



**Karmaveer Bhaurao Patil University,**

**Satara**

**Syllabus for**

**B. Sc. II Drug Chemistry**

**Under**

**Faculty of Science and Technology**

**(As per NEP 2020)**

**With effect from Academic Year 2025-2026**

## Syllabus for B. Sc. II Drug Chemistry

### Preamble:

This syllabus is prepared for second year undergraduate students to encourage them to study drug chemistry and excel for the academic and industrial exposure simultaneously. As per the UGC norms and industry requirement content of the syllabus have been framed. The depth of the syllabi is compatible to the syllabi of other universities, at the same time it is not rigid for the students at second year of their graduation. The units in the syllabus are well defined with scope and the number of lectures. The references are mentioned with relevance.

### GENERAL OBJECTIVES OF THE COURSE:

1. To introduce drug chemistry, which includes a detailed study of the drug, will help them to enhance their interdisciplinary approach with vigour.
2. To understand the fundamentals, principles, concepts, and recent developments in the subject area.
3. To create a skilled workforce to match the requirements of society.
4. To develop a scientific attitude is the major objective to make the students open-minded and curious.
5. To develop laboratory skills through practical work and equipment is including the collection and interpretation of scientific data to contribute to science.

### Program specific outcomes:

1. Able to apply the knowledge gained during the course of the program from drug chemistry, biochemistry, drug analysis, medicinal chemistry, and environmental studies.
2. Able to communicate easily and confidently.
3. Able to perform multitasking in the fields, including pharmaceuticals and research.
4. The students will graduate with proficiency in the subject of drug chemistry.
5. The students will be eligible to continue higher studies in their subject.

1. **Title:** Drug Chemistry
2. **Year of Implementation:** 2025-26
3. **Duration:** 01 Year
4. **Pattern:** Semester
5. **Medium of Instruction:** English
6. **Student Eligibility:** B.Sc. I and as per guideline of university
7. **Faculty Eligibility:** As per guideline of university & UGC guideline
8. **Structure of Course:**

| Level | Sem | Subject -1 |   |     |   | Subject-2 |   | Subject-3 |   | VSEC |     | AEC, VEC, IKS |     |     | OE | Total |
|-------|-----|------------|---|-----|---|-----------|---|-----------|---|------|-----|---------------|-----|-----|----|-------|
|       |     | DSC        |   | DSE |   |           |   |           |   | VSC  | SEC | AEC           | VEC | IKS |    |       |
|       |     | T          | P | T   | P | T         | P | T         | P |      |     |               |     |     |    |       |
| 5.0   | III | 4          | 2 | -   | - | 4         | 2 | -         | - | 2    | 2   | 2             |     | 2   | 2  | 22    |
|       | IV  | 4          | 2 | -   | - | 4         | 2 | -         | - | 2    | 2   | 2             | 2   | -   | 2  | 22    |

**Course Title:**

**Semester III**

| <b>Sr. No.</b> | <b>Course</b> | <b>Course Code</b> | <b>Title of Paper</b>                          | <b>No. of lectures/<br/>Practical per week</b> | <b>Credits</b> |
|----------------|---------------|--------------------|------------------------------------------------|------------------------------------------------|----------------|
|                | Major         |                    |                                                |                                                |                |
| 1.             | DSC V         | BDCT 231           | Pharmacokinetics                               | 2                                              | 2              |
| 2.             | DSC VI        | BDCT 232           | Physicochemical Properties of Drugs            | 2                                              | 2              |
| 3              | DSCP          | BDCP 233           | Major Lab I                                    | 1                                              | 2              |
|                | Minor         |                    |                                                |                                                |                |
| 4.             | DSC V         | BDCT 234           | Name Reactions and Synthetic Reagent           | 2                                              | 2              |
| 5.             | DSC VI        | BDCT 235           | Inorganic Chemistry                            | 2                                              | 2              |
| 6              | DSCP          | BDCP 236           | Minor Lab I                                    | 1                                              | 2              |
| 7.             | OE            | BDCTOE III         | Business Economics                             | 2                                              | 2              |
| 8.             | VSC           | BDCPVSC I          | Synthesis of Hygienic and Antiseptic Compounds | 1                                              | 2              |
| 9.             | SEC           | BDCPSEC I          | Separation Techniques                          | 1                                              | 2              |
| 10.            | AEC I         | BDCTAEC I          | English for Communication                      | 2                                              | 2              |
| 11             | IKS II        | BDCTIKS II         | Indian Health Sciences                         | 2                                              | 2              |
| <b>Total</b>   |               |                    |                                                | <b>14 T + 4 P</b>                              | <b>22</b>      |

### Semester IV

| Sr. No.      | Course   | Course Code | Title of Paper                             | No. of lectures/<br>Practical per week | Credits   |
|--------------|----------|-------------|--------------------------------------------|----------------------------------------|-----------|
| Major        |          |             |                                            |                                        |           |
| 1.           | DSC VII  | BDCT 241    | Enzyme & Metabolic Pathways                | 2                                      | 2         |
| 2.           | DSC VIII | BDCT 242    | Spectroscopic Techniques                   | 2                                      | 2         |
| 3.           | DSCP     | BDCP 243    | Major Lab II                               | 1                                      | 2         |
| Minor        |          |             |                                            |                                        |           |
| 4.           | DSC VII  | BDCT 244    | Organic Chemistry                          | 2                                      | 2         |
| 5.           | DSC VIII | BDCT 245    | Analytical Chemistry                       | 2                                      | 2         |
| 6.           | DSCP     | BDCP 246    | Minor Lab II                               | 1                                      | 2         |
| 5.           | OE       | BDCPOE IV   | Music Studies                              | 1                                      | 2         |
| 6.           | VSC      | BDCPVSC II  | Skin & Hair Care Products                  | 1                                      | 2         |
| 7.           | SEC      | BDCPSEC II  | Advance Analytical Techniques              | 1                                      | 2         |
| 8.           | AEC II   | BDCTAEC II  | English for Communication                  | 2                                      | 2         |
| 9.           | VEC II   | BDCTVEC II  | Environmental Awareness for Drug Chemistry | 2                                      | 2         |
| <b>Total</b> |          |             |                                            | <b>12 T+ 5 P</b>                       | <b>22</b> |

### 9. Evaluation Structure: Semester III (5.0)

| Course       | Course Category | Course Code                    | Internal Evaluation |        |         | ESE | Total Marks | Credits   |
|--------------|-----------------|--------------------------------|---------------------|--------|---------|-----|-------------|-----------|
|              |                 |                                | CCE-I               | CCE-II | CCE-III |     |             |           |
| Major        | T               | BDCT 231                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | T               | BDCT 232                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | P               | BDCP 233                       | 20                  |        |         | 30  | 50          | 02        |
| Minor        | T               | BDCT 234                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | T               | BDCT 235                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | P               | BDCP 236                       | 20                  |        |         | 30  | 50          | 02        |
| OE           | T               | BDCTOE III<br>(For Humanities) | 10                  | 10     | 10      | 30  | 50          | 02        |
| VSC          | P               | BDCPVSC I                      | 20                  |        |         | 30  | 50          | 02        |
|              | P               | BDCPSEC I<br>Practical         | 20                  |        |         | 30  | 50          | 02        |
| AEC I        | T               | BDCTAEC I                      | 10                  | 10     | 10      | 30  | 50          | 02        |
| IKS II       | T               | BDCTIKS II                     | 10                  | 10     | 10      | 30  | 50          | 02        |
| <b>Total</b> |                 |                                |                     |        |         |     | <b>550</b>  | <b>22</b> |

### Semester IV

| Course       | Course Category | Course Code                    | Internal Evaluation |        |         | ESE | Total Marks | Credits   |
|--------------|-----------------|--------------------------------|---------------------|--------|---------|-----|-------------|-----------|
|              |                 |                                | CCE-I               | CCE-II | CCE-III |     |             |           |
| Major        | T               | BDCT 241                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | T               | BDCT 242                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | P               | BDCP 243                       | --                  | --     | --      | 50  | 50          | 02        |
| Minor        | T               | BDCT 244                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | T               | BDCT 245                       | 10                  | 10     | 10      | 30  | 50          | 02        |
|              | P               | BDCP 246                       | --                  | --     | --      | 50  | 50          | 02        |
| OE           | T               | BDCTOE IV<br>(For IDS Courses) | 20                  |        |         | 30  | 50          | 02        |
| VSC          | P               | BDCPVSC II                     | 20                  |        |         | 30  | 50          | 02        |
|              | P               | BDCPSEC II<br>Practical        | 20                  |        |         | 30  | 50          | 02        |
| AEC II       | T               | BDCTAEC II                     | 10                  | 10     | 10      | 30  | 50          | 02        |
| VEC II       | T               | BDCTVEC II                     | 10                  | 10     | 10      | 30  | 50          | 02        |
| <b>Total</b> |                 |                                |                     |        |         |     | <b>550</b>  | <b>22</b> |

