

## **M.Sc. Pharmaceutical Chemistry**

**Programme Code: 342**

### **Programme Summary**

Duration: 2 years

### **Eligibility**

B. Sc. in any subject or B. Pharm. Chemistry is not a compulsory subject, student who has any science subject in bachelor course are eligible.

### **Program outcome:**

- ❖ The programme has been designed to learn relevant advanced skills that are essential in the areas of quality control, drug discovery, drug design and development of high quality pharmaceutical products, medicinal chemistry, pharmacology, modern analytical techniques and provide depth knowledge that enables the students to work more effectively within pharmaceutical industry.
- ❖ Focus is laid on study of quality control, separation techniques and the research environments. The course provides training in drug synthesis, drug testing, and development of drugs and validation of analytical methods.
- ❖ The curriculum includes lectures, practical's, seminars, project works, lab work, assessments. It enables them to equip with problem solving abilities and in developing analytical skills. Course provides students with latest technologies and with necessary skills to embark upon their career for their life.
- ❖ The students are skilled with extensive theoretical and practical knowledge about the various aspects of analysis of drugs, In-vitro evaluation of different conventional and advanced drug delivery systems like tablets, capsules, etc. according to the guidelines, modern analytical techniques which is used in quantitative and qualitative analysis, synthesis of medicinal important agents, isolation of compounds from plant origin.
- ❖ Exposure of students to the sophisticated analytical techniques like UV, IR, HPLC, NMR, Mass spectroscopy is an integral part of the curriculum.
- ❖ Curriculum also provides extensive learning about herbal drug technology as well as phytopharmaceuticals and nutraceutical.
- ❖ Curriculum is dedicated to a project work of industrial and commercial applicability.
- ❖ The PG degree in pharmaceutical chemistry enables the students to find jobs in varied sectors. The qualified candidates find jobs in pharmacy companies, drug manufacturing and marketing companies, health departments, laboratories, research organizations (CSIR), biotechnological firms, pest control department, and defence services. The jobs are available as professors, manager, scientist, researcher, patent analyst, quality control assistant. The students can further study for research work.

**Course outcome:**

S. No.	Course code	Course name	Credits	Course outcome
<b>1<sup>st</sup> Semester</b>				
1.	SOS/PC/C001	Quantitative Analytical Methods	3	Define the concept of pharmaceutical volumetric analysis, its scope and methods of expressing concentration. Course explains the types of acid base, redox, complexometric, Precipitation, non-aqueous solvents and steps involved in gravimetry. Course describes the methods for detection of end point of Acid base titration, precipitation titration, complexometric titration, redox titration and non-aqueous titration. Students estimate various compounds quantitatively along with standardization of titrant. Students determine the normality of the solution by this method.
2.	SOS/PC/C002	Modern Analytical Methods-I	3	The course explains the basic theoretical knowledge of the instrumentation techniques available. Student will deals with different analytical data from different principle instrument. The student will learn theoretical principle, instrumentation and applications of chromatographic techniques like adsorption, partition, paper, TLC, Ion exchange, column, GC, HPLC and Gel electrophoresis. The course explains & interprets theoretical principle, instrumentation and applications of Spectroscopic techniques like UV, IR, Calorimetry, Fluorimetry, AAS, FES, ORD and CD
3.	SOS/PC/C003	Basic Pharmacology	3	Exposure to the historical development of Pharmacology. To learn about general principles of route of drug administration, pharmacokinetics and pharmacodynamics of drugs. To gain knowledge of adverse drug reactions, drug interactions and drug allergy. To learn general concepts of toxicity and studied about general principles, general methods of several bio-assays.
4.	SOS/PC/C004	Stereochemistry and Reaction Mechanism	3	Identify the symmetry elements and symmetry operations in molecules by optical activity. Explain the criteria for chirality and discuss axial, planar and helical chirality. Discuss the methods of determination of relative and absolute configuration. Discuss racemization and Resolution techniques.

