

 Estd. 1962 "A++" Accredited by NAAC (2021) With CGPA 3.52	SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र दूरध्वनी-ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१-२६०९०९४ ०२३१-२६०९४८७	 
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Ref.No.SU/BOS/Science/148

Date: 26/05/2026

The Principal,
 All Concerned Affiliated Colleges/Institutions
 Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-III (Sem.V & VI) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper of B.Sc. Part-III (Sem.V & VI) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc. Part-III (Sem. V & VI) as per NEP-2020 (2.0)			
1.	Botany	9.	Geology
2.	Physics	10.	Zoology
3.	Statistics	11.	Chemistry
4.	Mathematics	12.	Electronics
5.	Microbiology	13.	Drug Chemistry
6.	Industrial Microbiology	14.	Pollution
7.	Biochemistry	15.	Food Science and Quality Control
8.	Computer Science (Optional)	16.	Biotechnology (Optional/Vocational)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2026-2027 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in>Syllabus>Syllabus as per NEP2020.

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2026 & March/April 2027. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,



Dy Registrar

Encl: as above

for information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

**Shivaji University,
Kolhapur**



Accredited By NAAC with 'A⁺⁺' Grade

Syllabus for
Bachelor of Science Part III
(B. Sc. III)

In
Drug Chemistry
(NEP-2.0)

To be implemented from June, 2026 onwards

SHIVAJI UNIVERSITY, KOLHAPUR
Revised Syllabus for the Bachelor of Science in Drug Chemistry
(As per NEP- 2.0)
Applicable from the Academic Year 2026 –27

1. **Title:** B. Sc. III Drug Chemistry, Shivaji University, Kolhapur Revised Syllabus as per NEP – 2.0
2. **Faculty:** Faculty of Science and Technology.
3. **Year of Implementation:** From June 2026
4. **Objectives of a Bachelor of Science (B.Sc.) in Drug Chemistry Program include:**
 - To introduce drug chemistry which includes detail study of drug will help them to enhance their interdisciplinary approach with vigour.
 - To understand the fundamentals, principles, concepts and recent developments in the subject area.
 - To create a skilled workforce to match the requirements of the society.
 - To develop scientific attitude is the major objective so as to make the students open minded, and curious.
 - To develop laboratory skills through practical work and equipment's along with the collection and interpretation of scientific data to contribute to science.
5. **Program Outcomes:**
 - Students gain a deep knowledge regarding natural products drug resources, analytical skills along with excipients, chemistry involved in SAR (Structure Activity Relationship) in drug development process, commonly used drugs for various therapeutic areas, Drug development process, toxicity and impurity profile.
 - Students will be able to communicate effectively i.e. being able to articulate, comprehend and write effective reports, make effective presentations and documentation and capable of expressing the subject through technical writing as well as through oral presentation.
6. **Program Specific Outcomes:**
 - PSO-1:- Able to apply the knowledge gained during the course of the program from biochemistry, drug analysis, medicinal chemistry and environmental studies.
 - PSO-2: Able to communicate easily and confidently
 - PSO-3: Able to perform multitask in the fields including pharmaceuticals and research.
 - PSO-4: The students will graduate with proficiency in the subject of drug chemistry.
 - PSO-5: The students will be eligible to continue higher studies in their subject.
7. **Program Education Outcomes:**

PEO-1: Students after graduation (Graduates) will possess strong analytical, critical thinking, and problem-solving skills relevant to the field in chemistry and they will be prepared for careers in various sectors, including industry, research, and government, requiring a strong foundation in drug chemistry.

PEO-2: Graduates will be able to utilize their chemical knowledge and skills to address societal needs and challenges include areas like environmental sustainability,

healthcare, energy solutions, and materials science.

PEO-3: Graduates will demonstrate a commitment to lifelong learning and professional development, and they will possess strong communication, teamwork, and leadership skills.

PEO-4: They will be able to apply their chemical knowledge and skills to solve problems and they will be prepared to adapt to the evolving landscape of the chemical sciences.

PEO-5: Graduates will be equipped to pursue further education, such as an M.Sc. or Ph.D., in chemistry or related disciplines and will be able to work effectively in multidisciplinary and interdisciplinary environments.

PEO-6 Graduates will be equipped to innovate and develop solutions that benefit society.

8. The B. Sc. III Course (Drug Chemistry) (Level 5.5) will be of **Two Semesters (Sem. V and Sem VI)**.

9. Pattern of Examination: The Examinations will be conducted **semester-wise for Theory and Practical**.

10. **Fee structure:** As per Shivaji University guidelines.

11. **Eligibility Criteria for Admission to B. Sc. Part III (Level 5.5):**

12. **Medium of Instruction:** English

13. **Structure of course:** Given in Framework Chart

14. **Scheme of Teaching and Examination:**

- Each theory course paper constitutes of 4-5 units require 30 hours of teaching lectures and there shall be two lectures per theory (2 Cr) course per week.
- B. Sc. III Chemistry Course will be of 44 Credits (1100 marks) .
- Examination of each **theory course** shall be of **50 marks** (40 university examination + 10 internal assessment). University examination of 40 marks (1.5 hours' duration) will be conducted at the end of each Semester. Internal assessment of 10 marks will be done before the semester examination during each semester.
- Examination of practical course shall be of 100 marks (4 Cr) and 50 marks (2 Cr) per semester.
- Pattern and Nature, marking scheme for theory and Practical Examination for Major Specific SEC and VSC courses are included in syllabus.
- Question papers will be set in the view of the entire syllabus and preferably covering each unit of the syllabus. Weightage should be provided to each unit as per the hours allotted for teaching.

15. **Standard of Passing:** The standard of passing shall be as per the following table.

	Semester End Exam	Internal Assessment	Course Exam (Total)
Maximum Marks	40	10	50
Minimum Marks required for passing	14	4	18

i) There shall be a separate head of passing for semester end examination and internal examination.

ii) Minimum 18 marks out of 50 and 35 marks out of 100 are required for passing of practical examination of each course. iii) Passing criteria for OJT and Field Project (FP) as per the University guidelines.

