Determine** analyte unknown concentration.
CO2	**Estimate** compounds using spectrophotometric methods
CO3	**Separate** mixture using chromatographic techniques.
CO4	**Interpret** complex molecules through thermal studies
CO5	**Analyze** pharmaceutical formulations volumetrically.

13. OCO-401: (Synthetic Organic Chemistry - I) (3 Credits) At the end of the course students will be able to:	
CO1	**Write** functional group transformation reactions.
CO2	**Explain** mechanistic pathways for organic transformation reactions.
CO3	**Explain** carbon -carbon bond formation reactions.
CO4	**Classify** different mechanisms of hydrolysis of esters.
14. ICO-401 :(Topics In Inorganic Chemistry & Environmental Chemistry) (3 Credits) At the end of the course students will be able to:	
CO1	**Explain** the fundamentals of transition and inner transition metals.
CO2	**Explain** selected compounds of representative elements.
CO3	**Classify** air pollutants in the atmosphere.
CO4	**Explain** Structural properties of the atmosphere
CO5	**Explain** the characteristics of water pollution and treatment methods of Industrial wastes.
15. HCO-401 :(Herbal Drug Technology And Cosmeticology) (3 Credits) At the end of the course students will be able to:	
CO1	**Explain** anatomy of skin and hair.
CO2	**Formulate** cosmetics and Herbal drug products.
CO3	**Explain** animal model screening and toxicities of Herbal drug formulations.
CO4	**Illustrate** the regulations laid by World Health Organization and Indian regulatory requirements for Clinical trials.
CO5	**Describe** the parameters of Schedule T as per Drug and Cosmetic Act.

M.SC. PHARMACEUTICAL CHEMISTRY

SEMESTER: III	
16. HCC-501 :(Pharmaceutical Chemistry –II) (3 Credits) At the end of the course students will be able to	
CO1	**Write** the IUPAC names, structure and synthesis of drugs.
CO2	**Classify** the drugs.
CO3	**Explain** the structure activity relationship (SAR) and mechanism of action of various types of drugs.

17. HCC-502: (Drug Product Formulation And Development) (3 Credits) At the end of the course students will be able to:	
CO 1	**Classify** the types of dosage forms.
CO 2	**Utilize** Pharmacopoeias and Formularies towards GLP.
CO 3	**Study** the research approach of Preformulation studies.
CO4	**Explain** the Pilot Plant and Scale-up techniques.
CO 5	**Formulate** the different types of Dosage forms.
18. HCC-503: (Drug Design And Development) (3 Credits) At the end of the course students will be able to:	
CO-1	**Identify** lead molecule for particular activity.
CO-2	**Explain** the ADMET of the drug.
CO-3	**Analyze** the structure activity relationship (SAR) of various types of drugs.
CO-4	**Design** using insilico molecular docking and **develop** the QSAR model for different biological activity of drugs.
19. HCC-504 :(Drug Quality And Regulatory Affairs) (3 Credits) At the end of the course students will be able to:	
CO 1	**Explain** role of quality assurance and quality control in pharmaceutical industries.
CO 2	**Explain** the ICH guidelines for drug efficacy and safety.
CO 3	**Create** the Standard documents needed in pharmaceutical industries.
20. HCO-510 :(Laboratory Course In Quality Control And Quality Assurance) (4 Credits) At the end of the course students will be able to:	
CO 1	**Analyze** dissolution rate of sustained release dosage forms.
CO2	**Design** and **fabricate** release profile of drugs.
CO3	**Prepare** solid dispersions.
CO4	**Develop** quality control tests for packaging materials.
CO5	**Analyze** drugs using validated methods.
SEMESTER IV	
21. HCO-506:(Pharmaceutical Stability) 4 Credits At the end of the course students will be able to:	
CO1	**Review** ICH process and ICH updates on stability.
CO 2	**Determine** stability requirements for OTC drug products.
CO 3	**Predict** shelf life and half-life of Pharmaceutical formulations.
CO 4	**Investigate** procedures of OOS results and FDA inspection of stability labs.