				<p>To learn about geometrical isomerism &amp; stereochemistry of olefins. Determine the configuration in E and Z isomers.</p> <p>Discuss Stereochemistry of carbon compounds with no chiral atom</p> <p>Discuss and understand Stereoisomerism of rings, stability of rings, and ease of ring formation.</p> <p>Explain actual shape of six membered rings &amp; its relation to properties &amp; reactivity.</p> <p>To describe mechanisms involving aromatic electrophilic reaction,</p> <p>To learn about mechanisms involving aromatic nucleophilic reactions and benzyne mechanism.</p> <p>To describe mechanisms involving free radical reactions and elimination mechanism.</p> <p>To understand and uses of organic name reactions in organic synthesis with mechanism.</p>
5.	SOS/PC/C005	Laboratory- I (Pharmaceutical Analysis)	3	<p>Define the concept of pharmaceutical analysis, its scope and methods of expressing concentration.</p> <p>Students perform the methods for detection of end point of Acid base titration, precipitation titration, complexometric titration, redox titration and Non-aqueous titration.</p> <p>Students perform assay and standardization of volumetric preparations.</p>
6.	SOS/PC/C006	Laboratory- II (Pharmaceutical Chemistry)	3	<p>Practical skills for the Identification of Organic compounds, mixtures and synthesis of organic compounds.</p>
<b>2<sup>nd</sup> Semester</b>				
7.	SOS/PC/C007	Modern Analytical Methods-II	3	<p>To learn about interpretation, theoretical principle, instrumentation and applications of Spectroscopic techniques like NMR, MS, Raman and Molecular Emission.</p>
8.	SOS/PC/C008	Drug Delivery and Biopharmaceutics	3	<p>To acquire knowledge of types, advantages, disadvantages &amp; formulation of oral dosage forms like solution, syrups, suspension emulsion, tablet and capsule.</p> <p>To learn about the quality control of various dosage forms.</p> <p>To understand the importance of Disintegration, Disintegration time and factors affecting disintegration.</p> <p>To learn Dissolution, Dissolution models, factors affecting dissolution rate and co-relation of dissolution with bioavailability.</p> <p>To know how factors affecting drug absorption including physicochemical, biological &amp; Pharmaceutical.</p>

				To provide knowledge of drug disposition, bioavailability and bioequivalence studies.
9.	SOS/PC/C009	Chemistry of Natural Products	3	To understand detailed knowledge about chemistry of medicinal compounds from natural origin. To understand general methods of structural elucidation of medicinally active natural compounds like carbohydrates, terpenoids, and alkaloids. To understand knowledge regarding isolation and purification of medicinal compounds from natural origin like terpenoids. To understand different types of heterocyclic compounds i.e. five membered and six membered heterocyclic compounds & their properties.
10.	SOS/PC/C010	Medicinal Chemistry	3	Helps in correlating between pharmacology of a disease and its mitigation or cure. To understand the drug metabolic pathways, adverse effect and therapeutic value of drugs To know the structural activity relationship of different class of drugs like antibiotics, anticancer, antifungal, antiviral, and anti-malarial agents. To acquire knowledge in the chemotherapy for cancer and micobacterial diseases and different anti-viral and anti-fungal agents. Well acquainted with the synthesis of some important class of drugs. Knowledge about the mechanism pathways of different class of medicinal compounds. To understand the chemistry of drugs with respect to their pharmacological activity.
11.	SOS/PC/C011	Laboratory-I (Formulation and Evaluation of Pharmaceutical Products)	3	To impart practical knowledge based on formulation and evaluation of pharmaceutical products.
12.	SOS/PC/C012	Laboratory-II (Chemistry of Natural Products).	3	To impart practical knowledge based on extraction and isolation of compounds from the different plants.
<b>3<sup>rd</sup> Semester</b>				
13.	SOS/PC/C015	Drug Design	3	This course aims at application of modern <i>in silico</i> tools or information technology in different phases of drug discovery and design of new drug candidates by understanding the molecular basis of the interaction of small molecules with their targets. Students would have better understanding on the various stages of drug discovery. They learnt and understand about lead moiety, receptors, specific & non-specific