Nature of Question paper and scheme of marking: Theory question paper: Maximum marks -40 Total No. of questions – 3 All questions are compulsory. Question No.1 is MCQ type (8 Marks). Question number 2 is long answer type question Carries 16 marks. Question number 3 is short answer type question carries 16 marks. (Nature of question paper is provided at the end of syllabus.)

B. Sc. III-Drug Chemistry (To be implemented from June 2026)

Level	Sem.	Major (Chemistry)		IDC/MD C/OE/G E	VSC/SEC		AEC, VEC, IKS			OJT, FP, CEP, CC, RP			Total Credits	Degree/ Cum. Cr. MEME
		Mandatory	Elective	OE (For Other Faculty)	VSC	SEC	AEC	VEC	IKS	CC	FP/ OJT	RP/ Dissert		
5.5	V	DCH-501 Paper-IX Drug Design and Early Development (2 Cr)	(Choose One) Elective Paper-I DCHA-503 Reaction Mechanism, Reagents & Name Reactions -A (2 Cr) or DCHB-503 Natural Products- B (2 Cr)	DCHOE PR-501 Practical Paper-V Drug Chemistr y (2 Cr)	PRDCH VSC-501 Vocation al Skill Course Practical Paper-II (2 Cr) (Major specific)		AEC III (2 Cr) (Englis h)	--	--	--	OJT (4 Cr)	--	--	UG Degree 132
		DCH-502 Paper-X Industrial Pharmacy (2 Cr)												
		PRDCH-504 Practical Paper- V(a) (2 Cr) PRDCH-505 Practical Paper- V(b) (2 Cr)	(Choose One) PRDCHA-506 Elective Practical Paper (2 Cr) or PRDCHB-506 Practical Paper (2 Cr)											
	Credits	4(T)+4(P) =8	2(T)+2(P) =4	2 (P) =2	2(P)=2	--	2(T)=2	--	--	--	4	--	22	
	IV	DCH-601 Paper-XI Therapeutic Areas & Its Drugs (2 Cr)	(Choose One) Elective Paper-II DCHC-603 Heterocyclic Drugs-C (2 Cr) DCHD-603 Industrial Chemistry- D (2 Cr)		PRDCH VSC-601 Vocation al Skill Course Practical Paper-III (2 Cr) (Major specific)	DCHSE C-601 Practical Skills in Chemistr y Paper- III (2 Cr)	AEC- IV (2 Cr) (Englis h)	--	IKS Major Specifi c(2Cr)	--	FP (2 Cr)	--	--	
		DCH-602 Paper-XII Herbal Drug Technology (2 Cr)												
		PRDCH-604 Practical Paper- VI(a) (2 Cr) PRDCH-605 Practical Paper- VI(b) (2 Cr)	(Choose One) Elective Practical Paper-II PRDCHC-606 Practical Paper (2 Cr) PRDCHD-606 Practical Paper (2 Cr)											
	Credits	4(T)+4(P) =8	2(T)+2(P) =4	--	2(P)=2	2(T)=2	2(T)=2	--	2(T)=2	--	2	--	22	
Total Credits		16	8	2	4	2	4	--	2	--	6+	--	44	
Exit Option: Exit Option:4 credits NSQF/Internship/Skill courses														

B. Sc. Part - III (NEP- 2.0) SEMESTER-V
Mandatory Drug Chemistry Paper No. IX
(Drug Design & Early Developments)
(Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (Cos): Students will be able to

CO-1: Explain the concept of disease and identify biological targets involved in drug discovery. Understand the principles of pharmacokinetics (PK) and pharmacodynamics (PD).

CO-2: Identify and optimize lead compounds using structural modification techniques.

CO-3: Describe various phases of clinical trials (Phase I–IV).

CO-4: Analyze current trends in drug development such as personalized medicine and advanced therapies.

Unit-1: Novel Drug Discovery [7]

- 1.1 Disease
- 1.2 Biological target
- 1.3 Binding sites of the drug candidate
- 1.4 Structural designing of the pharmacophore
- 1.5 PK study and PD stud

Unit-2: Drug Design [8]

- 2.1 Screening and types of the screening
- 2.2 Lead candidate identification and its modification.
- 2.3 Chain branching
- 2.4 Ring chain transformation
- 2.5 Bio-isomerism

Unit-3: Preclinical Trials in Drug Development [8]

- 3.1 In-vitro study and in-vivo study
- 3.2 DMPK, toxicity
- 3.3 Drug metabolite study
- 3.4 stability, formulation and solubility

Unit-4: Clinical Trials in Drug Development [7]

- 4.1 Phase I
- 4.2 Phase II
- 4.3 Phase III
- 4.4 Phase IV
- 4.5 IND Filling
- 4.6 process of FDA Approval
- 4.7 Drug registration process in India, US, Europe, Current Serial

References:

1. Medicinal chemistry by Graham L. Patrick's, Oxford publications.
2. Drug design and discovery by Richard Silverman
3. Medicinal Chemistry by Foye, Oxford publications.
4. Textbook of Organic Medicinal and Pharmaceutical Chemistry by Lippincott, Williams and

Wilkins.

5. Medical Chemistry. D. Sriram., P. Yogeshwari, Pearson.

B. Sc. Part III (NEP 2. 0) SEMESTER-V

Mandatory Drug Chemistry Paper No. X

(Industrial Pharmacy)

(Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (Cos): Students will be able to

CO-1: Formulate, manufacture, evaluate, and ensure quality compliance of liquid oral dosage forms (syrups and suspensions) in accordance with pharmacopeial standards and GMP guidelines.

CO-2: Formulate, manufacture, fill, evaluate, and ensure quality compliance of hard and soft gelatin capsules in accordance with pharmacopeial standards and GMP requirements.

CO-3: Formulate, manufacture, evaluate, and ensure the quality, safety, and regulatory compliance of cosmetic products in accordance with applicable standards and Good Manufacturing Practices (GMP).

