



SNDT Women's University, Mumbai

**Undergraduate Degree / UG
Programme (Syllabus as Per NEP) -
Faculty of Science & Technology**

(Non-AEDP)

**Bachelor of Science
(Pharmaceutical Chemistry)**

B.Sc. (Pharma. Chemistry)

As Per NEP – 2020

Semester – I & II

**Syllabus
(W.E.F. Academic Year 2026-27)**

Terminologies

Vertical	Full-Form/Definition	Remarks	Related To Major And Minor Courses
Major (Core)	Subject Comprising Mandatory and Elective Courses, Major Specific IKS, Vocational Skill Courses, Internship/ Apprenticeship, Field Projects, Research Projects Connected to Major	Minimum 50% Of Total Credits Corresponding to Three/Four - Year UG Degree- Mandatory Courses	Related To The Major
Minor Course	Course From Same Or Different Faculty	Minimum 18-20 Credits to Be Completed in The First Three Years of UG Programme	Related To the Minor
OEC	Open Elective Courses/ Generic Courses	10-12 Credits to Be Offered in I And/Or II Year. Faculty-Wise Baskets of OEC To Be Prepared	OEC Is to Be Chosen Compulsorily from Faculty Other Than That of the Major
VSC	Vocational Skill Courses, Including Hands On Training Corresponding To The Major And/Or Minor Subject	8-10 Credits, To Be Offered in First Three Years, Wherever Applicable Vocational Courses Will Include Skills Based on Advanced Laboratory Practical's of Major	Related To the Major or Minor
SEC	Skill Enhancement Courses	06 Credits, To Be Offered in I And II Year, To Be Selected from The Basket of Skill Courses Approved by University	Related To the Major or Minor Any Relevant Skill
AEC	Ability Enhancement Courses	08 Credits, To Be Offered in I And II Year, English: 04 Credits to Be Earned in Sem - I, Modern Indian Language Of 04 Credits to Be Offered in II Year	NA
VEC	Value Education Courses	Understanding India, Environmental Science/Education, Digital and Technological	NA

		Solutions, Health & Wellness, Yoga Education, Sports, And Fitness	
IKS	Indian Knowledge System	Generic IKS Course: Basic Knowledge Of The IKS To Be Offered At First Year Level	Major-Specific IKS Courses: Advanced Information About the Major, Part of the Major Credit to Be Offered at Second- Or Third-Year Level
OJT	On-Job Training (Internship / Apprenticeship)	Corresponding To the Major Subject	Related To The Major
FP	Field Projects	Corresponding To the Major Subject	Related To the Major
CC	Co-Curricular Courses	Health And Wellness, Yoga Education Sports, And Fitness, Cultural Activities, NSS/NCC And Fine/ Applied/Visual/ Performing Arts	NA
CE	Community Engagement and Service		Related To Major
RP	Research Project	Corresponding To the Major Subject	Related To Major

Programme Template

Faculty		Science and Technology
Program		B.Sc.
Specialization		Pharmaceutical Chemistry
Preamble		Pharmaceutical Chemistry is an interdisciplinary field that combines principles of chemistry and pharmaceutical sciences to study the design, synthesis, analysis, and development of medicinal drugs. The program provides students with fundamental knowledge of organic, inorganic, and analytical chemistry along with an understanding of drug discovery, formulation, and quality control. This program aims to develop scientific skills required for identifying chemical compounds with therapeutic potential and understanding their interaction with biological systems. It also emphasizes laboratory techniques, research methodologies, and regulatory aspects related to the pharmaceutical industry. The course prepares students for careers in pharmaceutical research, drug development, quality assurance, and healthcare-related sectors.
Programme Specific Outcomes (PSOs)		After completing this program, the learner will be able to,
	1	Understand the basic concepts of pharmaceutical chemistry, including the structure, classification, and properties of medicinal compounds.
	2	Explain the principles of drug design and synthesis and their role in the development of therapeutic agents.
	3	Apply analytical and laboratory techniques for identification, purification, and quality analysis of pharmaceutical substances.
	4	Interpret the relationship between chemical structure and biological activity of drugs.
	5	Understand the mechanism of action, therapeutic uses, and side effects of different pharmaceutical drugs.
	6	Follow quality control standards and safety regulations used in pharmaceutical industries and laboratories.
	7	Demonstrate research skills and scientific thinking for solving problems related to drug development and pharmaceutical analysis.
Eligibility Criteria for Programme		12th Standard (Science Stream)
Intake		60

Structure with Course Titles

B. Sc. (Pharmaceutical Chemistry) (Non-AEDP)

Semester - I

SN	Courses	Type of Course	Credits	Marks	Int Marks	Ext Marks
	Semester – I					
10132801	Fundamentals of Pharmaceutical Chemistry-I (Th)	Major (Core)	2	50	50	0
		Major (Core)	2	50	50	0
		Major (Core)	2	50	50	0
10432811	Medicinal Plants and Herbal Medicines (Th)	OEC	4	100	50	50
10632801	Pharmaceutical Chemistry (Pr)	VSC S1	2	50	50	0
10732811	Basic Pharmaceutical Laboratory Techniques (Th)	SEC	2	50	0	50
	Ability Enhancement Course (AEC) Link: https://sndt.ac.in/pdf/academics/syllabus-as-per-nep/aec-syllabus/ug-degree/ability-enhancement-course.pdf (Available on Website)	AEC (English) (Any One)	2	50	0	50
10810111	English For Academic Writing-Paper I (For Students of English Medium)					
10810112	English Language and Literature-I (For Students of Non-English medium)					
11051111	Inception of India Knowledge System	IKS (Generic)	2	50	0	50