**Best two scores will be considered for final internal evaluation.**

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|                                                                                                                                                                                                                                                       | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                            |
|                                                                                                                                                                                                                                                                                                                                        | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
|                                                                                                                                                                                                                                                                                                                                        | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                            |
|                                                                                                                                                                                                                                                                                                                                        | <b>Programme:</b> B.Sc.II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Semester - III</b>      |
|                                                                                                                                                                                                                                                                                                                                        | <b>Type:</b> Major (DSC V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Marks:</b> 50           |
|                                                                                                                                                                                                                                                                                                                                        | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>From:</b> A. Y. 2025-26 |
| <b>Name of the Course: BDCT 231 Pharmacokinetics</b>                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| <b>Course Objectives:</b> Students should be able to... <ol style="list-style-type: none"> <li>1) learn the basic principles of pharmacokinetics.</li> <li>2) understand the role of pharmacokinetics in drug development.</li> <li>3) analyze drug absorption processes.</li> <li>4) examine drug metabolism pathways.</li> </ol>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| <b>Course Outcomes:</b> By the end of course, students will be able to... <ol style="list-style-type: none"> <li>1) explore Principles of Pharmacokinetic.</li> <li>2) explain factors affecting on drug – target binding.</li> <li>3) describe Mathematical Modeling.</li> <li>4) demonstrate the drug metabolism process.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| <b>Module</b>                                                                                                                                                                                                                                                                                                                          | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Hrs</b>                 |
| <b>Module -1:</b>                                                                                                                                                                                                                                                                                                                      | <b>Drug Targets and Interactions</b> <ol style="list-style-type: none"> <li>1.1. Cell structure.</li> <li>1.2. Introduction to drug targets and their interactions.</li> <li>1.3. Drug targets at molecular level.</li> <li>1.4. Intermolecular bonding forces: Electrostatic bonds, Hydrogen bonds, Van der Waal's interaction, dipole- dipole and ion dipole interaction, repulsive interactions, Role of water and hydrophobic interactions.</li> <li>1.5. Drug targets: Lipid as drug target, Carbohydrates a drug target, Protein and nucleic as a drug target.</li> </ol>                                                                                                                                                                                                                                 | 7                          |
| <b>Module -2:</b>                                                                                                                                                                                                                                                                                                                      | <b>Drug Absorption and Distribution</b><br><b>Drug absorption</b> <ol style="list-style-type: none"> <li>2.1. Introduction to pharmacokinetics and important terminologies of pharmacokinetics.</li> <li>2.2. Routes of drug administration.</li> <li>2.3. Mechanisms of drug absorption through GIT.</li> <li>2.4. Factors influencing drug absorption through GIT.</li> <li>2.5. Absorption of drug through intra muscular routes and factors influencing on it.</li> </ol> <b>Drug distribution</b> <ol style="list-style-type: none"> <li>2.6. Tissue permeability of drugs.</li> <li>2.7. Binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs.</li> <li>2.8. Factors affecting protein-drug binding.</li> <li>2.9. Kinetics of protein binding,</li> </ol> | 7                          |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2.10. Clinical significance of protein binding of drugs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                    |
| <b>Module -3:</b>                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Drug Metabolism</b><br>3.1. Drug metabolism and factors affecting drug metabolism.<br>3.2. Pathways of drug metabolism: Phase I Reactions pathway, Phase II Reactions-conjugation.<br>3.3. Major pathways of drug metabolism along with some examples like amphetamine, barbiturates, Sulphonamides, propranolol, diazepam, Ephedrine, Phenmetrazine, Cimetidine, etc.<br>3.4. Biotransformation, types of biotransformation reactions: Synthetic and non-synthetic reactions.<br>3.5. Significance of drug metabolism in medicinal chemistry.                                     | 7                                                                                                                                                                                                                  |
| <b>Module -4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Drug Excretion and Toxicology</b><br><b>Excretion</b><br>4.1 Introduction to excretion, routes of drug excretion.<br>4.2 Renal excretion of drugs and factors affecting renal excretion of drugs<br>4.3 Renal clearance, non-renal routes of drug excretion of drugs.<br><b>Toxicology</b><br>4.4 History, and Basic toxicology terminology.<br>4.5 Dose and dose-response types of dosage, units, dose-response relationship.<br>4.6 Factors influencing toxicity.<br>4.7 Interaction and types of interactions.<br>4.8 Toxicity testing methods.<br>4.9 Toxicity of metabolites. | 9                                                                                                                                                                                                                  |
| <b>Reference Books:</b><br>1) Gupta, A. L. Medicinal Chemistry. Meerut: Pragati Prakashan, 2019.<br>2) Gupta, Alka L. Medicinal Chemistry. 10 <sup>th</sup> ed. Meerut: Pragati Prakashan, 2020.<br>3) Patrick, Graham L. An Introduction to Medicinal Chemistry. 7 <sup>th</sup> ed. Oxford: Oxford University Press, 2020.<br>4) Patrick, Graham L. An Introduction to Medicinal Chemistry. Oxford: Oxford University Press, 1995. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                    |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                    |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                    |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b><br><ul style="list-style-type: none"> <li>CCE -1 Compulsory Home assignment: 10 M</li> <li>CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>CCE- 3 Compulsory MCQ test: 10 M</li> </ul> Best two scores will be considered for final internal evaluation                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>End Semester Examination: 30 Marks</b><br><ul style="list-style-type: none"> <li>Question -1 10 Marks</li> <li>Question -2 20 Marks</li> <li>Question -3 20 Marks</li> </ul> Note: 50 Mark converted to 30 Mark |

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|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--|
|  | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                              |                            |  |
|                                                                                   | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |
|                                                                                   | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                            |  |
|                                                                                   | <b>Programme:</b> B.Sc. II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Semester - III</b>      |  |
|                                                                                   | <b>Type:</b> Major (DSC VI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Marks:</b> 50           |  |
|                                                                                   | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>From:</b> A. Y. 2025-26 |  |
|                                                                                   | <b>Name of the Course:</b> BDCT 232 Physicochemical Properties of Drugs                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |  |
| <b>Course Objectives:</b> Students should be able to...                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 1) learn the basic principles of pharmacokinetics.                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 2) understand the role of pharmacokinetics in drug development.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 3) analyse drug absorption processes.                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 4) examine drug metabolism pathways.                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| <b>Course Outcomes:</b> By the end of course, students will be able to...         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 1) describe the principles governing drug solubility and dissolution.             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 2) evaluate the stability of drugs under different environmental conditions.      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 3) Determine the influence of pH and pKa on drug absorption and bioavailability.  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| 4) demonstrate Mathematical Modeling.                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
| <b>Module</b>                                                                     | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Hrs</b>                 |  |
| <b>Module -1:</b>                                                                 | <b>Drug Solubility and Dissolution</b><br>1.1. Definition and significance of physicochemical properties of the drug and the role in drug design and development.<br>1.2. Drug Solubility definition, Types of solubility, Factors affecting solubility.<br>1.3. Drug dissolution, dissolution kinetics.<br>1.4. Measurement techniques.                                                                                                                                                                             | 7                          |  |
| <b>Module -2:</b>                                                                 | <b>Partition Coefficient, pH, and pKa</b><br><b>Partition coefficient</b><br>2.1. Definition and Significance<br>2.2. Calculation methods<br>2.3. Impact on drug distribution and permeability<br><b>pH and pKa</b><br>2.4. Acid-base properties of drugs<br>2.5. Henderson-Hasselbalch equation<br>2.6. Influence on drug absorption and ionization state                                                                                                                                                           | 8                          |  |
| <b>Module -3:</b>                                                                 | <b>Drug Stability and Formulation Considerations</b><br><b>Drug Stability</b><br>3.1. Definition, Significance, and Factors Affecting on stability of drug (e.g., temperature, pH, light)<br>3.2. Stability testing and prediction<br>3.3. Degradation pathways (e.g., hydrolysis, oxidation)<br><b>Formulation Considerations</b><br>3.4. Dosage forms and routes of administration<br>3.5. Excipients and their role in formulation<br>3.6. Strategies to enhance drug solubility, stability, and bioavailability. | 7                          |  |

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| <b>Module -4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Case Studies, Applications, Future Trends and Challenges</b><br>4.1 Application of physicochemical principles in drug development<br>4.2 Case studies highlighting the importance of property optimization<br>4.3 Emerging technologies in drug formulation.<br>4.4 Challenges and opportunities in optimizing physicochemical properties. | 8                                                                                                                                                                                                                     |
| <b>Reference Books:</b><br>1) Drug Solubility: Importance and Enhancement Techniques." PubMed Central (PMC). Accessed May, 2025.<br>2) Narang, Ajit S., and Ram I. Mahato. Pharmaceutics (Second Edition). Amsterdam: Elsevier, 2024.<br>3) pKa and Partition Coefficient Determination of Montelukast Sodium by Spectrophotometric and HPLC Technique." Journal of Pharmaceutical Negative Results 13, no. S01 2022.<br>4) The Role of Physicochemical and Topological Parameters in Drug Design." Frontiers in Drug Discovery 2024. |                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                       |
| <b>Evaluation Pattern:60/40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                       |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                       |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b> <ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M</li> </ul> Best two scores will be considered for final internal evaluation.                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                               | <b>End Semester Examination: 30 Marks</b> <ul style="list-style-type: none"> <li>• Question -1 10 Marks</li> <li>• Question -2 20 Marks</li> <li>• Question -3 20 Marks</li> </ul> Note: 50 Mark converted to 30 Mark |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Yashavantrao Chavan Institute of Science, Satara                                                                                                        |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Board of Studies in Drug Chemistry</b>                                                                                                               |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Programme:</b> B.Sc.II                                                                                                                               | <b>Semester - III</b>      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Type:</b> Major (DSCP)                                                                                                                               | <b>Marks:</b> 50           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Credits:</b> 2                                                                                                                                       | <b>From:</b> A. Y. 2025-26 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Name of the Course: BDCP 233 Major Practical I</b>                                                                                                   |                            |
| <b>Course Objectives:</b> Students should be able to...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                         |                            |
| <div>1) learn experimental techniques for assessing bioavailability, such as pharmacokinetic studies.</div> <div>2) understand the Claisen-Schmidt condensation reaction for the synthesis of cinnamic acid.</div> <div>3) explore the pharmaceutical relevance of paracetamol.</div> <div>4) practice techniques for isolation and purification of organic solids.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                         |                            |
| <b>Course Outcomes:</b> By the end of course, students will be able to...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                         |                            |
| <div>1) collect the experimental data to conclude the drug's efficacy and safety profiles.</div> <div>2) analyze the products Pharmacodynamics properties such as analgesic and antipyretic effects.</div> <div>3) interpret pKa values in terms of acid-base properties and chemical structure.</div> <div>4) describe the solubility trends and factors affecting solubility.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                         |                            |
| <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                         | <b>Hrs</b>                 |
| <b>(Any 15 of the following)</b> <div>1) Preparation of Cinnamic acid from benzaldehyde and malonic acid</div> <div>2) Preparation of Anthraquinone from anthracene</div> <div>3) Preparation of phthalimide from phthalic anhydride</div> <div>4) Preparation of 7-hydroxy-4-methyl coumarin</div> <div>5) Synthesis of ibuprofen</div> <div>6) Synthesis of paracetamol</div> <div>7) Synthesis and characterization of phenyl benzoate from phenol by acylation reaction.</div> <div>8) To determine Ka, pKa and partition coefficient(pc) value of salicylic acid and study their relationship.</div> <div>9) Experimental determination of pKa using potentiometric or spectrophotometric methods.</div> <div>10) Conducting stability studies of drug under different conditions (e.g. temperature, pH) and analyzing the results.</div> <div>11) Measurement of rheological properties using techniques like viscometry</div> <div>12) Preparation of buffer solutions of different pH values and determination of buffering capacity. (Acidic buffer)</div> <div>13) Preparation of buffer solutions of different pH values and determination of buffering capacity. (Basic buffer)</div> <div>14) Determination of pKa value by half neutralization / Henderson Hassel batch equation.</div> <div>15) To determine the viscosity of given unknown liquid</div> <div>16) To determine the pka value of a weak acid by titrating it against to determine the pka value of a weak acid by titrating it against base potentiometrically (using a pH meter)</div> <div>17) To determine the percentage adsorption of oxalic acid by charcoal method.</div> <div>18) To determine the bulk density, true density and porosity for the given sample powders.</div> |                                                                                                                                                         | 60                         |