CO-4: Formulate, manufacture, evaluate, and ensure the sterility, safety, efficacy, and regulatory compliance of sterile pharmaceutical preparations and immunological products in accordance with pharmacopeial standards and GMP guidelines.

Unit-1: Tablets and Liquid Orals

[8]

- 1.1 Introduction, ideal characteristics of tablets,
- 1.2 Classification of tablets, excipients,
- 1.3 Formulation of tablets, granulation methods,
- 1.4 Compression and processing problems, equipment's and tablet tooling,
- 1.5 Tablet coating: types of coating, coating material formulation of coating compositions methods of coating equipment employed and defects in coating.
- 1.6 Quality control tests: in process and finished product tests.
- 1.7 Liquid orals: formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging evaluation of liquid orals official in pharmacopoeia.

Unit-2: Capsules

[10]

A) Hard gelatin capsules

- 2.1 Introduction,
- 2.2 Production of hard gelatin capsule shells.
- 2.3 Size of capsules Filling,
- 2.4 Finishing and special techniques of formulation of hard gelatin capsule.
- 2.5 Manufacturing defects, in process and final products quality control tests for capsules.

B) Soft gelatin capsules:

- 2.6 Nature of shell and capsule contain,
- 2.7 Size of capsule importance of base adsorption and minimum/gm factors production in process and final product quality control tests.
- 2.8 Packaging, storage and stability testing of soft gelatin capsules and their applications.

Unit-3: Cosmetics

[6]

- 4.1 Introduction,
- 4.2 Types of cosmetics, its formulation and preparation of the following

cosmetics: Lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Unit-4: Sterile Formulations & Immunological Products

[6]

- 5.1 Injectable
- 5.2 Eye drops, eye ointments
- 5.3 Immunological Products: Sera, Vaccines, Toxoids and their manufacturing methods.

References:

1. Pharmaceutical dosage forms-tablets, volume 1, 2,3 by H. A. Liberman, Leon Lachman and J.B. Schwartz.
2. Pharmaceutical dosage forms-parental medications, volume 1&2, by H. A. Liberman and Leon Lachman.
3. Pharmaceutics-science of the dosage forms-design by M.E. Aulton, Churchill livingstone

B. Sc. Part III (NEP 2. 0) SEMESTER-V

Elective Paper I

Reaction Mechanisms Reagents & Name Reactions-A)

(Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (COs): Students will be able to

CO-1: Understand and apply the fundamental principles of chemical reactions, including reaction types, mechanisms, and factors influencing reactivity, to analyze and predict chemical behavior..

CO-2: Explain the mechanisms, factors affecting reactivity, and applications of nucleophilic and electrophilic substitution reactions to predict reaction outcomes in organic compounds.

CO-3: Understand the properties, mechanisms, and practical applications of key synthetic reagents in organic synthesis to design and predict chemical transformations.

CO-4: Understand the statements, general reactions, mechanisms, and synthetic applications of key organic reactions to analyze and design chemical transformations effectively.

Unit-1: Basics of Chemical Reactions

[8]

- 1.1 Types of organic reactions addition, substitution, elimination
- 1.2 Electronic movement in organic reactions
- 1.3 Fission of a covalent bond
- 1.4 Concepts of electrophiles and nucleophiles
- 1.5 Factors affecting on chemical reactions
- 1.6 Order of reactivity
- 1.7 Acidity and basicity.

Unit-2: Nucleophilic and Electrophilic Substitution Reaction

[7]

- 2.1 SN1 reaction
- 2.2 SN2 reaction
- 2.3 S_Ni reaction
- 2.4 Aliphatic electrophilic substitution
- 2.5 Aromatic electrophilic substitution
- 2.6 Aliphatic nucleophilic substitution
- 2.7 Aromatic nucleophilic substitution.

Unit-3: Synthetic Reagents and Applications

[8]

Preparation and Applications of following reagents.

- 3.1 Lithium aluminum hydride LiAlH_4
- 3.2 Osmium tetroxide (OsO_4)
- 3.3 Dicyclohexyl Carbodiimide (DCC)
- 3.4 Raney Nickel
- 3.5 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone (DDQ)
- 3.6 Polyphosphoric acid (PPA)
- 3.7 Diazomethane
- 3.8 Sodium borohydride (NaBH_4)

Unit-4: Name Reactions

[7]

Statement, general reaction, mechanism and synthetic applications of following reactions

- 4.1 Diels-Alder reaction
- 4.2 Oppenauer Oxidation
- 4.3 Meerwein – Ponderff- Verley reduction
- 4.4 Schmidt rearrangement
- 4.5 Hofmann rearrangement
- 4.6 Wittig reaction
- 4.7 Wagner-Meerwein rearrangement
- 4.8 Michael reaction
- 4.9 Dieckmann's reaction or condensation
- 4.10 Benzil- Benzilic acid rearrangement

Reference Books

1. March's Advanced Organic Chemistry, Michael B. Smith and Jerry March, Wiley, 2013.
2. Organic Chemistry Vol. 1 and 2 by I. L. Finar, Wiley publications.
3. A textbook of Organic Chemistry, Arun Bahl and
a. B.S. Bahl., S. Chand.
4. Organic Chemistry, J. Clayden, N. Greeves, S. Warren and P. Wothers, Oxford Press.
5. Organic chemistry by P. S. Kalsi.
6. Reaction mechanism, reagents by S. N. Sanyal

B. Sc. Part III (NEP 2. 0) SEMESTER-V

Elective Paper I

Natural Products-B

Theory Credits: 02,30 Hours

COURSE OUTCOMES (Cos): Students will be able to

CO-1: Understand the classification, chemical structures, biosynthesis, and pharmacological significance of alkaloids and terpenoids, and apply this knowledge in their identification and therapeutic applications.

CO-2: Understand the structures, stereochemistry, biosynthesis, chemical reactions, and pharmacological significance of steroids to analyze and apply their chemical and therapeutic properties.

CO-3: Understand the chemical structures, classification, biological functions, deficiency disorders, and therapeutic applications of vitamins to apply this knowledge in pharmaceutical and nutritional contexts.