22. HCO-503 :(Polymers In Pharmaceuticals And Novel Drug Delivery Systems) (3 Credits) At the end of the course students will be able to:	
CO1	**Identify** the type of polymers that can be used for drug delivery systems.
CO2	**Explain** different types of novel drug delivery system.
CO3	**Apply** novel drug delivery system knowledge in lab project.
23. HCO-505 :(Pharmaceutical Technology)(3 Credits) At the end of the course students will be able to:	
CO1	**Explain** unit processes for various chemical reactions.
CO2	**Apply** industrial knowledge for the synthesis of drug in laboratory.
CO3	**Illustrate** the need of pilot plant in industry.
CO4	**Classify** basic methods of purifying effluents.
CO5	**Apply** the knowledge of effluent treatment methods towards industrial manufacturing.
24. HCO-501 :(Pharmacological And Toxicological Screening Techniques) (3 Credits) At the end of the course students will be able to:	
CO-1	**Apply** the role of various screening methods in bioassay**.**
CO-2	**Evaluate** various in vivo and in vitro assay methods for various targets.
CO-3	**Evaluate** various types of toxicological studies.
CO-4	**Distinguish** different types of chemical toxicity and its antidote.
25. HCO-508:(Laboratory Course In Drug Product Formulation And Development) (3 Credits) At the end of the course students will be able to:	
CO 1	**Formulate** and **analyze** different pharmaceutical dosage forms.
CO 2	**Carry** out Quality Control Evaluation tests of Tablets and Capsules.
CO 3	**Evaluate** drug formulations qualitatively using analytical instruments.
CO 4	**Handle** dissolution apparatus to evaluate bioavailability studies.
CO 5	**Validate, qualify** and **Calibrate** critical instruments in the laboratory.
26. HCC-505 :(Laboratory Course In Pharmaceutical Chemistry) (3 Credits) At the end of the course students will be able to:	
CO1	**Apply** methods for synthesis pharmaceutical compounds.
CO2	**Apply** knowledge of heterocycles in the synthesis of bioactive compounds.
CO3	**Perform** synthesis of drug molecules of medicinal importance.

M.SC. - ORGANIC CHEMISTRY

SEMESTER III

16. OCC-501 :(Organic Spectroscopy) (3 Credits)
At the end of the course students will be able to:

CO1	**Apply** various concepts in organic spectroscopy for structure elucidation.
CO2	**Explain** the principles and applications of heteronuclear coupling of carbon to ^{19}F and ^{31}P.
CO3	**Utilize** advanced NMR techniques and 2DNMR spectroscopy experiments for detailed structural elucidation.
CO4	**Interpret** the spectra and **deduce** the structures of simple to moderately complex molecules.

17. OCC-502 :(Reaction Mechanisms, Stereochemistry And Asymmetric Synthesis) (3 Credits)
At the end of the course students will be able to:

CO1	**Explain** the synthetic applications and the mechanistic aspects of molecular rearrangements.
CO2	**Apply** Baldwin's Rule for intramolecular reactions.
CO3	**Apply** the principles of stereochemistry in organic synthesis.
CO4	**Apply** the knowledge of various asymmetric synthesis methods in the classical chemistry of organic compounds.

18. OCC-503:(Synthetic Methods In Organic Chemistry) (3 Credits)
At the end of the course students will be able to:

CO1	**Design** synthesis of organic molecules.
CO2	**Propose** plausible mechanism of given organic reactions.

19. OCC-504:(Pericyclic And Organic Photochemical Reactions) (3 Credits)
At the end of the course students will be able to:

CO1	**Explain** Frontier Molecular Orbital Theory.
CO2	**Draw** Orbital correlation diagram.
CO3	**Differentiate** between Norrish Type –I and Norrish Type –II cleavage.
CO4	**Predict** products in given Pericyclic and Photochemical reactions.
CO5	**Propose** plausible mechanism of given reaction.

20. CGO-501 :(Selected Experiments In Chemistry) (4 Credits) At the end of the course students will be able to:	
CO1	**Perform** synthesis of Schiff bases, ferrites and their characterization.
CO2	**Develop** computational methods.
21. CGO-500 Dissertation (8 Credits) (Over both semesters)	
SEMESTER IV	
22. OCO-501:(Chemistry Of Natural Products) (3 Credits) At the end of the course students will be able to:	
CO1	**Identify** and **classify** different types of natural products.
CO2	**Apply** methods of isolation and structural elucidation to investigate natural products.
CO3	**Write** the biosynthetic pathways for terpenes, alkaloids and steroids.
23. OCO-502:(Organometallic Chemistry) (3 Credits) At the end of the course students will be able to:	
CO1	**Explain** carbon -carbon bond formation using organometallic reagents.
CO 2	**Apply** transition metal and main group chemistry for organic synthesis.
CO 3	**Construct** simple to complex molecules using organometallic chemistry.
24. OCO-504:(Retrosynthesis In Organic Chemistry) (3 Credits) At the end of the course students will be able to:	
CO1	**Investigate** chemical precursors for making organic molecules.
CO 2	**Apply** organic reactions to construct simple to complex molecules.
CO3	**Write** logical steps planning the organic synthesis.
25. OCO-505 :(Heterocyclic Chemistry) (3 Credits) At the end of the course the students will be able to:	
CO1	**Classify** and **write** the nomenclature of various heteroaromatic molecules.
CO2	**Explain** reactivity of heterocyclic compounds.
CO3	**Develop** synthetic strategies for heterocyclic compounds.
26. OCC-505 :(Organic Mixture Separation And Identification (3 Credits) At the end of the course students will be able to:	
CO1:	**Separate** the given three component organic mixtures.
CO 2	**Identify** and **characterize** each component.
CO3	**Utilize** various laboratory techniques for purification of organic compounds.

27. CGO-500 :(Dissertation) (8 Credits) At the end of the course students will be able to:	
CO1	**Explain** the literature survey on a research problem.
CO2	**Deliver** presentation.
CO3	**Develop** good experimental and analytical skills
CO4	**Develop** good report and project writing skills.