	IKS Link: https://www.sndt.ac.in/pdf/academics/syllabus-as-per-nep/iks-syllabus/ug-degree/inception-of-indian-knowledge-system.pdf (Available on Website)					
10952111	Introduction to Indian Constitution Link: https://www.sndt.ac.in/pdf/academics/syllabus-as-per-nep/vec-syllabus/ug-degree/introduction-to-indian-constitution.pdf (Available on Website)	VEC	2	50	0	50
	Co-Curricular Course (CC) Link: https://www.sndt.ac.in/pdf/academics/syllabus-as-per-nep/cc-syllabus/ug-degree/co-curricular-course-as-per-nep-2020-semester-i-syllabus.pdf (Available on Website)	CC (Any One)	2	50	50	0
11450121	Basics of National Service Scheme					
11450221	National Cadets Corps. (NCC) Studies-I					
11450322	Health and Wellness					
11450421	Performing Arts Exploration					
			22	550	300	250

B. Sc. (Pharmaceutical Chemistry) (Non-AEDP)**Semester – II**

SN	Courses	Type of Course	Credits	Marks	Int Marks	Ext Marks
	Semester - II					
20132811	Fundamentals of Pharmaceutical Chemistry-II (Th)	Major (Core)	2	50	0	50
		Major (Core)	2	50	0	50
		Major (Core)	2	50	0	50
		VSC S2	2	50	50	0
		VSC S3	2	50	50	0
20432811	Cosmetic Science and Personal Care Products (Th)	OEC	4	100	50	50
20732801	Industrial Safety and Good Manufacturing Practices (GMP) (Th)	SEC	2	50	50	0
	Ability Enhancement Course (AEC) Link: https://www.sndt.ac.in/pdf/academics/syllabus-as-per-nep/aec-syllabus/ug-degree/ability-enhancement-course.pdf (Available on Website)	AEC (English) (Any One)	2	50	0	50
20810111	English For Academic Writing-Paper II (For Students of English Medium)					
20810112	English Language and Literature-II (For Students of Non-English medium)					
20952111	Environment Awareness	VEC	2	50	0	50

	Link: https://www.sndt.ac.in/pdf/academics/syllabus-as-per-nep/vec-syllabus/ug-degree/environment-awareness.pdf (Available on Website)					
	Co-Curricular Course (CC) Link: https://www.sndt.ac.in/pdf/academics/syllabus-as-per-nep/cc-syllabus/ug-degree/co-curricular-course-as-per-nep-2020-semester-ii-syllabus.pdf (Available on Website)	CC (Any One)	2	50	50	0
21450121	Volunteerism and National Service Scheme					
21450221	National Cadets Corps. (NCC) Studies-II					
21450323	Yoga Education					
21450421	Fine Art					
			22	550	250	300

Exit with UG Certificate with 4 extra credits (44 + 4 credits)

Couse Syllabus

Semester – I

.1.1 Major (Core)

Course Titles	Fundamentals of Pharmaceutical Chemistry-I (Th)
Course Credits	2 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Understand the basic concepts, scope, and importance of pharmaceutical chemistry.
	2. Understand the fundamental principles of pharmaceutical inorganic chemistry, including the classification, quality standards, purity requirements, limit tests, and pharmaceutical applications of inorganic compounds.
Module 1 (Credit 1) – Introduction to Pharmaceutical Chemistry	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the fundamental concepts, scope, importance, history, and terminology of pharmaceutical chemistry and its relationship with medicinal chemistry, pharmacology, and pharmaceuticals.
	2. Describe the roles and responsibilities of pharmaceutical chemists in drug discovery, drug development, quality control, quality assurance, research, and the pharmaceutical industry.
Content Outline	• Definition, scope, and importance of pharmaceutical chemistry. History and development of pharmaceuticals. Relationship of pharmaceutical chemistry with medicinal chemistry, pharmacology, and pharmaceuticals. Pharmaceutical terminology: generic name, chemical name, official name, and brand (trade) name. Role of pharmaceutical chemists in drug discovery, development, quality control, quality assurance, pharmaceutical industries, and research and development in the pharmaceutical industry.
Module 2 (Credit 1) – Pharmaceutical Inorganic Chemistry	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the scope, importance, classification, sources, and quality standards of pharmaceutical inorganic compounds, including pharmacopoeias and limit tests.
	2. Describe the role of inorganic compounds, pharmaceutical aids, and inorganic excipients in medicine, pharmacy, and the manufacture of pharmaceutical products.
Content Outline	• Introduction, scope, and importance of pharmaceutical inorganic chemistry. Classification and sources of inorganic pharmaceutical compounds. Pharmacopoeias: Indian

	Pharmacopoeia (IP), British Pharmacopoeia (BP), and United States Pharmacopoeia (USP) – basic concepts. Purity requirements and impurities in pharmaceutical substances. Limit tests: principle and significance (chloride, sulphate, iron, arsenic, and heavy metals) – basic concepts. Introduction to pharmaceutical aids and inorganic excipients. Role of inorganic compounds in medicine and pharmacy.
--	--

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

Module 1 – Introduction to Pharmaceutical Chemistry

Project 1: Study of Pharmaceutical Terminology and Drug Development Process

Description: Students will select 3–5 commonly used medicines and collect information on their generic name, chemical name, official name, brand (trade) name, dosage form, therapeutic use, and manufacturer. They will also prepare a flow chart describing the drug discovery and development process, highlighting the roles of Quality Control (QC), Quality Assurance (QA), Research & Development (R&D), and pharmaceutical industries. The project may be presented as a written report, chart, poster, or PowerPoint presentation.