CO-4: Understand the classification, structures, physical and chemical properties, and biological significance of lipids, and apply this knowledge in pharmaceutical, nutritional, and biochemical contexts.

Unit -1: Alkaloids & Terpenoids [12]

A) Alkaloid: Occurrence, Isolation, Classification, Properties, General methods for structure determination, synthesis of nicotine, morphine, codeine, berberine and its applications.

B) Terpenoids: Occurrence, Classification, Extraction, General Characteristics, Isoprene rule, Synthesis of menthol, camphor and its applications.

Unit-2: Steroids [8]

3.1 Introduction,

3.2 Occurrence,

3.3 Classification,

3.4 Biological Significance and Biosynthesis,

3.5 Mevalonate pathway: Oestrone, cortisol, testosterone, progesterone.

Unit-3: Vitamins [5]

3.1 Overview on Vitamin A, B, C, D, E and K.

3.2 Synthesis of vitamin B and C.

Unit-4: Lipids [5]

4.1 Introduction,

4.2 Classification,

4.3 Properties and biological importance.

4.4 Fatty acids Nomenclature and Structures,

4.5 Lipids in cell membrane Cholesterol and steroids,

4.6 Hormones- structure and functions.

References:

1. Steroids in laboratory and clinical practice, John William Honour, Elsevier Publications, 2023.
2. Anabolics steroids, Matthew R. Rhea, Pero J Marin, Mark D. Peterson, Jaffery L. Alexander; 2008.
3. Textbook of Biochemistry, U. Satyanarayana
4. The Vitamins fundamental aspects in nutritional and health. Gerald Combs, Jr., James McClung, 5th edition, Dec. 2015.
5. A fragrant introduction to terpenoids chemistry, 1st edition 2003, Charles S. Sell, RSC.
6. Terpenoids Chemistry, Biochemistry, Medicinal effects and Ethno-pharmacology, Bimal Krishna Banik, Bishwa Mohan Sahoo, Abhishek Tiwari 2022, CRC press.
7. Pharmaceutical Chemistry of Natural Products, by V. Algarsamy, Elsevier.

B. Sc. Part III (NEP 2. 0) SEMESTER-V

Practical Paper

Course Outcomes (Cos): Student will be able to

1. To conduct qualitative and quantitative analyses of organic compounds and gain proficiency in techniques such as separating binary mixtures, estimating compounds from samples, and synthesizing organic derivatives.
2. To separate binary organic mixtures into individual components by utilizing differences in solubility and chemical nature (acidic, phenolic, basic, or neutral). Develop skills to identify each component through qualitative analysis, including detection of elements and functional groups and determination of physical constants.
3. To quantify organic compounds using titrimetric methods to measure specific functional groups or compounds. This will help develop skills in calculating and interpreting the purity of organic samples for accurate laboratory analysis.
4. To conduct organic synthesis and purification techniques for specific compounds, while mastering essential lab operations like refluxing, filtration, and recrystallization. Additionally, students will learn to calculate percentage yields and verify product purity through physical constants like melting points.

PRDCH-504 Mandatory Practical Paper-V(a) (2 Cr)

List of Experiments: Perform the following experiments

1. Vitamin B synthesis
2. Extraction of nicotine from Tobacco.
3. Determination of total contents of alkaloids.
4. Assay of Ibuprofen
5. Assay of Furosemide
6. Assay of phenobarbitone
7. Assay of Aspirin
8. Determination of Partition Coefficient of Benzoic Acid Between Benzene and Water
9. Estimation of sucrose.
10. Saponification value of oil.

PRDCH-505 Mandatory Practical Paper-V(b) (2 Cr)

List of Experiments: Perform the following experiments

11. To determine the amount of acid and amide present in the given mixture of acid and amide.
12. Determination of the molecular weight of dibasic acid by the volumetric method.
13. Determination of iodine value of oil.
14. Multicomponent reaction - Preparation of Dihydropyrimidone.
15. Base-catalyzed Aldol condensation- Preparation of Dibenzal propanone.
16. Diazo coupling: Preparation of Methyl orange.
17. Methylation: Preparation of methyl-2-naphthyl ether (Nerolin) from β -Naphthol
18. Nitration: Preparation of picric acid from phenol.
19. Preparation of quinoxaline from benzyl and orthophenyldiamine

PRDCHA-506 Elective Practical Paper-I (2 Cr)

List of Experiments: Perform the following experiments

1. Shampoo

2. Lipsticks
3. Balm
4. Cold Creams
5. Vanishing Creams
6. Tooth paste
7. Estimation of Vitamin C
8. Estimation Magnesium from Talcum powder
9. To determine Ca from given drug sample by complexometric method
10. Separation and identification of amino acid by paper chromatographic method
11. To determine amount of antacid from give pharma table
12. Determination of Glucose by GOD-POD method

Note- Any other relevant practical may be added.

PRDCHB-506 Elective Practical Paper-I (2 Cr)

List of experiments; Perform the following experiments

1. Preparation of Benzimidazole
2. Synthesis of Benzocaine
3. Synthesis of Sulphaamide From aniline
4. Synthesis of 4- Hydroxy, 4-methyl coumarin from resorcinol
5. Synthesis of Benzilic Acid from Benzil
6. Synthesis of Dibenzalacetone from aldehyde and ketone
7. Synthesis of P-Nitro acetanilide
8. To prepare benzimidazole from o-phenylenediamine.
9. Synthesis of Phenytoin
10. To prepare hexamine from formaldehyde

B. Sc. Part III (NEP 2. 0) SEMESTER-VI

Mandatory Drug Chemistry Paper No. XI

(Therapeutic Areas and Its Drugs)

(Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (Cos): Students will be able to

CO-1: Understand the classification, mechanisms of action, pharmacological effects, therapeutic uses, and adverse effects of central nervous system drugs to apply this knowledge in rational drug therapy and pharmaceutical practice.

CO-2: Understand the classification, mechanisms of action, pharmacological effects, therapeutic uses, and safety considerations of cardiovascular drugs to apply this knowledge in clinical and pharmaceutical practice.