**Reference Books:**

- 1) Arikh, Dilip M. Handbook of Pharmaceutical Granulation Technology. 4<sup>th</sup> ed. New York: Marcel Dekker, 2018.
- 2) Beckett, A. H., and J. B. Stenlake. Practical Pharmaceutical Chemistry. Vols. I & II. 4<sup>th</sup> ed. London: The Athlone Press, 2000.
- 3) Barel, André O., Marc Paye, and Howard I. Maibach, Handbook of Cosmetic Science and Technology. 1<sup>st</sup> ed. New York: Marcel Dekker, 2001.
- 4) Alsenz, J., E. Meister, and E. Haenel. "Development of a Partially Automated Solubility Screening (PASS) Assay for Early Drug Development." Journal of Pharmaceutical Sciences 96, no. 7, 2007
- 5) Arnott, John A., and Sonia Lobo Planey. "The Influence of Lipophilicity in Drug Discovery and Design." Expert Opinion on Drug Discovery 7, no. 10, 2012

**Evaluation Pattern: 60:40****Total Marks: 50****Continuous Comprehensive Evaluation: 20 Marks**

- Journal: 10 Mark
- Students Performance: 5 Mark
- Attendance: 5 Mark

**End Semester Examination: 30 Marks**

- Question -1:
- Question -2:



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - III**

**Type:** Minor (DSC V)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCT 234 Named reaction and Synthetic Reagents

**Course Objectives:** Students should be able to...

- 1) study the principles of stereochemistry including chirality, enantiomers, diastereomers, and meso compounds.
- 2) understanding molecular structure and bonding.
- 3) learn the synthetic applications of various reagents inorganic synthesis.
- 4) know the significance of chirality in biological systems and drug design.

**Course Outcomes:** By the end of course, students will be able to...

- 1) predict the stereo-chemical outcome of organic reactions.
- 2) explain the driving forces and factors influencing the reaction outcomes.
- 3) recognize chiral centers in organic molecules and identify their stereo chemical configurations (R/S nomenclature).
- 4) classify organic reagents based on their functional groups and chemical properties.
- 5) identify the outcome of reactions based on the choice of reagents and reaction conditions.

| Module            | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Hrs |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module -1:</b> | <b>Oxidizing Agents</b><br>Preparation and Applications of the following reagents. <ol style="list-style-type: none"> <li>1.1. Osmium Tetra-oxide (<math>\text{OsO}_4</math>)</li> <li>1.2. Ceric Ammonium nitrate (CAN)</li> <li>1.3. Selenium dioxide (<math>\text{SeO}_2</math>)</li> <li>1.4. 2,3- Dichloro - 5,6 - dicyano –1,4-benzoquinone (DDQ)</li> <li>1.5. Ozone (<math>\text{O}_3</math>)</li> <li>1.6. Potassium Permanganate (<math>\text{KMnO}_4</math>)</li> <li>1.7. Chromic acid (<math>\text{Cr}_2\text{O}_3</math>)</li> <li>1.8. Nitrous acid (<math>\text{HNO}_2</math>)</li> </ol> | 7   |
| <b>Module -2:</b> | <b>Reducing Agents</b><br>Preparation and Applications of the following reagents <ol style="list-style-type: none"> <li>2.1. Nitric acid (<math>\text{HNO}_3</math>)</li> <li>2.2. Sodium borohydride (<math>\text{NaBH}_4</math>)</li> <li>2.3. Lithium aluminum hydride (<math>\text{LiAlH}_4</math>)</li> <li>2.4. Raney Nickel (Ra-Ni)</li> <li>2.5. Grignard reagent (<math>\text{RMgX}</math>)</li> <li>2.6. Sodium amalgam (Na-Hg)</li> <li>2.7. Lindlar catalyst</li> <li>2.8. Zinc (Zn)</li> </ol>                                                                                               | 5   |

|                   |                                                                                                                                                                                                                                                                                                                                                                |    |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Module -3:</b> | <b>Name Reactions</b><br>3.1. Perkin reaction<br>3.2. Knoevenagel condensation<br>3.3. Mannich reaction<br>3.4. Reformatsky reaction<br>3.5. Pinacol pinacolone rearrangement<br>3.6. Wolff-Kishner reduction<br>3.7. Baeyer-Villiger oxidation.<br>3.8. Reimer- Tiemann reaction<br>3.9. Claisen condensation reaction<br>3.10. Clemmenson reduction reaction | 10 |
| <b>Module -4:</b> | <b>Stereochemistry</b><br>4.1 Concept of stereochemistry<br>4.2 Types of stereoisomerism<br>4.3 Chiral and achiral compounds<br>4.4 Optical isomerism in tartaric acid<br>4.5 Enantiomers and diastereomers<br>4.6 Geometrical isomerism<br>4.7 Nomenclature of stereoisomerism D, L, CIP rule: R/S, E and Z (cis-trans), erythro and threo.                   | 8  |

**Reference Books:**

- 1) Bruice, Paula Yurkanis. Organic Chemistry. 8<sup>th</sup> ed. Boston: Pearson, 2016.
- 2) Carey, Francis A., and Richard J. Sundberg. Advanced Organic Chemistry: Part A: Structure and Mechanisms. 5<sup>th</sup> ed. New York: Springer, 2007.
- 3) Clayden, Jonathan, Nick Greeves, and Stuart Warren. Organic Chemistry. 2<sup>nd</sup> ed. Oxford: Oxford University Press, 2012.
- 4) Eliel, Ernest L., Samuel H. Wilen, and Lew Mander. Stereochemistry of Organic Compounds. New York: Wiley-Interscience, 1994.
- 5) March, Jerry, and Michael B. Smith. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure. 6<sup>th</sup> ed. Hoboken, NJ: Wiley-Interscience, 2007.