Module 2 – Pharmaceutical Inorganic Chemistry

Project 1: Study of Inorganic Pharmaceutical Compounds and Pharmacopoeial Standards

Description: Students will select 5–6 commonly used inorganic pharmaceutical compounds (e.g., sodium chloride, calcium carbonate, magnesium hydroxide, ferrous sulphate, zinc oxide, potassium permanganate) and prepare a project report covering:

- Chemical name and molecular formula.
- Pharmaceutical category and therapeutic use.
- Source and pharmaceutical application.
- Purity requirements as per the Indian Pharmacopoeia (IP).
- Basic information on pharmacopoeial standards and limit tests.
- Role of the selected compounds in medicine and pharmacy.

The project may be presented as a written report, chart, poster, or PowerPoint presentation.

Reference Books

1. Williams, D. A., Lemke, T. L., Roche, V. F., & Zito, S. W. (Eds.). *Foye's Principles of Medicinal Chemistry*. 9th Edition. Wolters Kluwer, 2025.
2. Patrick, G. L. *An Introduction to Medicinal Chemistry*. 8th Edition. Oxford University Press, 2023.

3. Cairns, D. *Essentials of Pharmaceutical Chemistry*. 6th Edition. Pharmaceutical Press, 2022.
4. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
5. Sweetman, S. C. (Ed.). *Martindale: The Complete Drug Reference*. 40th Edition. Pharmaceutical Press, 2020.
6. Donald Cairns. *Essentials of Pharmaceutical Chemistry*. 6th Edition. Pharmaceutical Press, 2022.
7. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
8. G. R. Chatwal. *Inorganic Pharmaceutical Chemistry*. Latest Revised Edition. Himalaya Publishing House, 2023.
9. Anand & Chatwal. *Pharmaceutical Chemistry – Inorganic*. Latest Revised Edition. Himalaya Publishing House, 2023.
10. A. H. Beckett & J. B. Stenlake. *Practical Pharmaceutical Chemistry (Part I & II)*. 4th Edition (Latest Reprint). CBS Publishers & Distributors, 2022.

Semester – I

.1.5 Open Elective Courses (OEC)

Course Titles	Medicinal Plants and Herbal Medicines (Th)
Course Credits	4 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Explain the importance, classification, cultivation, and therapeutic applications of medicinal plants and herbal medicines.
	2. Identify major phytochemicals, understand the preparation and quality control of herbal medicines, and appreciate their role in healthcare and pharmaceutical research.
Module 1 (Credit 1) – Introduction to Medicinal Plants	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the scope, importance, classification, and sources of medicinal plants in healthcare systems.
	2. Describe the cultivation, collection, processing, storage, and role of medicinal plants in traditional and primary healthcare practices.
Content Outline	• Definition, scope, and importance of medicinal plants. History and development of traditional systems of medicine (Ayurveda, Siddha, Unani, and Folk medicine). Classification and sources of medicinal plants. Cultivation, collection, processing, and storage of medicinal plants. Role of medicinal plants in primary healthcare.
Module 2 (Credit 1) – Phytochemicals and Herbal Medicines	
Learning Outcomes	After learning the module, learners will be able to,
	1. Identify the major classes of phytochemicals and explain their medicinal significance in herbal drugs.
	2. Discuss the principles, advantages, limitations, and preparation methods of herbal medicines and formulations.
Content Outline	• Introduction to phytochemicals and their importance. Major classes of phytochemicals: alkaloids, glycosides, flavonoids, tannins, terpenoids, saponins, and essential oils. Herbal medicines: definition, advantages, limitations, and applications. Common methods of preparation of herbal formulations (decoctions, infusions, powders, extracts, and tinctures).
Module 3 (Credit 1) – Common Medicinal Plants and Their Uses	
Learning Outcomes	After learning the module, learners will be able to,
	1. Recognize important medicinal plants by their botanical names, families, active constituents, and therapeutic uses.

	2. Correlate the phytochemical constituents of selected medicinal plants with their pharmacological and medicinal applications.
Content Outline	- Study of selected medicinal plants: - Tulsi (<i>Ocimum tenuiflorum</i>) - Neem (<i>Azadirachta indica</i>) - Turmeric (<i>Curcuma longa</i>) - Aloe vera (<i>Aloe barbadensis</i> Miller) - Ashwagandha (<i>Withania somnifera</i>) - Amla (<i>Phyllanthus emblica</i>) - Ginger (<i>Zingiber officinale</i>) - Giloy (<i>Tinospora cordifolia</i>) - Botanical name, family, active constituents, medicinal properties, and therapeutic uses.
Module 4 (Credit 1) – Quality Control, Safety, and Future Prospects	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the principles of quality control, standardization, authentication, and Good Agricultural and Collection Practices (GACP) for herbal medicines.
	2. Evaluate the safety, regulatory requirements, and future research prospects of herbal medicines for their rational and effective use.
Content Outline	Quality control and standardization of herbal medicines. Good Agricultural and Collection Practices (GACP) (basic concepts). Adulteration and authentication of herbal drugs. Safety, toxicity, and adverse effects of herbal medicines. Regulatory aspects of herbal medicines in India. Current trends and future prospects of herbal medicine research.