CO-3: Understand the classification, mechanisms of action, therapeutic uses, and adverse effects of drugs used in respiratory system disorders to apply this knowledge in rational pharmacotherapy and pharmaceutical practice.

CO-4: Understand the classification, mechanisms of action, therapeutic applications, and adverse

effects of anti-neoplastic and anti-HIV drugs to apply this knowledge in rational treatment and pharmaceutical practice.

Unit-1: Central Nervous system Drugs [8]

- 1.1 Introduction to Central Nervous system
- 1.2 Pharmacological actions, Concept of sedation, hypnosis, anesthesia
- 1.3 Phenobarbitone (Barbiturates)
- 1.4 Phenytoin (Hydantoins)
- 1.5 Trimethadione (Oxazolinediones)
- 1.6 Piracetam (Pyranones)
- 1.7 Midazolam
- 1.8 Alprazolam (Benzodiazepines)
- 1.9 Methylphenidate, (Piperidines)
- 1.10 Chlorpromazine (Phenothiazines)
- 1.11 Fluoxetine (phenyl propyl amines)
- 1.12 Synthesis of Trimethadione
- 1.13 Mode of action of Barbiturates as sedatives and hypnotics

Unit-II: Cardiovascular Drugs [6]

- 2.1 Introduction to Cardiovascular system
- 2.2 Diseases of Cardiovascular system
- 2.3 Classification based on pharmacological actions, 2.4 Cardio tonic
- 2.5 Antiarrhythmic agents
- 2.6 Enalapril, (alpha amino acids)
- 2.7 Isosorbide dinitrate(Nitrates)
- 2.8 Atenolol (Aryloxy propanol amines)
- 2.9 Nifedipine (pyridines)
- 2.10 Chlorthiazide (Thiazides)
- 2.11 Mode of action of Atenolol

Unit-III: Drugs for Respiratory System [8]

- 3.1 Respiratory system anatomy and working mechanism
- 3.2 Disease of respiratory system
- 3.3 General idea of Expectorants; Mucolytes
- 3.4 Bronchodilators; Decongestants and Antitussives
- 3.5 Bromohexine (Phenyl methyl amines)
- 3.6 Salbutamol
- 3.7 Pseudo-ephedrine (Phenyleth amines)
- 3.8 Oxymetazoline (Imidazolines)
- 3.8 Codeine Phosphate (Opiates)
- 3.10 Synthesis of Salbutamol

Unit-IV: Anti-Neoplastic and Anti-HIV Drugs [8]

A) Anti-Neoplastic Drugs

- 4.1 Malignancy; Causes of cancer, brief idea of Immuno Stimulants,

- Immuno suppressants
- 4.2 Lomoustine (Nitrosoureas)
- 4.3 Fluorouracil (Pyrimidines)
- 4.4 Estrogen (Steroidal hormones)

B) Anti-HIV Drugs

- 4.5 Idea of HIV pathogenicity
- 4.6 Symptoms of AIDS AZT
- 4.7 Lamivudinr, Stavidine (Pyrimidines)
- 4.8 DDI (Purines)

References:

1. The pharmacological basis of therapeutics by Goodman and Gilmans
2. Cardiac Drugs by Kanu Chatterjee, Eric J Topol Jaypee Publisher 2015
3. Textbook of medical physiology arthurc, guyton and John E. Hall Miamisburg U.S.A
4. Human Anatomy and Physiology by Dr. N.Murugesh Sathya Publishers 2021

B.Sc. Part III (NEP 2. 0) SEMESTER-VI Compulsory Drug Chemistry Paper No. XII (Herbal Drug Technology) (Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (COs): Students will be able to

CO-1: Understand the chemical composition, active constituents, and pharmacological significance of herbs to effectively utilize them as raw materials in pharmaceutical and herbal product development.

CO-2: Understand the chemical composition, biological activities, and therapeutic significance of nutraceuticals to apply this knowledge in the development and evaluation of health-promoting products.

CO-3: Understand the chemical composition, active ingredients, formulation principles, and functional properties of herbal cosmetics to apply this knowledge in the development, evaluation, and safe use of cosmetic products.

CO-4: Understand the structure and functioning of the herbal industry, along with methods for evaluation, standardization, and quality control of herbal drugs to ensure their safety, efficacy, and regulatory compliance.

Unit-1: Herbs as raw materials

[8]

- 1.1 Definition of herb
- 1.2 Herbal medicine
- 1.3 Herbal medicinal product
- 1.4 Herbal drug preparation
- 1.5 Source of Herbs, Selection, identification and authentication of herbal materials
- 1.6 Processing of herbal raw material
- 1.7 Biodynamic Agriculture Good agricultural practices in cultivation of medicinal plants including Organic farming
- 1.8 Pest and Pest management in medicinal plants: Bio pesticides/ Bio insecticides

Unit-2: Nutraceuticals

[7]

- 2.1 General aspects, Market, growth, scope and types of products available in the market
- 2.2 Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases
- 2.3 Study of following herbs as health food: Alfa alfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Alma, Ginseng, Ashwagandha, Spirulina
- 2.4 Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra

Unit-3: Herbal Cosmetics

[7]

- 3.1 Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colors, perfumes, protective agents, bleaching agents, antioxidants in products such as skincare, hair care and oral hygiene products
- 3.2 Herbal excipients: Herbal Excipients – Significance of substances of natural origin as excipients colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.
- 3.3 Herbal formulations: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytotomies.

Unit-4:Herbal Industry

[8]

A) General Introduction to Herbal Industry

- 4.1 Herbal drugs industry: Present scope and future prospects.
- 4.2 A brief account of plant-based industries and institutions involved in work on medicinal and aromatic plants in India.
- 4.3 Schedule T– Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule –T) and its objectives Infrastructural requirements, working space, storage area, machinery and equipment's, standard

B) Evaluation of Drugs

- 4.4 WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs. Patenting and Regulatory requirements of natural products:
- 4.5 Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bio prospecting and Bio piracy
- 4.6 Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

References:

1. Textbook of pharmacognocny by Trease & Evans.
2. Pharmacognocny & phytochemistry by V. D. Rangari
3. Pharmacopeial standards for ayurvedic formulations (Council of research in Indian medicine and homeopathy).