**Evaluation Pattern: 60:40**

**Total Marks: 50**

|                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Continuous Comprehensive Evaluation: 20 Marks</b> <ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M</li> </ul> Best two scores will be considered for final internal evaluation | <b>End Semester Examination:30 Marks</b> <ul style="list-style-type: none"> <li>• Question -1 10 Marks</li> <li>• Question -2 20 Marks</li> <li>• Question -3 20 Marks</li> </ul> Note: 50 Mark converted to 30 Mark |
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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Programme:</b> B.Sc.II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Semester - III</b>      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Type:</b> Minor (DSC VI)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Marks:</b> 50           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>From:</b> A. Y. 2025-26 |
| <b>Name of the Course: BDCT 235 Inorganic Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
| <b>Course Objectives:</b> Students should be able to...<br>1) enhance knowledge about periodic table thoroughly and understand the meaning of transition<br>2) learn co-ordinate bond, double salt and complex salt<br>3) understand about the metalloporphyrin with spatial reference to hemoglobin and myoglobin<br>4) illustrate the importance of elements in biological process.                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
| <b>Course Outcomes:</b> By the end of course, students will be able to...<br>1) recall the position of element in periodic table and write their properties summarize the characteristic properties with respect to electronic configuration, lanthanide contraction oxidation state.<br>2) describe co-ordinate bond, double salts and complex salt on the basis of co-ordination.<br>3) discuss the metalloporphyrin with special reference to hemoglobin and myoglobin.<br>4) explain coordination chemistry with reference to chelation. Elaborate application of corrosion. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |
| <b>Module</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Hrs</b>                 |
| <b>Module -1:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Study of periodic properties of elements</b><br><b>p- Block elements:</b><br>1.1. Group 13, 14 and 15 Position of elements in periodic table,<br>1.2. Characteristics of p-block elements with special reference to electronic configuration and Periodic properties,<br>1.3. Compounds of group 13,14 and 15,<br>1.4. Boron-Diborane methods of preparation and nature of bonding (structure),<br>1.5. Borazine method of separation and nature of bonding (structure),<br>1.6. Allotropes of carbon and phosphorus,<br>1.7. Oxyacid of nitrogen – HNO <sub>2</sub> , HNO <sub>3</sub> ,<br>1.8. Hydrides of Nitrogen- NH <sub>3</sub> and N <sub>2</sub> H <sub>4</sub><br><b>Chemistry of elements of first transition series:</b><br>1.9. Position of elements in periodic table<br>1.10 Characteristics of d-block elements with special reference to<br>i) electronic structure ii) Oxidation states,<br>iii) Magnetic character iv) Colored ions v) Complex formation.<br>1.11. Stability of oxidation states of Fe with respect to Latimer diagram. | 9                          |
| <b>Module -2:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Co-ordination Chemistry</b><br>2.1. Introduction, Definition of Co- ordination chemistry.<br>2.2. Formation of co-ordinate covalent bond in BF <sub>3</sub> -NH <sub>3</sub> , [NH <sub>4</sub> ] <sup>+</sup> and H <sub>2</sub> O.<br>2.3. Difference between double salt and complex salt,<br>2.4. Werner's theory Postulates. The theory as applied to cobalt amines viz. CoCl <sub>3</sub> .6NH <sub>3</sub> , CoCl <sub>3</sub> .5NH <sub>3</sub> , CoCl <sub>3</sub> .4NH <sub>3</sub> , CoCl <sub>3</sub> .3NH <sub>3</sub> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 12                         |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>2.5. Description of the terms- ligand, co-ordination number, co-ordination sphere, Effective atomic number IUPAC nomenclature of coordination compounds.</p> <p>2.6. Isomerism in complexes with C.N. 4 and 6- Geometrical Isomerism, Optical Isomerism, Structural Isomerism Ionization Isomerism,</p> <p>2.7. Hydrate Isomerism, Coordination, Isomerism, Linkage Isomerism and Co-ordination position Isomerism</p> <p>2.8. Valence bond theory of transition metal complex with respect to, C.N. 4,</p> <p>2.9. Complexes of Cu and Ni, C.N. 6</p> <p>2.10. Complexes of Fe and Co</p> |                                                                                                                                                                                                                                       |
| <b>Module -3:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p><b>Bioinorganic Chemistry</b></p> <p>3.1. Introduction</p> <p>3.2. Essential and trace elements in biological process,</p> <p>3.3. Metalloporphyrin with special reference to hemoglobin and myoglobin.</p> <p>3.4. Biological role of alkali and alkaline earth metal ions with special reference to <math>\text{Na}^+</math> &amp; <math>\text{K}^+</math></p>                                                                                                                                                                                                                           | 4                                                                                                                                                                                                                                     |
| <b>Module -4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p><b>Chelation</b></p> <p>4.1 Introduction with respect to ligands, chelating agent,</p> <p>4.2 Chelation and metal chelate.</p> <p>4.3 Structural requirements of chelate formation,</p> <p>4.4 Difference between metal chelate and metal complex</p> <p>4.5 Classification of chelating agents with specific illustration of bidentate chelating agents</p> <p>4.6 Application of chelation with respect to chelating agents- EDTA and DMG</p>                                                                                                                                            | 5                                                                                                                                                                                                                                     |
| <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1) Bertini, Ivano, Harry B. Gray, Edward I. Stiefel, and Joan Silverstone Valentine, eds. Biological Inorganic Chemistry: Structure and Reactivity. 3<sup>rd</sup> ed. Mill Valley, CA: University Science Books, 2007.</li> <li>2) Bertini, Ivano "Bioinorganic Chemistry in the Postgenomic Era." Proceedings of the National Academy of Sciences 100, no. 7, 2003</li> <li>3) Kauffman, George B."Review of 'Biological Inorganic Chemistry: Structure &amp; Reactivity' 3<sup>rd</sup> Edition." Structural Chemistry 18, 2007</li> <li>4) Watkinson, Michael. Bioinorganic Chemistry: The Biological Chemistry of Transition Metals. Hoboken, NJ: John Wiley &amp; Sons, 2009.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                       |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                       |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                       |
| <p><b>Continuous Comprehensive Evaluation: 20 Marks</b></p> <ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M</li> </ul> <p>Best two scores will be considered for final internal evaluation</p>                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><b>End Semester Examination: (30 Marks)</b></p> <ul style="list-style-type: none"> <li>• Question -1 10 Marks</li> <li>• Question -2 20 Marks</li> <li>• Question -3 20 Marks</li> </ul> <p>Note: 50 Mark converted to 30 Mark</p> |



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - III**

**Type:** Minor (DSCP)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCP 236 Minor Practical I

**Course Objectives:** Students should be able to...

- 1) understand the importance and relevance of organic chemistry in various scientific disciplines and real-world applications.
- 2) enhance critical thinking, problem-solving, and data interpretation skills through experimental design and analysis.
- 3) gain proficiency in qualitative and quantitative analysis techniques for organic compounds.
- 4) apply theoretical knowledge of organic chemistry principles in practical scenarios.

**Course Outcomes:** By the end of course, students will be able to...

- 1) differentiate acidic and basic compounds.
- 2) determine the concentration or quantity of specific organic compounds.
- 3) synthesize organic compounds through laboratory techniques such as refluxing, distillation, extraction and recrystallization.
- 4) evaluate the efficiency of the synthetic methods in terms of yield, purity.

| Module | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Hrs |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|        | (Any 15 of the following)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |
|        | <b>1. Organic qualitative analysis:</b> <ol style="list-style-type: none"> <li>a) Salicylic acid</li> <li>b) Phthalic acid</li> <li>c) Cinnamic acid</li> <li>d) Oxalic acid</li> <li>e) <math>\beta</math>-naphthol</li> <li>f) Succinic acid</li> <li>g) p-Nitro phenol</li> <li>h) o-Nitro aniline</li> <li>i) m-Nitro aniline</li> <li>j) Diphenylamine</li> <li>k) Acetamide</li> <li>l) Ethyl methyl Ketone</li> <li>m) Acetophenone</li> <li>n) Benzophenone</li> <li>o) Benzaldehyde</li> <li>p) Ethyl acetate</li> </ol> <b>2. Organic Estimation:</b> <ol style="list-style-type: none"> <li>a) Estimation of Acetone</li> <li>b) Estimation of glycine</li> <li>c) Estimation of Vitamin C</li> </ol> | 60  |

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>3. Organic Preparations:</b></p> <p>a) Preparation of Benzoic acid<br/> b) Preparation of p-Nitro acetanilide<br/> c) Preparation of Benzamide<br/> d) Preparation of Di-hydro-pyrimidone</p> <p><b>4. Inorganic preparations:</b></p> <p>a) Preparation of tetra ammonium copper (II) sulphate<br/> b) Preparation of chloro pentammine cobalt (III) chloride</p> <p><b>5. Titrimetric analysis:</b></p> <p>a) Determination on Percentage purity of tetramine copper (II) sulphate.<br/> b) Determination of percentage purity of given sample of soda ash.</p> <p><b>6. Analysis of Inorganic binary mixture:</b><br/> Anions: <math>\text{Cl}^-</math>, <math>\text{Br}^-</math>, <math>\text{NO}_3^-</math>, <math>\text{NO}_2^-</math>, <math>\text{SO}_4^{--}</math>, <math>\text{CO}_3^{--}</math><br/> Cations: <math>\text{Cd}^{++}</math>, <math>\text{Fe}^{++}</math>, <math>\text{Al}^{+++}</math>, <math>\text{Cr}^{+++}</math>, <math>\text{Zn}^{++}</math>, <math>\text{Mn}^{++}</math>, <math>\text{Co}^{++}</math>, <math>\text{Mg}^{++}</math>, <math>\text{K}^+</math>, <math>\text{NH}_4^+</math>,<br/> <math>\text{Ba}^{++}</math>, <math>\text{Cu}^{++}</math></p> |                                                                                                                                       |
| <p><b>Reference Books:</b></p> <p>1) A.I. Vogel, A.R. Tatchell, B.S. Furniss, A.J. Hannaford, P.W.G. Smith 1996<br/> 2) Alhasan, Huda S., and Nadiyah Alahmadi. Principles of Qualitative Inorganic Analysis: Precipitation, Separation and Identification of Cations. Sharjah: Bentham Science Publishers, 2021.<br/> 3) Svehla, G., and B. Sivasankar. Vogel's Qualitative Inorganic Analysis. 7<sup>th</sup> ed. New Delhi: Pearson Education, 2012.<br/> 4) Svehla, G., and B. Sivasankar. Vogel's Qualitative Inorganic Analysis. 7<sup>th</sup> ed. New Delhi: Pearson Education, 2012.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                       |
| <p><b>Evaluation Pattern: 60:40</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                       |
| <p><b>Total Marks: 50</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                       |
| <p><b>Continuous Comprehensive Evaluation: 20 Marks</b></p> <ul style="list-style-type: none"> <li>Journal: 10 Mark</li> <li>Students Performance: 5 Mark</li> <li>Attendance: 5 Mark</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p><b>End Semester Examination: 30 Marks</b></p> <ul style="list-style-type: none"> <li>Question -1:</li> <li>Question -2:</li> </ul> |

|                                                                                   |                                                                                                                                                         |                            |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|  | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b> |                            |
|                                                                                   | Yashavantrao Chavan Institute of Science, Satara                                                                                                        |                            |
|                                                                                   | <b>Board of Studies in Drug Chemistry</b>                                                                                                               |                            |
|                                                                                   | <b>Programme:</b> B.Sc.II                                                                                                                               | <b>Semester - III</b>      |
|                                                                                   | <b>Type:</b> VSC                                                                                                                                        | <b>Marks:</b> 50           |
|                                                                                   | <b>Credits:</b> 2                                                                                                                                       | <b>From:</b> A. Y. 2025-26 |
|                                                                                   | <b>Name of the Course:</b> BDCPVSC I Synthesis of Hygienic and Antiseptic Compounds                                                                     |                            |

**Course Objectives:** Students should be able to...

- 1) understand and implement standard safety procedures and protocols.
- 2) gain a comprehensive understanding of health and hygiene principles.
- 3) acquire hands-on skills in formulating various hygiene products.
- 4) integrate the principles of Good Manufacturing Practices (GMP) throughout the practical sessions.