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

Module 1 – Introduction to Medicinal Plants

Project 1: Survey and Documentation of Local Medicinal Plants

Description: Students will conduct a survey of their home, college campus, or nearby locality to identify 8–10 medicinal plants. They will prepare a project report including:

- Common name and botanical name.
- Family.
- Plant part used.
- Traditional medicinal uses.
- Method of cultivation or availability.
- Photographs (if possible).

Students will gain practical knowledge of medicinal plants, their identification, traditional uses, and their importance in primary healthcare.

Module 2 – Phytochemicals and Herbal Medicines

Project 1: Preparation and Documentation of a Simple Herbal Formulation

Description: Students will prepare one simple herbal formulation (such as an infusion, decoction, herbal powder, or tincture) using a commonly available medicinal plant (e.g., tulsi, ginger, turmeric, or neem). They will submit a project report including:

- Name of the medicinal plant.
- Major phytochemicals present.
- Materials required.
- Method of preparation.
- Therapeutic uses.
- Advantages and limitations of the formulation.
- Storage and precautions.

Students will understand the role of phytochemicals in herbal medicines and gain hands-on experience in the basic preparation and documentation of herbal formulations.

Module 3 – Common Medicinal Plants and Their Uses

Project 1: Comparative Study of Selected Medicinal Plants

Description: Students will select any four medicinal plants from the prescribed list (Tulsi, Neem, Turmeric, Aloe vera, Ashwagandha, Amla, Ginger, and Giloy) and prepare a comparative project report. The report should include:

- Common name and botanical name.
- Family.
- Major active constituents.
- Medicinal properties.
- Therapeutic uses.
- Photographs or herbarium specimens (where feasible).
- Comparative summary of their medicinal applications.

Students will develop the ability to identify medicinal plants, correlate their phytochemical constituents with therapeutic uses, and enhance their skills in scientific documentation and presentation.

Module 4 – Quality Control, Safety, and Future Prospects

Project 1: Quality Evaluation and Standardization of a Herbal Product

Description: Students will select one commercially available herbal product (e.g., a herbal tablet, syrup, powder, tea, or cosmetic) and evaluate it based on:

- Product name and manufacturer.
- Herbal ingredients and their claimed uses.

- Label information and regulatory details.
- Quality standards (packaging, storage conditions, expiry date, batch number, certification, if available).
- Possible adulteration or safety concerns.
- Suggestions for quality improvement and safe use.

Students will present their findings in the form of a written report or PowerPoint presentation. Students will understand the principles of quality control, standardization, regulatory requirements, and safety evaluation of herbal medicines while developing skills in product analysis and scientific reporting.

Reference Books

1. Trease, G. E., & Evans, W. C. *Trease and Evans Pharmacognosy*. 17th Edition. Elsevier, 2024.
2. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. *Pharmacognosy*. 58th Edition. Nirali Prakashan, 2024.
3. Bruneton, J. *Pharmacognosy, Phytochemistry and Medicinal Plants*. 2nd Edition (Reprint). Lavoisier Publishing, Latest Reprint.
4. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
5. World Health Organization (WHO). *WHO Monographs on Selected Medicinal Plants*. Latest Available Volumes. World Health Organization.
6. *Quality Standards of Indian Medicinal Plants*. Indian Council of Medical Research (ICMR). Latest Available Volumes.

Semester – I

.1.6 Vocational Skill Courses (VSC-S1)

Course Titles	Pharmaceutical Chemistry (Pr)
Course Credits	2 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Perform basic pharmaceutical laboratory experiments using standard laboratory equipment, chemicals, and Good Laboratory Practices (GLP).
	2. Apply fundamental techniques for the identification, preparation, and quality assessment of pharmaceutical substances while following laboratory safety and documentation practices.
Module 1 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to,
	1. Identify common pharmaceutical dosage forms, laboratory apparatus, pharmaceutical excipients, and drug label information, and prepare simple laboratory solutions using standard laboratory techniques.
	2. Demonstrate Good Laboratory Practices (GLP), safe handling of chemicals and equipment, measurement of pH, determination of melting point, and proper recording of experimental observations.
Content Outline	• Identification and study of common laboratory apparatus and glassware used in pharmaceutical laboratories. • Preparation of standard laboratory solutions (e.g., 0.1 N HCl, 0.1 N NaOH) and proper labeling. • Measurement of pH of pharmaceutical solutions using pH paper and a digital pH meter. • Determination of the melting point and boiling point of simple pharmaceutical organic compounds. • Study of pharmaceutical labels to identify generic name, brand name, active pharmaceutical ingredient (API), batch number, manufacturing date, expiry date, and storage conditions. • Identification of common inorganic pharmaceutical aids and excipients such as talc, calcium carbonate, magnesium stearate, kaolin, and bentonite. • Identification tests for magnesium hydroxide, sodium bicarbonate, copper sulphate, and ferrous sulphate. • Demonstration of Good Laboratory Practices (GLP), laboratory safety rules, proper handling of chemicals, and waste disposal.
Module 2 (Credit 1)	
Learning Outcomes	After learning the module, learners will be able to,
	1. Identify common inorganic pharmaceutical compounds, pharmaceutical aids, excipients, laboratory apparatus, and