(Heterocyclic Drugs-C)
(Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (Cos): Students will be able to

CO-1: Understand the structures, nomenclature, reactions, and synthetic applications of heterocyclic compounds to apply this knowledge in organic synthesis and pharmaceutical development.

CO-2: Understand the structures, reactions, mechanisms, and synthetic applications of five- and six-membered heterocyclic compounds to apply this knowledge in organic synthesis and drug development.

CO-3: Describe the structures, chemical reactions, mechanisms, and synthetic applications of condensed heterocyclic compounds to apply this knowledge in organic synthesis and pharmaceutical research.

CO-4: Understand the structures, reactivity, synthesis, and applications of bridged and spiro heterocyclic compounds to apply this knowledge in organic synthesis and drug development.

Unit-1: Heterocyclic Chemistry **[6]**

1.1 Introduction

1.2 Classification of heterocyclic compounds

1.3 Aliphatic heterocyclic compounds

1.4 Aromatic heterocyclic compounds and 3-6 membered heterocyclic compounds condensed or fused hetero cyclic compounds

1.5 Applications of heterocyclic compounds

Unit-2: Five & Six Membered Heterocyclic Compounds **[8]**

2.1 Drugs with 5 & 6 membered heterocyclic compounds with one and two hetero atoms (03 each)

2.2 Synthesis

2.3 Mode of action and its applications/uses

Unit-3: Condensed Heterocyclic Compounds **[8]**

3.1 Drugs with condensed five membered heterocycles

3.2 Synthesis and applications of Benzoxazole

3.3 Benzthiazole

3.4 Benzimidazole

3.5 Condensed six membered heterocycles synthesis

3.6 Applications of Benzofuran, Indole and Quinoline

Unit-4: Bridged and Spiro Heterocycles **[8]**

Synthesis and applications of (06) bridged heterocyclic drugs:

4.1 Zoipidem

4.2 Necopidem

4.3 Aldpidem

4.4 Minodronic acid

4.5 Cephalexin and quinine

References:

1. Heterocyclic Chemistry by R. K. Bansal.

2. Heterocyclic Chemistry by T. Gilchrist.
3. The essence of Heterocyclic chemistry by A. R. Parikh, Hansa Parikh, Rajan Khunt.
4. Heterocyclic Chemistry by R. R. Gupta, M. Kumar, V. Gupta, Springer publications.
5. Principles of modern Heterocyclic Chemistry by A. Paquette.

B.Sc. Part III (NEP 2. 0) SEMESTER-VI

Elective Drug Chemistry Paper II

(Industrial Chemistry-D)

(Theory Credits: 02, 30 hours.)

COURSE OUTCOMES (COs): Students will be able to

CO-1: Understand the principles, manufacturing processes, and practical applications of various small-scale industrial products.

CO-2: Understand the principles of entrepreneurship, business planning, and management strategies to effectively initiate, develop, and manage entrepreneurial ventures.

CO-3: Understand the production processes, quality control, and industrial applications of sugar, and apply this knowledge in efficient operation and management of sugar industry practices.

CO-4: Understand the principles, production processes, and applications of industrial heavy chemicals to effectively operate, manage, and optimize their manufacture in industrial settings.

Unit-1: Small scale Industries

[8]

1.1 Introduction and aspects of small-scale industries

1.2 safety matches

1.3 Agarbatties

1.4 Naphthalene balls

1.5 Wax candles

1.6 Shoe polishes

1.7 Gum paste

1.8 Writing and fountain pen ink

1.9 Plaster of Paris

1.10 Silicon carbide crucibles

1.11 How to remove stains

Unit-2: Entrepreneurship Development and Management

[8]

2.1 Entrepreneurship, Concept/Meaning

2.2 Need, Competencies/qualities of an entrepreneur,

2.3 Entrepreneurial Support System, District Industry Centers (DICs) Commercial Banks State Financial Corporations

2.4 Small Industries Service Institutes (SISIs)

2.5 Small Industries Development Bank of India (SIDBI)

2.6 National Bank for Agriculture and Rural Development (NABARD)

2.7 National Small Industries Corporation (NSIC) and other relevant institutions/organizations at state level

Unit-3: Sugar Industry

[7]

3.1 Introduction Manufacture of cane sugar in India

- 3.2 Extraction of juice
- 3.3 Clarification
- 3.4 Concentration
- 3.5 Crystallization, centrifugation and other details of industrial process
- 3.6 By products of sugar industry manufacture of ethyl alcohol from molasses
- 3.7 Preparation of wash
- 3.8 Fermentation and distillation

Unit–4: Manufacture of Industrial Heavy Chemicals

[7]

- 4.1. Introduction
- 4.2. Manufacture of Ammonia by Haber's process; i) Physicochemical principles, ii) Plant and process
- 4.3 Manufacture of Sulphuric acid by Contact process; i) Physicochemical principles, ii) Plant and process.
- 4.4. Manufacture of Nitric acid by Ostwald's (Ammonia oxidation process); i) Physicochemical principles, ii) Plant and process.
- 4.5. Manufacture of Sodium carbonate (Washing soda) by Solvay process; i) Physicochemical principles, ii) Plant and process.

References:

1. Industrial Chemistry - B. K. Sharma
2. Chemical Process industries- Shreve & Brink
3. Industrial Chemistry- Kent
4. Industrial Chemistry- Rogers
5. Industrial Chemistry- R. K. Das

B. Sc. Part III (NEP 2. 0) SEMESTER-VI)

Practical Paper

Course Outcomes (COs): Students will be able

1. To conduct qualitative and quantitative analyses of organic compounds and gain proficiency in techniques such as separating binary mixtures, estimating compounds from samples, and synthesizing organic derivatives.
2. To separate binary organic mixtures into individual components by utilizing differences in solubility and chemical nature (acidic, phenolic, basic, or neutral). Develop skills to identify each component through qualitative analysis, including detection of elements and functional groups and determination of physical constants.
3. To quantify organic compounds using titrimetric methods to measure specific functional groups or compounds. This will help develop skills in calculating and interpreting the purity of organic samples for accurate laboratory analysis.
4. To conduct organic synthesis and purification techniques for specific compounds, while mastering essential lab operations like refluxing, filtration, and recrystallization. Additionally, students will learn to calculate percentage yields and verify product purity through physical constants like melting points.