**Course Outcomes:** By the end of course, students will be able to...

- 1) adopt hands-on proficiency in formulating a variety of hygiene and antiseptic products.
- 2) demonstrate competence in implementing quality control measures to ensure the efficiency and safety of hygiene and antiseptic products.
- 3) improve saponification skills.
- 4) implement standard safety protocols for personal.

| Module | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Hrs |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|        | <p align="center"><b>(Any 15 of the following)</b></p> <ol style="list-style-type: none"> <li>1. To learn a standard operating procedure to wear the PPE kit.</li> <li>2. To study &amp; understand the health &amp; Hygiene.</li> <li>3. To creating hygienic lotions: formulation and techniques.</li> <li>4. Hands-on hygiene: crafting and understanding hygienic gels.</li> <li>5. Preparation of soap to improve saponification skills.</li> <li>6. Creams of cleanliness: formulating and making hygienic creams.</li> <li>7. To prepare hygienic creams.</li> <li>8. To prepare antiseptic hand sanitizer.</li> <li>9. To prepare antiseptic wipes.</li> <li>10. Crafting an effective hand wash solution.</li> <li>11. To prepare antiseptic sprayer.</li> <li>12. To prepare antiseptic disinfectant.</li> <li>13. To prepare chlorhexidine an antiseptic powder.</li> <li>14. To prepare hygiene floor maintainer.</li> <li>15. To prepare oral antiseptics.</li> <li>16. To prepare antiseptic gargle and mouth wash</li> </ol> | 60  |

**Reference Books:**

- 1) Block, Seymour S. Disinfection, Sterilization, and Preservation. 5<sup>th</sup> ed. Philadelphia: Lea & Febiger, 2001.
- 2) Curtis, Valerie, and Sandy Cairncross. "Dirt, disease and the marketing of hygiene." Journal of

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <p>Industrial Ecology 7, no. 3-4, 2004</p> <p>3) Lis-Balchin, Maria. Aromatherapy Science: A Guide for Healthcare Professionals. London: Pharmaceutical Press, 2006.</p> <p>4) McDonnell, Gerald, and A. Denver Russell. "Antiseptics and disinfectants: activity, action, and resistance." Clinical Microbiology Reviews 12, no. 1, 1999</p> <p>5) Snowden, Brian. "Personal hygiene." In Encyclopedia of Food Microbiology, 2<sup>nd</sup> ed., edited by Carl A. Batt and Mary Lou Tortorello, 3:1003-1009. Amsterdam: Elsevier, 2014.</p> |                                                                                                                                    |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                    |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                    |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b> <ul style="list-style-type: none"> <li>• Journal: 10 Mark</li> <li>• Students Performance: 5 Mark</li> <li>• Attendance: 5 Mark</li> </ul>                                                                                                                                                                                                                                                                                                                                               | <b>End Semester Examination: 30 Marks</b> <ul style="list-style-type: none"> <li>• Question -1:</li> <li>• Question -2:</li> </ul> |

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|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------|
|                                                                 | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                            |            |
|                                                                                                                                                  | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |            |
|                                                                                                                                                  | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                            |            |
|                                                                                                                                                  | <b>Programme:</b> B.Sc.II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Semester - III</b>      |            |
|                                                                                                                                                  | <b>Type:</b> SEC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Marks:</b> 50           |            |
|                                                                                                                                                  | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>From:</b> A. Y. 2025-26 |            |
| <b>Name of the Course:</b> BDCPSEC I Separation Techniques                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| <b>Course Objectives:</b> Students should be able to...                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 1) recall different methods of separation.                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 2) learn functional group detection.                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 3) understand the importance of separation techniques in practical skills.                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 4) acquire skill to separate binary mixtures.                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| <b>Course Outcomes:</b> By the end of course, students will be able to...                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 1) isolate active pharmaceutical ingredients from given tablet.                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 2) extract oil from given natural source.                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 3) identify the type of given mixture and separate it.                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 4) determine the functional group of given organic compound.                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| <b>Module</b>                                                                                                                                    | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                            | <b>Hrs</b> |
|                                                                                                                                                  | <b>(Any 15 of the following)</b><br>1. Isolation of Active Pharmaceutical Ingredient from given pharmaceutical tablet.<br>a) Paracetamol<br>b) Aspirin<br>c) Ibuprofen<br>2. Extraction of piperazine from black paper by Soxhlet apparatus.<br>3. Separation of Miscible liquids by simple distillation<br>4. Separation of compound mixture by steam distillation<br>5. Identification and Separation of binary mixture of<br>a) Acid-Base<br>b) Acid-Phenol<br>c) Acid- Neutral<br>d) Base-phenol<br>e) Base- Neutral<br>6. Isolation of crude drugs from natural sources. (Any Two)<br>7. Separation of mixture of compound with the help of TLC.<br>8. Separation of mixture of compound with the help of paper chromatography.<br>9. Separation of mixture of compound with the help of column chromatography. |                            | 60         |
| <b>Reference Books:</b>                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 1) Aboul-Enein, Hassan Y., 1 <sup>st</sup> ed. Separation Techniques in Clinical Chemistry. 1 <sup>st</sup> ed. Boca Raton, FL: CRC Press, 2003. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 2) Bock, Rudolf, and Reinhard Nießner.                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 3) Burgot, Gwenola, and Jean-Louis Burgot. General Analytical Chemistry: Separation and Spectral Methods. Boca Raton, FL: CRC Press, 2023.       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |
| 4) Kapadiya, Khushal, and Jyoti Kuchhadiya. A Handbook of Separation Techniques. Mumbai:                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |            |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Himalaya Publishing House, 2021.                                                                                                                                                               |                                                                                                                                   |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                               |                                                                                                                                   |
| <b>Total Marks: 50</b>                                                                                                                                                                         |                                                                                                                                   |
| <b>Continuous Comprehensive Evaluation:20 Marks</b> <ul style="list-style-type: none"> <li>• Journal: 10 Mark</li> <li>• Students Performance: 5 Mark</li> <li>• Attendance: 5 Mark</li> </ul> | <b>End Semester Examination:30 Marks</b> <ul style="list-style-type: none"> <li>• Question -1:</li> <li>• Question -2:</li> </ul> |

|                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|                                                                                                                                                                                                               | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                         |                            |
|                                                                                                                                                                                                                                                                                                | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                |                            |
|                                                                                                                                                                                                                                                                                                | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                       |                            |
|                                                                                                                                                                                                                                                                                                | <b>Programme:</b> B.Sc.II                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Semester - III</b>      |
|                                                                                                                                                                                                                                                                                                | <b>Type:</b> IKS                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Marks:</b> 50           |
|                                                                                                                                                                                                                                                                                                | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                               | <b>From:</b> A. Y. 2025-26 |
| <b>Name of the Course: BDCTIKS II Indian Health Sciences</b>                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| <b>Course Objectives:</b> Students should be able to...<br>1) recall the basics qualities of a vaidya.<br>2) study daily regimen for maintenance of good health.<br>3) learn basic concepts of ayurveda.<br>4) understand importance of digestion in maintenance of good health.               |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| <b>Course Outcomes:</b> By the end of course, students will be able to...<br>1) discuss characteristics of vaidya.<br>2) explain causes of diseases according to ayurveda.<br>3) describe ashtanga ayurveda to society.<br>4) apply the relationship of daily regimen to maintain good health. |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                            |
| <b>Module</b>                                                                                                                                                                                                                                                                                  | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Hrs</b>                 |
| <b>Module -1:</b>                                                                                                                                                                                                                                                                              | <b>Basic Concepts of Ayurveda</b><br>1.1 Vedic foundations of Ayurveda, concerne of Ayurveda with<br>1.2 Maintenance of good health and treatment of disease,<br>1.3 The three Gunas and three Doshas,<br>1.4 Panchamabhuta and Sapta- Dhatu<br>1.5 The importance of Agni (digestion).<br>1.6 Six Rasas and their relation to doshas.<br>1.7 Ayurvedic view of the cause of dCCEase.                                           | 8                          |
| <b>Module -2:</b>                                                                                                                                                                                                                                                                              | <b>Daily regimen and seasonal regimen</b><br>2.1. Dinacharya or daily regimen for the maintenance of good health<br>2.2. Rutucharya<br>2.3. Seasonal regimen<br>2.4. Effects of seasonal regimen on health                                                                                                                                                                                                                      | 6                          |
| <b>Module -3:</b>                                                                                                                                                                                                                                                                              | <b>Introduction to Charaka- Samhita</b><br>3.1. Charaka and Sushruta on the qualities of a Vaidya. The whole world is a teacher of the good Vaidya.<br>3.2. Charaka's description of a hospital. Hospitals in ancient and mediaeval India.<br>3.3. Flourishment of Ayurveda: Flourishment of Ayurveda till 18/19 <sup>th</sup> centuries.<br>3.4. Surgical practices, inoculation.<br>3.5. Current revival of Ayurveda and Yoga | 9                          |
| <b>Module -4:</b>                                                                                                                                                                                                                                                                              | <b>Introduction to Sushruta- Samhita</b><br>4.1 Introduction of Sushruta- Samhita,<br>4.2 Sections on plastic surgery,                                                                                                                                                                                                                                                                                                          | 7                          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                      |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4.3 Cataract surgery and anal fistula,<br>4.4 The large pharmacopeia of Ayurveda.                                                                                                                                    |  |
| <b>Reference Books:</b><br>1) Das B., Charak Samhita: Text with English Translation & Critical Exposition, 2009<br>2) Krishan S., Essential Ayurveda; Jaico publishing house. 2021<br>3) Lad V., Ayurveda: The Science of Self-Healing; Motilal Banarsi dass Publishers. 2017<br>4) Srikanth Murty K. R., Illustrated Sushrut Samhita Text English Tr; Chaukhamba orientatika publisher 2012,<br>5) Tiwari M., Ayurveda: Secrets of Healing: The complete Ayurvedic guide to healing through Pancha Karma seasonal therapies, diet, herbal remedies and memory; Motilal Banarsidass Publishers. 2017 |                                                                                                                                                                                                                      |  |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                      |  |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                      |  |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b> <ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M</li> </ul> Best two scores will be considered for final internal evaluation                                                                                                                                                                                                         | <b>End Semester Examination:30 Marks</b> <ul style="list-style-type: none"> <li>• Question -1 10 Marks</li> <li>• Question -2 20 Marks</li> <li>• Question -3 20 Marks</li> </ul> Note: 50 Mark converted to 30 Mark |  |



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - IV**

**Type:** Major (DSC VII)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCT 241 Enzymes and Metabolic Pathways

**Course Objectives:** Students should be able to...

- 1) study the fundamental principles of enzyme structure and function.
- 2) understand the nature of enzymes as biological catalysts and their significance in metabolic reactions.
- 3) learn parameters such as  $K_m$ ,  $V_{max}$ , and catalytic efficiency.
- 4) explore the various mechanisms by which enzymes catalyse biochemical reactions.