	pharmaceutical label information, and prepare simple inorganic pharmaceutical solutions using standard laboratory procedures.
	2. Demonstrate Good Laboratory Practices (GLP), safe handling of chemicals and reagents, perform basic pharmacopoeial and limit tests, and follow appropriate laboratory safety and waste disposal practices.
Content Outline	• Identification of common inorganic pharmaceutical compounds used as antacids, electrolytes, haematinics, and antiseptics. • Demonstration of pharmacopoeial tests and familiarization with the Indian Pharmacopoeia (IP) for selected inorganic pharmaceutical substances. • Study of limit tests for chloride and sulphate. • Demonstration of limit tests for iron and heavy metals (demonstration/qualitative observation). • Good Laboratory Practices (GLP), laboratory safety, chemical handling, and proper disposal of inorganic chemical waste. • Preparation of boric acid. • Preparation of ferrous sulphate. • Preparation of potash alum.

Reference Books

1. Donald Cairns. *Essentials of Pharmaceutical Chemistry*. 6th Edition. Pharmaceutical Press, 2022.
2. A. H. Beckett & J. B. Stenlake. *Practical Pharmaceutical Chemistry* (Part I & II). 4th Edition (Reprint Edition). CBS Publishers & Distributors.
3. Graham L. Patrick. *An Introduction to Medicinal Chemistry*. 8th Edition. Oxford University Press, 2023.
4. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
5. Donald Cairns. *Essentials of Pharmaceutical Chemistry*. 6th Edition. Pharmaceutical Press, 2022.
6. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
7. A. H. Beckett & J. B. Stenlake. *Practical Pharmaceutical Chemistry* (Part I & II). 4th Edition (Latest Reprint). CBS Publishers & Distributors.
8. G. R. Chatwal. *Inorganic Pharmaceutical Chemistry*. Himalaya Publishing House. Latest Revised Edition.
9. Anand & Chatwal. *Pharmaceutical Chemistry – Inorganic*. Himalaya Publishing House. Latest Revised Edition.

Semester – I

.1.7 Skill Enhancement Courses (SEC)

Course Titles	Basic Pharmaceutical Laboratory Techniques (Th)
Course Credits	2 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Apply Good Laboratory Practices (GLP), laboratory safety procedures, and basic pharmaceutical laboratory techniques for the preparation and handling of pharmaceutical substances.
	2. Perform fundamental pharmaceutical analytical procedures, maintain laboratory records, and follow appropriate documentation and waste disposal practices.
Module 1 (Credit 1) – Pharmaceutical Laboratory Safety and Basic Laboratory Techniques	
Learning Outcomes	After learning the module, learners will be able to,
	1. Demonstrate Good Laboratory Practices (GLP), laboratory safety measures, and the correct use of common laboratory apparatus and chemicals.
	2. Prepare simple laboratory solutions and perform basic laboratory operations while maintaining accurate laboratory records.
Content Outline	• Introduction to the pharmaceutical laboratory and Good Laboratory Practices (GLP). Laboratory safety rules, personal protective equipment (PPE), and first aid. Identification and use of common laboratory apparatus and glassware. Handling, storage, and labeling of chemicals and reagents. Basic laboratory operations: weighing, measuring volumes, filtration, decantation, and transfer of liquids. Preparation of standard laboratory solutions (molarity, normality, and percentage solutions). Maintenance of laboratory records and notebooks.
Module 2 (Credit 1) – Basic Pharmaceutical Analytical Techniques	
Learning Outcomes	After learning the module, learners will be able to,
	1. Perform basic pharmaceutical analytical techniques such as pH measurement, melting point determination, and simple volumetric analysis.
	2. Record, interpret, and report experimental observations while following laboratory safety and waste management practices.
Content Outline	• Measurement of pH using pH paper and a digital pH meter. Preparation and use of buffer solutions (basic concepts). Determination of the melting point of pharmaceutical compounds. Introduction to volumetric analysis and common laboratory titrations. Basic documentation of experimental observations and reporting. Laboratory waste management and safe disposal of pharmaceutical chemicals.

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

Module 1 – Pharmaceutical Laboratory Safety and Basic Laboratory Techniques

Project 1: Preparation of a Pharmaceutical Laboratory Safety Manual and Laboratory Inventory

Description: Students will prepare a Laboratory Safety Manual by documenting:

- Good Laboratory Practices (GLP).
- Laboratory safety rules and emergency procedures.
- Personal Protective Equipment (PPE) and its proper use.
- Hazard symbols and safe handling of chemicals.
- Identification and functions of common laboratory apparatus and glassware.
- Methods for labeling, storage, and handling of chemicals.
- Preparation of one standard laboratory solution (e.g., 0.1 M NaCl or 0.1 N HCl) with proper calculations and labeling.
- Maintenance of a laboratory notebook and recording of observations.

The project may be submitted as a written report, laboratory manual, chart, or PowerPoint presentation. Students will develop practical knowledge of laboratory safety, Good Laboratory Practices (GLP), correct use of laboratory equipment, chemical handling, solution preparation, and scientific documentation.

Module 2 – Pharmaceutical Inorganic Chemistry

Project 1: Basic Pharmaceutical Analysis of Selected Samples

Description: Students will perform a basic laboratory study on one pharmaceutical sample or solution by carrying out simple analytical techniques such as:

- Measurement of pH using pH paper and a digital pH meter.
- Preparation of a simple buffer solution.
- Determination of the melting point of a selected pharmaceutical compound (where applicable).
- Demonstration of a simple acid–base titration.
- Recording observations, calculations, and interpretation of results.
- Documentation of laboratory waste generated and its safe disposal methods.