PRDCH-604 Mandatory Practical Paper-VI(a) (2 Cr)

List of Experiments: Perform the following experiments

1. 1,3 Pyrazole
2. 1,3 Oxazole
3. Synthesis of Barbiturates
4. Preparation of Dihydro pyrimidine
5. Preparation of Triphenyl imidazole
6. Determination of Aldehyde content in herb.
7. Determination of alcohol content of Asava and Arista.
8. Preparation of herbal face pack.
9. Preparation of herbal Hair care products. (2)
10. Determination of Phenol contents in herbs.

PRDCH-605 Mandatory Practical Paper-VI(b) (2 Cr)

List of Experiments: Perform the following experiments

1. Estimation of aspirin from methylsalicylate.
2. Estimation of ethylmethyl ketone
3. Analysis of ibuprofen content from pharmaceutical tablets.
4. Estimation of formalin.
5. Determination of caffeine from tea powder.
6. Estimation of fatty acid from soap sample.
7. Estimation of ethyl methyl ketone
8. Base-catalyzed Aldol condensation- Preparation of Benzalacetophenone (Chalcone) from benzaldehyde and acetophenone.
9. Benzil- Benzilic acid rearrangement reaction: Preparation of Benzilic acid
10. Sandmeyer reaction: Preparation of p-Chlorotoluene from p-Toluidine

Note- Any other relevant practical may be added.

PRDCHC-606 Elective Practical Paper-II (2 Cr)

List of Experiments: Perform the following experiments

1. Synthesis of Sulpha drugs
2. Preparation of Paracetamol
3. Synthesis of five membered heterocyclic ring containing drug.(02)
4. Synthesis of Quinolone from aniline (Skraup synthesis)
5. Synthesis of Benzophenone Oxime
6. Synthesis of 1-Nitronaphthalene
7. Synthesis of 2-phenylindole
8. Synthesis of Isonicotinic Acid from 4-methyl Pyridine
9. Synthesis of 4-Methyl 7-Hydroxycoumarin from resorcinol and ethyl acetoacetate
10. Synthesis of Benztriazol from Ortho phenyl diamine

Note- Any other relevant practical may be added.

PRDCHD-606 Elective Practical Paper-II (2 Cr)

1. Estimation of sucrose
2. Preparation of Aloe Vera gel.

3. Estimation of Oxalic acid from cane sugar.
4. Methyl orange, Aniline yellow dye preparation.
5. Preparation of Water for Injection
6. Drawing structure and Reaction using Chems sketch/ Chemdraw
7. Preparation of Benzene azo beta naphthol dye
8. To estimate amount of acetic acid from given commercial sample of vinegar
9. To determine Ca from chock powder
10. To determine hardness of water from given industrial sample of water.

Note- Any other relevant practical may be added.

References:

1. Practical Organic Chemistry: A. I. Vogel.
2. Practical Organic Chemistry: O. P. Agarwal
3. Laboratory Manual for Principles of General Chemistry: J. A. Beran and Mark Lassiter (Wiley)
4. Fundamentals of Analytical Chemistry and Principles of Instrumental Analysis by Skoog, Holler & West
5. Practical Physical Chemistry by Dr. M. Satish Kumar
6. University Practical Chemistry (Combined Volume for Physical, Organic & Inorganic) by P.C. Kamboj
7. Practical Physical Chemistry by B. Viswanathan, P.S. Raghavan,
8. Advanced Practical Organic Chemistry by N.K. Vishnoi.
9. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis by V. K. Ahluwalia and Renu Aggarwal.

Shivaji University, Kolhapur



Accredited By NAAC with 'A++' Grade

Syllabus for

Bachelor of Science Part-III
(B. Sc. III)

VOCATIONAL SKILL COURSE

IN

DRUG CHEMISTRY

(NEP-2.0)

To be implemented from

June 2026 onwards

VOCATIONAL SKILL COURSES

B. Sc. III, Semester V, VSC Practical Paper-II

PRDCHVSC-501 Vocational Skill Course in Drug Chemistry Practical Paper-II	Credits: 2 Hours: 60
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Course Outcomes (CO):

After completion of the course, the students will be able to:

- CO1 Understand the concepts, principles, theories and practical applications of Drug Chemistry
- CO2 Develop synthesis and analysis skills in drug chemistry.
- CO3 Gain knowledge of various analytical instruments.
- CO4 Develop analytical skills.

Practicals:

1. Preparation 1: Preparation of Urea-Formaldehyde Resin.
2. Preparation 2: Preparation of Soap and Evaluation of Its Cleansing Action.
3. Preparation 3: Preparation of potash alum.
4. Preparation 4: Preparation of Phenol-Formaldehyde Resin (Bakelite)
5. Estimation 1: Estimation of Aspirin by conductometric titration.
6. Estimation 2: Estimation of chlorophylls in leaf pigments.
7. Estimation 3: Estimation of boric acid by conductometric titration.
8. Estimation 4: Estimation of sulphanilamide by colorimetry.
9. Estimation 5: Estimation of chloride ions by conductometric titration.
10. Purification: Purification of organic compounds by sublimation (e.g., camphor, naphthalene)
11. Isolation 1: Isolation of casein and lactose from milk.
12. Isolation 2: Isolation of piperine from black pepper.
13. Isolation 3: Determination of caffeine in tea leaves or instant coffee.
14. Chromatography: Separation of organic mixtures by paper chromatography/Thin layer chromatography (TLC) and determination of R_f value.
15. Potentiometry 1: Determination of percentage purity of sodium benzoate sample by potentiometric titration.