**Course Outcomes:** By the end of course, students will be able to...

- 1) explain factors affecting enzyme activity, such as pH, temperature, and substrate concentration.
- 2) identify key metabolic pathways, including glycolysis, the citric acid cycle, and oxidative phosphorylation.
- 3) analyze Enzyme Structure and Function.
- 4) elaborate the principles of enzyme kinetics, including Michaelis-Menten kinetics, Lineweaver-Burk plots, and factors affecting enzyme activity.

| Module            | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Hrs |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module -1:</b> | <b>Enzymes</b><br>1.1. Definition, Explanation of terms- Holoenzyme Apoenzyme, Coenzyme, prosthetic group, cofactor.<br>1.2. Classification of enzymes into six classes with one example of each class EC number of enzymes.<br>1.3. Enzyme as a catalyst concept of the activation energy in enzyme-catalysed reaction units of enzyme activity specific activity turnover number<br>1.4. Enzyme specificity types of specificity, the active site of the enzyme, and its features.<br>1.5. Theories of the mechanism of enzyme action lock and key and induced fit theory.<br>1.6. Factors affecting enzyme activity substrate concentration, pH, temperature. | 9   |
| <b>Module -2:</b> | <b>Enzyme Kinetics</b><br>2.1. Derivation of Michaelis-Menten equation, plot advantages, disadvantages significance of $K_m$ and $V_{max}$ .<br>2.2. Lineweaver-Burk equation and plot, Advantages, disadvantages.<br>2.3. Enzyme inhibition, types of inhibition (competitive, non-competitive, uncompetitive, substrate inhibition, allosteric inhibition).<br>2.4. Isoenzymes (lactate dehydrogenase, Creatine phosphokinase, Alkaline Phosphatase, Alcohol dehydrogenase.                                                                                                                                                                                    | 5   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                    |
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| <b>Module -3:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Carbohydrate Metabolism</b><br>3.1. Major pathways of carbohydrate metabolism.<br>3.2. Recapitulation of carbohydrates Glycolysis – Pathway, energetics and significance<br>3.3. Citric acid cycle- Pathway, energetics and significance.<br>3.4. HMP shunt and its significance.<br>3.5. Glucose-6-Phosphate dehydrogenase (G6PD) deficiency.<br>3.6. Glycogen metabolism pathways and glycogen storage diseases (GSD).<br>3.7. Gluconeogenesis- pathway and its significance. | 7                                                                                                                                                                                                                  |
| <b>Module -4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Lipid Metabolism</b><br>4.1 Introduction Classification of lipids and functions of lipids.<br>4.2 $\beta$ - Oxidation of fatty acid (Palmitic acid): activation of fatty acid, carnitine transport system, $\beta$ oxidation cycle, significance, energetic<br>4.3 Biosynthesis of fatty acid (Palmitic acid) & significance, Structure of fatty acid synthetase complex (Eukaryotes).                                                                                          | 9                                                                                                                                                                                                                  |
| <b>Reference Books:</b><br>1) Barar F. S., Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi. 2000<br>2) Choudhary N. C. And Gurbani N. K., Pharmaceutical Chemistry. Vallabh Prakashan, Delhi, 2014<br>3) Dr. Jain J. L., Fundamentals of Biochemistry, 7 <sup>th</sup> edition S. Chand & Company Ltd. New Delhi, 2016.<br>4) Gaud R. S. & Dr. Gupta G. D, Practical Pharmaceutics, CBS Publishers and Distributors New Delhi. 2000 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                    |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                    |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                    |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b><br><ul style="list-style-type: none"> <li>CCE -1 Compulsory Home assignment: 10 M</li> <li>CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>CCE- 3 Compulsory MCQ test: 10 M</li> </ul> Best two scores will be considered for final internal evaluation                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>End Semester Examination: 30 Marks</b><br><ul style="list-style-type: none"> <li>Question -1 10 Marks</li> <li>Question -2 20 Marks</li> <li>Question -3 20 Marks</li> </ul> Note: 50 Mark converted to 30 Mark |



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - IV**

**Type:** Major (DSC VIII)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCT 242 Spectroscopic Techniques

**Course Objectives:** Students should be able to...

- 1) understand the principles of nuclear spin, magnetic resonance, and NMR spectroscopy.
- 2) recognize the characteristic absorption bands in UV spectra and their correlation with molecular structure.
- 3) appreciate the role of spectroscopy in advancing scientific research, technology, and industry.
- 4) identify the characteristic absorption bands in IR spectra corresponding to different functional groups.

**Course Outcomes:** By the end of course, students will be able to...

- 1) explore the applications of UV spectroscopy in organic chemistry, pharmaceuticals, environmental analysis, and materials science.
- 2) explain the principles of vibrational and rotational transitions in molecules and their interaction with IR radiation.
- 3) Discuss the importance of spectroscopy in elucidating the structure, composition, and properties of materials at the molecular level.
- 4) illustrate the principles of nuclear spin, magnetic resonance, and NMR spectroscopy.

| Module            | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Hrs |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module -1:</b> | <b>Introduction to Spectroscopy</b><br>1.1. Meaning of spectroscopy, nature of electromagnetic radiation: wavelength, frequency, energy, amplitude, wave number and their relationship.<br>1.2. Different units of measurement of wavelength and frequency, different regions of electromagnetic radiations.<br>1.3. Interaction of radiation with matter: absorption, emission, fluorescence and scattering.<br>1.4. Types of spectroscopy and advantages of spectroscopic methods, energy types and energy levels of atoms and molecules. | 9   |
| <b>Module -2:</b> | <b>UV Visible Spectroscopy</b><br>2.1. Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra.<br>2.2. Beer and Lambert's law, derivation and deviations.<br>2.3. Instrumentation- sources of radiation, wavelength selectors, sample cells, detectors-Photo tube, photomultiplier tube, photo voltaic cell, silicon photodiode.<br>2.4. Applications spectrophotometric titrations, Single component, and multi-component analysis.                                                      | 5   |
| <b>Module -3:</b> | <b>Infra-red Spectroscopy</b><br>3.1. Introduction, Principle of IR Spectroscopy.<br>3.2. IR: Instrumentation, schematic diagram- Fundamental modes of vibrations                                                                                                                                                                                                                                                                                                                                                                           | 7   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>types and calculation – Condition for absorption of IR radiations Regions of IR Spectrum, fundamental group region, fingerprint region.</p> <p>3.3. Hooks Law for Calculation of vibrational frequency, Factors affecting on IR absorption frequency.</p> <p>Characteristic of IR absorption of following functional groups a) Alkanes, alkenes, alkynes b) Alcohol and phenols c) Ethers d) Carbonyl compounds e) Amines f) Nitro-compounds g) Aromatic Compounds</p>                                                   |                                                                                                                                                                                                                                     |
| <b>Module -4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><b>Nuclear Magnetic Resonance</b></p> <p>4.1 Introduction, Principles of PMR Spectroscopy.</p> <p>4.2 NMR -Instrumentation, Schematic diagram</p> <p>4.3 Magnetic and nonmagnetic nuclei</p> <p>4.4 Chemical shift- definition, measurement, calculation,</p> <p>4.5 Factors affecting Chemical shift, Shielding &amp; Deshielding, Peak Integration.</p> <p>4.6 Merits of TMS as PMR reference compounds.</p> <p>4.7 Coupling Constant, Types of Coupling Constant, Spin- spin splitting (n +1 rule), Applications.</p> | 9                                                                                                                                                                                                                                   |
| <p><b>Reference Books:</b></p> <p>1) Barar F. S., Essentials of Pharmacotherapeutics, S. Chand &amp; Company Ltd. New Delhi 2000</p> <p>2) Choudhary N. C. And Gurbani N. K., Pharmaceutical Chemistry. Vallabh Prakashan, Delhi. 2014</p> <p>3) Gaud R. S. &amp; Gupta G. D, Practical Pharmaceutics, CBS Publishers and Distributors, New Delhi. 2007</p> <p>4) Jain J. L., Fundamentals of Biochemistry, 7<sup>th</sup> edition S. Chand &amp; Company Ltd. New Delhi. 2016</p> <p>5) Jain N. K Textbook of Professional Pharmacy, 5<sup>th</sup> Vallabh Prakash, Delhi., 2009</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                     |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                     |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                     |
| <p><b>Continuous Comprehensive Evaluation: 20 Marks</b></p> <ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M</li> </ul> <p>Best two scores will be considered for final internal evaluation</p>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p><b>End Semester Examination: 30 Marks</b></p> <ul style="list-style-type: none"> <li>• Question -1 10 Marks</li> <li>• Question -2 20 Marks</li> <li>• Question -3 20 Marks</li> </ul> <p>Note: 50 Mark converted to 30 Mark</p> |