The project may be submitted as a laboratory report, practical record, or PowerPoint presentation. Students will gain practical experience in basic pharmaceutical analytical techniques, accurate documentation of experimental results, and safe laboratory waste management practices.

Reference Books

1. Donald Cairns. *Essentials of Pharmaceutical Chemistry*. 6th Edition. Pharmaceutical Press, 2022.
2. A. H. Beckett & J. B. Stenlake. *Practical Pharmaceutical Chemistry (Part I & II)*. 4th Edition (Latest Reprint). CBS Publishers & Distributors, 2022.

3. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
4. David G. Watson. *Pharmaceutical Analysis: A Textbook for Pharmacy Students and Pharmaceutical Chemists*. 4th Edition. Elsevier, 2020.
5. R. M. Verma. *Practical Pharmaceutical Chemistry*. Latest Revised Edition. CBS Publishers & Distributors, 2021.

Course Structure

Semester – II

.2.1 Major (Core)

Course Titles	Fundamentals of Pharmaceutical Chemistry-II (Th)
Course Credits	2 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Explain the fundamental concepts of organic chemistry, including classification of organic compounds, functional groups, chemical bonding, hybridization, electronic effects, hydrocarbons, and acid–base theories relevant to pharmaceutical sciences.
	2. Apply the concepts of organic reactions, reaction intermediates, stereochemistry, and functional group chemistry to understand the structure, properties, reactivity, and pharmaceutical significance of organic compounds used in drug development and pharmaceutical applications.
Module 1 (Credit 1) – Basic Concepts of Organic Chemistry	
Learning Outcomes	After learning the module, learners will be able to,
	1. Classify organic compounds based on their functional groups and explain the role of chemical bonding, hybridization, and electronic effects in determining their properties.
	2. Apply the concepts of hydrocarbons and Brønsted–Lowry and Lewis acid–base theories to interpret the chemical behavior and pharmaceutical significance of organic compounds.
Content Outline	• Introduction, scope and importance of organic chemistry in pharmaceutical sciences, Classification of organic compounds and functional groups, Chemical bonding and hybridization (sp, sp², sp³), Electronic effects: inductive, resonance, electromeric effect and hyperconjugation (basic concepts), Introduction to hydrocarbons (alkanes, alkenes, alkynes) and their properties. Acids and bases: Brønsted–Lowry and Lewis concepts; factors affecting acidity and basicity
Module 2 (Credit 1) – Organic Reactions and Stereochemistry	
Learning Outcomes	After learning the module, learners will be able to,
	1. Differentiate various types of organic reactions, reaction intermediates, and forms of isomerism, with emphasis on their significance in pharmaceutical chemistry.
	2. Explain the importance of stereochemistry and functional groups in determining the chemical properties and biological activity of pharmaceutical compounds.
Content Outline	• Types of organic reactions: substitution, addition, elimination and rearrangement (basic concepts), Reaction intermediates:

	carbocations, carbanions and free radicals. Isomerism: structural and stereoisomerism. Optical and geometrical isomerism (basic concepts). Importance of stereochemistry in pharmaceutical compounds and drugs, Introduction to important organic compounds used in pharmaceuticals (alcohols, aldehydes, ketones, carboxylic acids)
--	--

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

Module 1 - Basic Concepts of Organic Chemistry

Project 1: Identification of Functional Groups in Pharmaceutical Compounds

Description: Collect the chemical structures of 10 commonly used pharmaceutical drugs (e.g., aspirin, paracetamol, ibuprofen, caffeine, amoxicillin). Identify and classify the functional groups present in each compound and explain how these functional groups influence the physical and chemical properties, biological activity, and pharmaceutical applications of the drugs. Present the findings in the form of a chart or report.

Module 2 - Organic Reactions and Stereochemistry

Project 1: Classification and Reaction Mapping of Organic Compounds

Description: Prepare a project illustrating the major types of organic reactions (substitution, addition, elimination, and rearrangement) using simple organic compounds. Include examples of reaction intermediates (carbocations, carbanions, and free radicals) and classify common pharmaceutical organic compounds such as alcohols, aldehydes, ketones, and carboxylic acids based on their functional groups and applications in medicine.

Reference Books

1. Morrison, R. T., & Boyd, R. N. *Organic Chemistry* (8th Edition). Pearson Education, 2019 (Indian Reprint).
2. Solomons, T. W. G., Fryhle, C. B., & Snyder, S. A. *Organic Chemistry* (13th Edition). Wiley, 2022.
3. Bruice, P. Y. *Organic Chemistry* (9th Edition). Pearson, 2023.
4. Clayden, J., Greeves, N., & Warren, S. *Organic Chemistry* (3rd Edition). Oxford University Press, 2023.
5. Graham L. Patrick. *An Introduction to Medicinal Chemistry* (7th Edition). Oxford University Press, 2023.
6. *Wilson and Gisvold's Textbook of Organic Medicinal and Pharmaceutical Chemistry*, 13th Edition. Wolters Kluwer/Lippincott Williams & Wilkins, 2021.
7. *Foye's Principles of Medicinal Chemistry*, 8th Edition. Wolters Kluwer, 2020.