16. Potentiometry 2: Determine the pK value of acetic acid potentiometrically.
17. Stalagmometer: Comparison of cleansing powers of two samples of detergents using Stalagmometer.
18. Refractometry: Determination of the composition of salt using refractometer.
19. Polarimetry: To study the influence of solvents on the optical rotation of camphor.
20. Construct the phase diagram for ethanol-benzene-water system.
21. To investigate the reaction between potassium persulphate and potassium iodide by colorimetric measurements.

Note: An explanation and understanding of theoretical concepts, mechanisms, reactions, and instrumentation are expected.

References:

1. Industrial Chemistry by B. K. Sharma.
2. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co: New Delhi (2011).
3. Fundamentals of Analytical Chemistry; Skoog, West. Holler and Crouch 9th edition; Mary Finch. (2014).
4. Vogel's Textbook of Quantitative Chemical Analysis; 6th edition, Pearson Education Limited, (2007).
5. Findlay's Practical Physical Chemistry (Longman) 2015.
6. Practical Physical Chemistry: Gurtu (S Chand) 2014.
7. Systematic Experimental Physical Chemistry: Rajbhoj, Chandekar (Anjali Publication) 2016.
8. Advanced Practical Physical Chemistry: J.B. Yadav (Goel Publishing House) 2015.
9. Vogel's Textbook of Quantitative Inorganic Chemistry by A. I. Vogel.
10. Physical Chemistry of Inorganic Qualitative Analysis by Kuricose & Rajaram.
11. Advanced Practical Organic Chemistry by N.K. Vishnoi. Vikas Publishing House Private Limited.

B.Sc. III Syllabus (NEP-2.0)

To be implemented from June 2026 onwards

VOCATIONAL SKILL COURSE

Semester V

Nature of Practical Exam

No. of Examination Days- 01

Semester-V Practical Paper-II (50 Marks)

Q. 1 Experiment I- 20 Marks

Q. 2 Experiment II - 20 Marks

Q. 3 Oral - 5 Marks

Q. 4 Journal- 5 Marks

VOCATIONAL SKILL COURSES

B. Sc. III, Semester VI, VSC Practical Paper-III

PRDCHVSC-601 Vocational Skill Course in Drug Chemistry Practical Paper-III	Credits: 2 Hours: 60
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VOCATIONAL SKILL COURSES

Course Outcomes:

After completion of the course, the students will be able to:

CO1: Students will learn preparation skills.

CO2: Students will learn different types of conductometric titrations.

CO3: Students will learn the use of computer techniques to solve the problems in chemistry.

CO4: Students will learn the concept of optical rotation.

Practicals:

1. Preparation 1: Bromination of acetanilide/aniline/phenol
2. Preparation 2: Nitration of nitrobenzene/toluene.
3. Preparation 3: Preparation of biodiesel from waste cooking oil and characterization using TLC.

4. Preparation 4: Preparation of pigment (zinc oxide).
5. Conductometry 1: To determine the concentration of $\text{NH}_4\text{Cl}/\text{CH}_3\text{COONa}$ using conductivity measurements.
6. Conductometry 2: To determine the concentration and complexation of Ni^{2+} with EDTA using conductivity measurements.
7. Stalagmometer: To determine the surface tension and Parachor values of given liquid using stalagmometer.
8. Colorimetry 1: Determine the concentrations of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ in a mixture using colorimetry.
9. Colorimetry 2: Verify Lambert-Beer's law and determine the concentration of $\text{K}_2\text{Cr}_2\text{O}_7$ in a solution of unknown concentration.
10. Estimation 1: Determination of free acidity in ammonium sulphate fertilizer.
11. Estimation 2: To estimate the Mg present in multivitamins.
12. Estimation 3: Estimation of Iodine Content in iodized salt.
13. Estimation 4: Estimate percentage of available chlorine in bleaching powder.
14. Determination of the iodine number of the given oil.
15. Estimate the comparative effectiveness of different types of graphs like line, pie chart and bar graph.
16. Evaluate the absolute and method errors in a set of data collected during the determination of nitrogen in an organic compound.
17. Indexing of a given powder diffraction pattern of a cubic crystalline system.
18. Study Photoreduction of benzophenone to benzopinacol in the presence of sunlight.
19. To determine specific and molecular rotation of given compound and find out intrinsic rotation.
Note: An explanation and understanding of theoretical concepts, mechanisms, reactions, and instrumentation are expected.

References:

1. Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
2. Khosla, B. D.; Garg, V. C. & Gulati, A., *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
3. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. *Experiments in Physical Chemistry 8th Ed.*; McGraw-Hill: New York (2003).
4. Halpern, A. M. & McBane, G. C. *Experimental Physical Chemistry 3rd Ed.*; W.H. Freeman & Co.: New York (2003).
5. Khosla, B.D.; Garg, V.C.; Gulati, A. (2015), *Senior Practical Physical Chemistry*, R. Chand & Co, New Delhi.
6. Kapoor, K.L. (2019), *A Textbook of Physical Chemistry*, Vol.7, 1st Edition, McGraw Hill Education.
7. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. (2003), *Experiments in Physical Chemistry*, 8th Edition, McGraw-Hill, New York.

B.Sc. III Syllabus (NEP-2.0)

To be implemented from June 2026 onwards

VOCATIONAL SKILL COURSE

Semester VI

Nature of Practical Exam

No. of Examination Days- 01

Semester-V Practical Paper-III (50 Marks)

Q. 1 Experiment I- 20 Marks

Q. 2 Experiment II - 20 Marks

Q. 3 Oral - 5 Marks

Q. 4 Journal- 5 Marks

Shivaji University, Kolhapur

Syllabus for
Bachelor of Science Part-III
(B. Sc. III)
SKILL ENHANCEMENT COURSE (SEC)
AND
INDIAN KNOWLEDGE SYSTEM (IKS)
IN
DRUG CHEMISTRY
(NEP-2.0)

**To be implemented from
June 2026 onwards**

Syllabus is as Per Given in B. Sc. III Chemistry

(NEP-2.0)