|                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--|
|                                                                                                                                                                                  | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                            |  |
|                                                                                                                                                                                                                                                                   | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                            |  |
|                                                                                                                                                                                                                                                                   | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                            |  |
|                                                                                                                                                                                                                                                                   | <b>Programme:</b> B.Sc.II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Semester - IV</b>       |  |
|                                                                                                                                                                                                                                                                   | <b>Type:</b> Major (DSCP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Marks:</b> 50           |  |
|                                                                                                                                                                                                                                                                   | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>From:</b> A. Y. 2025-26 |  |
| <b>Name of the Course: BDCP 243 Practical IV</b>                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
| <b>Course Objectives:</b> Students should be able to...                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
| 1) study structure interpretation by <sup>1</sup> H NMR.<br>2) learn instrument handling skill and related calculations.<br>3) enhance skill in structural illustration from IR spectra.<br>4) know the qualitative and quantitative analysis.                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
| <b>Course Outcomes:</b> By the end of course, students will be able to...                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
| 1) expertise in qualitative and quantitative analysis.<br>2) become skilled in interpreting IR spectra<br>3) evaluate the structural interpretation of the compound by <sup>1</sup> H NMR.<br>4) illustrate the functional group in the given structure.          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
| <b>Module</b>                                                                                                                                                                                                                                                     | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Hrs</b>                 |  |
|                                                                                                                                                                                                                                                                   | <p align="center"><b>(Any 15 of the following)</b></p> <p>1. Qualitative analysis and determination of types of Carbohydrates (4)<br/>2. Qualitative analysis of Proteins (4)<br/>3. Qualitative analysis of Lipids (4)<br/>4. Isolation of casein from milk<br/>5. To estimate Glucose by DNSA method<br/>6. Quantitative analysis of reducing sugar<br/>7. Quantitative analysis of proteins<br/>8. Estimation of fructose by Resorcinol method.<br/>9. Enzymatic hydrolysis of starch<br/>10. To measure the absorbance of KMnO<sub>4</sub> by using Colorimeter<br/>11. To measure the absorbance of CuSO<sub>4</sub> by using Colorimeter<br/>12. Structural illustration of Alcohol functional group by IR (Any 2)<br/>13. Structural illustration of Phenol functional group by IR (Any 2)<br/>14. Structural illustration of Ether functional group by IR (Any 2)<br/>15. Structural illustration of Ester functional group by IR (Any 2)<br/>16. Structural illustration of Aldehyde functional group by IR (Any 2)<br/>17. Structural illustration of Ketone functional group by IR (Any 2)<br/>18. Structural illustration of Amine functional group by IR (Any 2)<br/>19. Structural illustration of Nitro functional group by IR (Any 2)<br/>20. Structural illustration by <sup>1</sup>H NMR</p> | 60                         |  |
| <b>Reference Books:</b>                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |
| 1) Beckett A. H. & Stenlake, J. B. Practical Pharmaceutical Chemistry Vol I & II 4 <sup>th</sup> edition, Stahlone, Press of University of London. 2000.<br>2) Damodaran, K. Geetha. Practical Biochemistry. New Delhi: Jaypee Brothers Medical Publishers, 2020. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                            |  |

- 3) Parikh D. M. Handbook of Pharmaceutical Granulation Technology, 2020.
- 4) Paye M. Barel A. O, Maibach H., Handbook of Cosmetic Science and Technology. 1<sup>st</sup> edition CRC Press. 2001.
- 5) Shankara, Y. M. Shivaraja, M. K. Ganesh, and A. R. Shivashankara. Laboratory Manual for Practical Biochemistry. 2<sup>nd</sup> ed. New Delhi: Jaypee Brothers Medical Publishers, 2017.

**Evaluation Pattern: 60:40**

**Total Marks: 50**

**Continuous Comprehensive Evaluation: 20 Marks**

- Journal: 10 Mark
- Students Performance: 5 Mark
- Attendance: 5 Mark

**End Semester Examination: 30 Marks**

- Question -1:
- Question -2:



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - IV**

**Type:** Minor (DSC VII)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCT 244 Organic Chemistry

**Course Objectives:** Students should be able to...

- 1) understand the concept of reactive intermediates and their importance in organic chemistry.
- 2) study reaction mechanisms including substitution, elimination, addition, and rearrangement reactions.
- 3) describe the generation of electrophiles and their role in various electrophilic substitution reactions.
- 4) discuss the principles and mechanisms of aromatic nucleophilic substitution reactions.

**Course Outcomes:** By the end of course, students will be able to...

- 1) identify conditions that favor or inhibit the desired reaction pathways.
- 2) explain the concept of reactive intermediates and their significance in organic chemistry.
- 3) differentiate between  $SN^1$ ,  $SN^2$ , and  $SN^i$  mechanisms
- 4) classify and name amines, including aliphatic and aromatic amines.

| Module            | Title and Contents                                                                                                                                                                                                                                                                                                                                                                        | Hrs |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module -1:</b> | <b>Reactive Intermediates</b><br>1.1. Introduction of Reactive Intermediates<br>1.2. Carbocation<br>1.3. Carbanion<br>1.4. Carbon free radical<br>1.5. Nitrene<br>1.6. Arynes                                                                                                                                                                                                             | 7   |
| <b>Module -2:</b> | <b>Nucleophilic Substitution Reaction</b><br>2.1. Introduction to nucleophilic substitution reactions<br>2.2. $SN^1$ reaction<br>2.3. $SN^2$ reaction<br>2.4. $SN^i$ reaction<br>2.5. nucleophilic substitution reactions                                                                                                                                                                 | 6   |
| <b>Module -3:</b> | <b>Electrophilic Substitution Reaction</b><br>3.1. Introduction of electrophilic reactions<br>3.2. Generation of Electrophile<br>3.3. Aliphatic electrophilic substitution reactions<br>3.4. Aromatic electrophilic substitution reactions                                                                                                                                                | 8   |
| <b>Module -4:</b> | <b>Amines and Diazonium Salt</b><br>4.1 Amines (aliphatic and aromatic): up to 5 carbons<br>4.2 Preparations: from alkyl halides<br>4.3 Gabriel's Phthalimide Synthesis<br>4.4 Hoffmann bromamide reaction<br>4.5 Carbylamines test, Hinesburg test, reaction with $HNO_2$<br>4.6 Schotten-Baumann reaction<br>4.7 Electrophilic substitution reaction of aniline (Nitration, Bromination | 9   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                          |  |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Sulphonation)<br>4.8 Diazonium salts: Preparation from aromatic amines.<br>4.9 Reactions: conversion to benzene and phenol.                                                                                              |  |
| <b>Reference Books:</b><br>1) Clayden, Jonathan, Nick Greeves, and Stuart Warren. Organic Chemistry. 2 <sup>nd</sup> ed. Oxford: Oxford University Press, 2012.<br>2) McMurry, John. Organic Chemistry, 9 <sup>th</sup> ed. Boston: Cengage Learning, 2015.<br>3) Morrison, Robert Thornton, and Robert Neilson Boyd. Organic Chemistry. 6 <sup>th</sup> ed. Delhi: Pearson Education, 2005.<br>4) Solomons, T. W. Graham, and Craig B. Fryhle, Organic Chemistry. 11 <sup>th</sup> ed. Hoboken: John Wiley & Sons, 2013. |                                                                                                                                                                                                                          |  |
| <b>Evaluation Pattern: 60: 40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                          |  |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                          |  |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b><br><ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M</li> </ul> Best two scores will be considered for final internal evaluation                                                                                                                           | <b>End Semester Examination: 30 Marks</b><br><ul style="list-style-type: none"> <li>• Question -1 10 Marks</li> <li>• Question -2 20 Marks</li> <li>• Question -3 20 Marks</li> </ul> Note: 50 Mark converted to 30 Mark |  |



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - IV**

**Type:** Minor (DSC VIII)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCT 245 Analytical Chemistry

**Course Objectives:** Students should be able to...

- 1) understand the fundamental principles of atomic absorption spectroscopy (AAS).
- 2) learn classification and basic principles of electroanalytical methods.
- 3) know the diverse applications of qualitative and quantitative analysis in various fields.
- 4) identify the elements present in a sample using FES.

**Course Outcomes:** By the end of course, students will be able to...

- 1) explain types of conductance, degree of dissociation.
- 2) interpret the results of FES analysis.
- 3) illustrate the basic principles of AAS.
- 4) select and apply relevant qualitative and quantitative techniques to collect, analyze, and interpret data effectively.