Semester – II

.2.6 Open Elective Courses (OEC)

Course Titles	Cosmetic Science and Personal Care Products (Th)
Course Credits	4 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Explain the principles of cosmetic science, the composition and applications of personal care products, and their role in personal hygiene and healthcare.
	2. Describe cosmetic ingredients, quality control measures, safety requirements, regulatory guidelines, and recent developments in cosmetic science.
Module 1 (Credit 1) – Introduction to Cosmetic Science	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the definition, scope, history, classification, and importance of cosmetic science and personal care products.
	2. Describe the basic structure and functions of the skin, hair, nails, and oral cavity, and their relevance to cosmetic applications.
Content Outline	• Definition, scope, and importance of cosmetic science. History and evolution of cosmetics. Classification of cosmetics and personal care products. Skin, hair, nails, and oral cavity: basic structure and functions. Role of cosmetics in personal hygiene, beauty, and healthcare.
Module 2 (Credit 1) – Cosmetic Ingredients and Formulations	
Learning Outcomes	After learning the module, learners will be able to,
	1. Identify the major cosmetic ingredients and explain their functions in various personal care products.
	2. Describe the basic formulations of cosmetic products and compare conventional and herbal cosmetics with their advantages and limitations.
Content Outline	• Introduction to cosmetic ingredients. Functions of emollients, humectants, surfactants, preservatives, antioxidants, fragrances, colorants, and sunscreen agents. Basic formulations of creams, lotions, shampoos, soaps, face powders, lipsticks, deodorants, and toothpaste. Herbal cosmetics: concept, advantages, and limitations.
Module 3 (Credit 1) – Quality Control and Safety of Cosmetics	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the principles of quality control, Good Manufacturing Practices (GMP), and the importance of proper packaging, labeling, and storage of cosmetic products.

	2. Describe the basic concepts of cosmetic safety evaluation, skin irritation, allergy testing, and common quality issues including adulteration.
Content Outline	Quality control of cosmetic products. Good Manufacturing Practices (GMP) for cosmetics (basic concepts). Stability, packaging, labeling, and storage of cosmetic products. Safety evaluation, skin irritation, allergy testing (basic concepts). Adulteration and quality issues in cosmetics.
Module 4 (Credit 1) – Regulatory Aspects and Recent Trends	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the basic regulatory requirements, BIS guidelines, and labeling standards applicable to cosmetic products in India.
	2. Discuss current trends in natural, herbal, organic, and cosmeceutical products and their future prospects in the cosmetic industry.
Content Outline	Cosmetics and Drugs Act and Rules (basic overview). Bureau of Indian Standards (BIS) guidelines for cosmetics. Labeling requirements and consumer awareness. Natural, herbal, organic, and cosmeceutical products. Current trends and future prospects in cosmetic science and personal care products.

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

Module 1 – Introduction to Cosmetic Science

Project 1: Survey and Analysis of Common Cosmetic and Personal Care Products

Description: Students will collect 5–8 commonly used cosmetic and personal care products (e.g., soap, shampoo, face wash, moisturizer, toothpaste, sunscreen, lipstick, hair oil) and prepare a project report including:

- Product name and category.
- Purpose and area of application (skin, hair, nails, or oral care).
- Major ingredients listed on the label.
- Manufacturer and brand.
- Benefits and precautions for use.
- Label information (manufacturing date, expiry date, batch number, and storage conditions).

Students may present their findings as a written report, chart, poster, or PowerPoint presentation. Students will gain knowledge of the classification, applications, labeling, and importance of cosmetic and personal care products in personal hygiene, beauty, and healthcare.

Module 2 – Cosmetic Ingredients and Formulations

Project 1: Comparative Study of Cosmetic Ingredients in Personal Care Products

Description: Students will select any three cosmetic or personal care products (e.g., cream, shampoo, lotion, soap, toothpaste, or sunscreen) and prepare a comparative report covering:

- Product name and category.
- List of major ingredients.
- Function of each ingredient (emollient, humectant, surfactant, preservative, antioxidant, fragrance, colorant, sunscreen agent, etc.).
- Identification of herbal and synthetic ingredients.
- Advantages and limitations of the selected products.
- Conclusion on the suitability of the products for different users.

Students may present their work as a written report, chart, poster, or PowerPoint presentation. Students will understand the functions of cosmetic ingredients, differentiate between herbal and conventional cosmetic formulations, and develop skills in product analysis and scientific documentation.

Module 3 – Quality Control and Safety of Cosmetics

Project 1: Quality Assessment of a Cosmetic Product

Description: Students will select one commercially available cosmetic product (e.g., face cream, shampoo, soap, sunscreen, or lotion) and evaluate its quality based on:

- Product name and manufacturer.
- Packaging and labeling information.
- Manufacturing date, expiry date, batch number, and storage instructions.
- List of ingredients and intended use.
- Quality claims and safety warnings.
- Identification of possible adulteration or quality concerns (if any).
- Recommendations for safe use and proper storage.

Students may present their findings as a written report, chart, poster, or PowerPoint presentation. Students will understand the importance of quality control, Good Manufacturing Practices (GMP), product labeling, packaging, storage, and safety evaluation of cosmetic products, while developing analytical and scientific reporting skills.