				<p>drug action, drug-receptor interactions and drug metabolism. They would have studied on the various targets for drug discovery. They understand drug metabolism approaches to drug design, concept of isosterism &amp; bioisoterism for modification of lead moiety, metabolite antagonism, stereochemistry &amp; drug action, analog design, and concept of prodrug in drug discovery processes.</p> <p>Students understand drug development as a process involving target selection (receptor), lead discovery using computer-based methods and combinatorial chemistry (CADD).</p> <p>They would have better understanding on the topography of receptor and drug receptor interaction.</p> <p>They would have learnt the importance of the role of computer aided drug design in drug discovery.</p> <p>Explain the various tools used in QSAR studies and how these are applied in the design of drugs using examples.</p>
14.	SOS/PC/E002	Pharmacodynamic agents	3	<p>To understand the chemistry of drugs with respect to their biological activity.</p> <p>To know the structural activity relationship of different class of drugs including cardiovascular system and central nervous system acting drugs.</p>
15.	SOS/PC/E003	Phytopharmaceuti-cals and Nutraceuticals	3	<p>To study in detail historical background, present status and future scope of Phytophrmaceuticals.</p> <p>To learn in detail about classification of crude drug and adulteration and evaluation of drugs.</p> <p>To impart knowledge of general principle of formulation of primary and secondary plant with biogenesis of carbohydrates, lipids, volatile oils and resins.</p> <p>To know how plants and their environmental factors influencing the variability in drug activity.</p> <p>To learn general introduction and uses of Nutraceuticals.</p> <p>To understand the importance of tissue culture and its scope in production of phytopharmaceuticals.</p>
16.	SOS/PC/E004	Computers	3	<p>To learn and understand about history of computer, introduction of computer and operating system and their software.</p> <p>To learn, design and develop C++ Programming.</p> <p>To learn about arrays class and objects, function &amp; function overloading, constructor and destructor, file handling.</p> <p>To understand Internet and its working, the Uniform resource locator(URL), World wide web, HTTP, Internet explorer, PDB, NRL-3D, BLAST &amp; FASTA,</p>

				Special software to align sequences, general DNA sequence data base, protein structure data base, genome project database, human mapping data base.
17.	SOS/PC/C013	Laboratory –I (Drug Design)	3	To impart practical knowledge based on synthesis of drugs.
18.	SOS/PC/C014	Laboratory-II (Pharmaceutical Technology)	3	To perform and understand the various Quality control parameters for different dosage form.
<b>4<sup>th</sup> Semester</b>				
19.	SOS/PC/E010	Herbal Drug Technology	3	To learn in detail about herbal drugs, Importance of herbal therapies, Herbal verses conventional drugs, safety in Herbal drugs, toxicity in herbals and interaction. To learn herbals as nutraceuticals, cosmetics and for common ailments like cold, skin infection and diarrhea. To study Analytical profiles of selected herbs- <i>Brahmi</i> , <i>Arandrographis paniculeta</i> , <i>Aegle marmelos</i> and <i>Gymnema sylvestre</i> . To know the Quality control and quality Assurance of Herbal drugs.
20.	SOS/PC/E013	Essential of Traditional Medicine	3	The main aim of the course is to aware the importance of herbal medicine in traditional medicinal system. To know the traditional medicinal system such as Ayurveda, Sidha and Homeopathy. To understand detailed knowledge about medicinal herbs, management of the quality of the processes, Efficacy of Herbal medicine. Validation of herbal therapies. Safety in herbal drugs. Toxicity in herbal and their interaction. General concept of evaluation and quality control Assessment by drug Regulations. Herbal drug regulation in India. To learn about the various phytoconstituents present in herbal medicine. To learn about various methods of extraction procedure, extraction of specific phytochemical group and treatment of drug residue after extraction.
21.	SOS/PC/E015	Laboratory I (Herbal drug Technology)	3	To perform and understand the extraction of herbal drugs their phytochemical analysis and TLC and paper chromatography.
22.	SOS/PC/C016	Project /Dissertation	3	To learn about how to write and design a project/dissertation by using latest techniques from pharmaceutical research areas and carryout novel research which develops skills & knowledge.