Module 4 – Regulatory Aspects and Recent Trends

Project 1: Consumer Awareness and Regulatory Study of Cosmetic Products

Description: Students will select one natural, herbal, organic, or cosmeceutical product available in the market and prepare a project report covering:

- Product name and manufacturer.
- Product category and intended use.
- Compliance with labeling requirements (ingredients, batch number, manufacturing date, expiry date, directions for use, precautions, etc.).
- BIS certification or other quality marks (if applicable).
- Claims made by the manufacturer and consumer awareness regarding their authenticity.
- Current market trends and future scope of natural and herbal cosmetic products.

Students may present the project as a written report, chart, poster, or PowerPoint presentation. Students will develop an understanding of the regulatory framework for cosmetics, labeling standards, consumer awareness, and the emerging trends in natural, herbal, organic, and cosmeceutical products.

Reference Books

1. Harry's Cosmeticology, 10th Edition, Chemical Publishing Company, 2022.
2. P. P. Sharma. *Cosmetics: Formulation, Manufacturing and Quality Control*, 6th Edition, Vandana Publications, 2022.
3. Mithal, B. M. *A Textbook of Cosmetics*, Latest Revised Edition, Vallabh Prakashan, 2023.
4. Rosen, M. R., & Draelos, Z. D. *Cosmetic Science and Technology: Theoretical Principles and Applications*, Elsevier, 2023.
5. Barel, A. O., Paye, M., & Maibach, H. I. (Eds.) *Handbook of Cosmetic Science and Technology*, 5th Edition, CRC Press, 2022.
6. Bureau of Indian Standards (BIS). *Indian Standards for Cosmetics* (Latest Available Standards).

Semester – II

.2.7 Skill Enhancement Courses (SEC)

Course Titles	Industrial Safety and Good Manufacturing Practices (GMP)
Course Credits	2 Credit's
Course Outcomes	After going through the course, learners will be able to
	1. Apply industrial safety principles, hazard control measures, and occupational health practices to ensure a safe pharmaceutical working environment.
	2. Explain and implement the basic principles of Good Manufacturing Practices (GMP), documentation, quality assurance, and quality control in pharmaceutical industries.
Module 1 (Credit 1) – Industrial Safety and Occupational Health	
Learning Outcomes	After learning the module, learners will be able to,
	1. Explain the principles of industrial safety, workplace hazards, and occupational health in pharmaceutical industries.
	2. Demonstrate the proper use of PPE, safety signs, emergency procedures, and safe handling and disposal of chemicals.
Content Outline	• Introduction to industrial safety and its importance in pharmaceutical industries. Types of workplace hazards: physical, chemical, biological, fire, and electrical hazards. Personal Protective Equipment (PPE): types, selection, and proper use. Laboratory and industrial safety signs and hazard symbols. Fire prevention, fire extinguishers, emergency response, and first aid. Safe handling, storage, and disposal of chemicals. Occupational health and environmental safety (basic concepts).
Module 2 (Credit 1) – Good Manufacturing Practices (GMP)	
Learning Outcomes	After learning the module, learners will be able to,
	1. Describe the principles and requirements of Good Manufacturing Practices (GMP), Good Documentation Practices (GDP), and Standard Operating Procedures (SOPs).
	2. Explain the roles of Quality Control (QC), Quality Assurance (QA), hygiene, sanitation, and equipment maintenance in pharmaceutical manufacturing.
Content Outline	• Introduction, objectives, and importance of Good Manufacturing Practices (GMP). Basic requirements of GMP in pharmaceutical manufacturing. Good Documentation Practices (GDP) and Standard Operating Procedures (SOPs). Quality Control (QC) and Quality Assurance (QA): basic concepts. Hygiene, sanitation, and personnel training. Equipment cleaning, maintenance, calibration, and validation (basic concepts). Introduction to regulatory guidelines for pharmaceutical

	industries.
--	-------------

Assignments/Activities towards Comprehensive Continuous Evaluation (CCE):

Module 1 – Industrial Safety and Occupational Health

Project 1: Industrial Safety Audit of a Laboratory

Description: Students will conduct a safety audit of a college laboratory or prepare a model pharmaceutical laboratory safety plan. The report should include:

- Identification of hazards.
- Safety signs and PPE requirements.
- Fire safety equipment.
- Emergency exit plan.
- Chemical storage practices.
- Recommendations for improving laboratory safety.

Module 2 – Good Manufacturing Practices (GMP)

Project 1: Preparation of a Model GMP and SOP Manual

Description: Students will prepare a model GMP manual for a pharmaceutical manufacturing unit. The project should include:

- GMP requirements.
- Layout of a manufacturing area.
- Personnel hygiene practices.
- Documentation formats.
- Sample Standard Operating Procedure (SOP) for cleaning laboratory equipment or preparing a pharmaceutical solution.
- Quality Control and Quality Assurance measures.

Reference Books

1. World Health Organization (WHO). *WHO Good Manufacturing Practices (GMP) for Pharmaceutical Products: Main Principles*. Latest Updated Edition, WHO, 2023.
2. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia*. 2022 Edition. Indian Pharmacopoeia Commission, Ministry of Health & Family Welfare, Government of India, 2022.
3. Willig, S. H., & Stoker, J. R. *Good Manufacturing Practices for Pharmaceuticals*. 6th Edition. CRC Press, 2021.
4. Willig, S. H., & Stoker, J. R. *Good Manufacturing Practices for Pharmaceuticals: A Plan for Total Quality Control*. CRC Press, Latest Reprint, 2021.
5. Donald Cairns. *Essentials of Pharmaceutical Chemistry*. 6th Edition. Pharmaceutical Press, 2022.