| Module            | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Hrs |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module -1:</b> | <b>Electro Analytical Methods of Analysis</b><br>1.1. Classification of electro analytical methods of analysis,<br>1.2. Basic principle of:<br>i] pH meter ii] Potentiometer and iii] Conductometer<br>1.3. Conductance measurement- Direct reading conductivity bridge, conductivity cell and cell constant<br>1.4. Conductometric Titrations: Introduction, Instrumentation<br>1.5. Types of conductometric Titrations, Advantages and disadvantages of conductometric Titrations.                                                                                                                                  | 7   |
| <b>Module -2:</b> | <b>Fundamentals of Analysis</b><br>2.1. Principal of qualitative and quantitative analysis,<br>2.2. Classification of qualitative analysis: organic and inorganic qualitative analysis<br>2.3. Identification of compounds, the functional group analysis,<br>2.4. Application of solubility product and common ion effect,<br>2.5. separation of cation into groups,<br>2.6. Application of complex formation,<br>2.7. Application of oxidation – reduction in inorganic qualitative analysis<br>2.8. Choice of groups reagents & Group analysis.<br>2.9. Inter faring anions (Flurate, borate, oxalate & phosphate) | 9   |
| <b>Module -3:</b> | <b>Flame Emission Spectroscopy</b><br>3.1. Introduction and theory of flame emission spectroscopy,<br>3.2. Principle- Measurement of emission of atomic species,<br>3.3. Advantages and disadvantages of FES,<br>3.4. Instrumentation of single beam FES,                                                                                                                                                                                                                                                                                                                                                             | 7   |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3.5. Inferences in emission spectroscopy,<br>3.6. method of analysis: calibration curve method, standard addition method and internal standard method,<br>3.7. Qualitative and quantitative applications of FES,<br>3.8. Numerical problems                                                                                            |                                                                                                                                                               |
| <b>Module -4:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Atomic Absorption Spectroscopy</b><br>4.1 Principles of AAS,<br>4.2 Difference between AAS and flame Photometry,<br>4.3 Instrumentation of single beam for atomic absorption spectrometer (Source, chopper, nebulizer, monochromator, detector, amplifier),<br>4.4 Interference: Spectral and chemical,<br>4.5 Applications of AAS. | 9                                                                                                                                                             |
| <b>Reference Books:</b><br>1) G. R. Chatwal and Sham Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, 2011<br>2) G. Svehla, B. Sivasankar, Vogel's text book of Qualitative Inorganic Analysis, Pearson Education India, 2012<br>3) J. Mendham, B. Sivasankar) Vogel's text book of Quantitative Chemical Analysis, Pearson Education India, 2009<br>4) S. M. Khopkar, Basic concepts in Analytical chemistry, New Age International Ltd, 2017 |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                               |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                               |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                               |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b><br>• CCE -1 Compulsory Home assignment: 10 M<br>• CCE -2 Short & long Answer Question Test/ Seminar/Open Book Test/ Book Review//Field Work/ Industry Visit: 10 M<br>• CCE- 3 Compulsory MCQ test: 10 M<br>Best two scores will be considered for final internal evaluation                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                        | <b>End Semester Examination: 30 Marks</b><br>• Question -1 10 Marks<br>• Question -2 20 Marks<br>• Question -3 20 Marks<br>Note: 50 Mark converted to 30 Mark |



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc. II

**Semester - IV**

**Type:** Minor (DSCP)

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCP 246 Minor Practical II

**Course Objectives:** Students should be able to...

- 1) understand the mechanism and conditions involved in the preparation of Benzylic acid from benzil.
- 2) differentiate between various acids (cinnamic acid, Succinic acid, Oxalic acid) based on their chemical properties and reactions.
- 3) discuss the importance of green chemistry principles in organic synthesis and their impact on reducing waste generation, energy consumption, and environmental pollution.
- 4) apply knowledge of organic reactions and mechanisms to propose efficient synthetic routes for the preparation of target compounds.

**Course Outcomes:** By the end of course, students will be able to...

- 1) perform the synthesis of benzylic acid from benzil using appropriate reagents and conditions.
- 2) synthesize dibenzalacetone from benzaldehyde derivatives using an eco-friendly catalyst.
- 3) identify and differentiate between various organic compounds through qualitative tests.
- 4) determine the strength of given acid/base.

| Module | Title and Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Hrs |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|        | (Any 15 of the following)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |
|        | <b>1. Organic Preparations:</b><br>a) Preparation of Benzylic acid from Benzil<br>b) Preparation of diazonium salt.<br>c) Preparation of Bromine solution.<br>d) Preparation of dibenzalacetone (Green synthesis)<br><b>2. Organic qualitative analysis:</b> (Minimum 8 compounds)<br>a) Benzoic acid<br>b) acetyl salicylic acid<br>c) aniline<br>d) o- toluidine<br>e) N, N dimethylaniline<br>f) Chlorobenzene<br>g) Bromo benzene<br>h) Nitrobenzene<br>i) M-dinitrobenzene<br>j) Naphthalene<br>k) Thiourea<br><b>3. Preparation of derivatives:</b><br>a) Picrate derivative of anthracene & beta naphthol.<br>b) Oxime derivative of acetone and acetophenone<br>c) 2:4 DNP of acetaldehyde and acetophenone. | 60  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <p>d) Iodoform (acetone).<br/>e) Oxalate derivative of urea.</p> <p><b>4. Conductometry:</b><br/>a) Determination of strength of strong acid by titrating against strong alkali</p> <p><b>5. pH Metry:</b><br/>a) Determination of pH of given soil samples<br/>b) Determination of percentage purity of boric acid using supplied NaOH<br/>c) Determination of titrable acidity in the given sample of milk or lassi</p>                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                           |
| <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1) Furniss, Brian S., et al. Vogel's Textbook of Practical Organic Chemistry. 5<sup>th</sup> ed. London: Longman Scientific &amp; Technical, 1989.</li> <li>2) Mann, Frederick George, and Bernard Charles Saunders. Practical Organic Chemistry. 4<sup>th</sup> ed. Cambridge: Cambridge University Press, 1960.</li> <li>3) Pavia, Donald L., Gary M. Lampman, George S. Kriz, and James A. Vyvyan. Introduction to Organic Laboratory Techniques: A Microscale Approach. 5<sup>th</sup> ed. Belmont, CA: Brooks/Cole, Cengage Learning, 2013.</li> <li>4) Vogel, Arthur I. Vogel's Textbook of Practical Organic Chemistry. 5<sup>th</sup> ed. Edited by Brian S. Furniss et al. London: Longman Scientific &amp; Technical, 1989</li> </ol> |                                                                                                                                           |
| <p align="center"><b>Evaluation Pattern: 60:40</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                           |
| <p align="center"><b>Total Marks: 50</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                           |
| <p><b>Continuous Comprehensive Evaluation: 20 Marks</b></p> <ul style="list-style-type: none"> <li>• CCE -1 Compulsory Home assignment: 10 M</li> <li>• CCE -2 Short &amp; long Answer Question Test/ Seminar/Open Book Test/ Book Review/Field Work/ Industry Visit: 10 M</li> <li>• CCE- 3 Compulsory MCQ test: 10 M<br/>Best two scores will be considered for final internal evaluation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                | <p><b>End Semester Examination: 30 Marks</b></p> <ul style="list-style-type: none"> <li>• Question -1:</li> <li>• Question -2:</li> </ul> |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Programme:</b> B.Sc.II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Semester - IV</b>       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Type:</b> VSC (Vocational Skill Course)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Marks:</b> 50           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Credits:</b> 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>From:</b> A. Y. 2025-26 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Name of the Course: BDCPVSC II Skin and Hair Care Products</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                            |  |
| <b>Course Objectives:</b> Students should be able to...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |
| <div>1) understanding of cosmetic science, enabling you to confidently create high-quality products</div> <div>2) equip with the knowledge and practical skills to formulate and prepare a diverse range of effective, marketable, and safe cosmetic products.</div> <div>3) formulate and prepare various hair care products.</div> <div>4) Prepare essential cosmetic bases and popular products.</div>                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |
| <b>Course Outcomes:</b> By the end of course, students will be able to...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |
| <div>1) Discuss the principles of formulation, including the role of key ingredients.</div> <div>2) select and combine ingredients that promote hydration, skin barrier function, and overall skin health.</div> <div>3) master the art and science of formulating cosmetic products, utilizing appropriate techniques for blending, emulsification, and stabilization.</div> <div>4) apply theoretical knowledge through hands-on experiences, gaining practical skills in the creation of hair conditioners, moisturizers, body lotions, face massage oils, sunscreen lotions, skin cleansers, and face washes.</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |
| <b>Module</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Hrs</b>                 |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <div>(Any 15 of the following)</div> <div>1. To formulate and prepare an effective and marketable shampoo.</div> <div>2. Moisture Mastery: Formulating luxurious skin elixirs</div> <div>3. Lotion Alchemy: Creating Indulgent Body Bliss</div> <div>4. Almond Elegance: Artisanal face massage oil delight</div> <div>5. Purity Unveiled: The art of skin cleanser creation</div> <div>6. Face Freshness Fusion: Crafting invigorating face wash marvels</div> <div>7. To prepare a tonner for the dry skin.</div> <div>8. To prepare herbal mehndi for shiny hairs. (black &amp; brown)</div> <div>9. To prepare colour corrector for dark spots.</div> <div>10. To prepare aloe-vera gel.</div> <div>11. To prepare a hair serum.</div> <div>12. To prepare a face scrub.</div> <div>13. To prepare gulabjal.</div> <div>14. To prepare vaselline.</div> <div>15. To prepare herbal face mask.</div> <div>Note: any other relevant practical may be added.</div> | 60                         |  |
| <b>Reference Books:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |
| <div>1) Block, Seymour S. Disinfection, Sterilization, and Preservation. 5<sup>th</sup> ed. Philadelphia: Lea &amp; Fibiger, 2001.</div> <div>2) Curtis, Valerie, and Sandy Cairncross. "Dirt, disease and the marketing of hygiene." Journal of</div>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |  |

Industrial Ecology 7, no. 3-4 2004

- 3) McDonnell, Gerald, and A. Denver Russell. "Antiseptics and disinfectants: activity, action, and resistance." Clinical Microbiology Reviews 12, no. 1 1999
- 4) Snowdon, Brian. "Personal hygiene." In Encyclopaedia of Food Microbiology, 2<sup>nd</sup> ed., edited by Carl A. Batt and Mary Lou Tortorello, 3:1003-1009. Amsterdam: Elsevier, 2014.

**Evaluation Pattern: 60:40**

**Total Marks: 50**

**Continuous Comprehensive Evaluation: 20 Marks**

- Journal: 10 Mark
- Students Performance: 5 Mark
- Attendance: 5 Mark

**End Semester Examination: 30 Marks**

- Question -1:
- Question -2:

|                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
|                                                                                                                                                                                                                                                                                                                 | <b>Karmaveer Bhaurao Patil University, Satara</b><br>(A State Public University Est. u/s 3(6) of MPUA 2016)<br><b>Faculty of Science and Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                  | Yashavantrao Chavan Institute of Science, Satara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Board of Studies in Drug Chemistry</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                            |
|                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Programme:</b> B.Sc. II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Semester - IV</b>       |
|                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Type:</b> SEC (Skill Enhancement Course)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Marks:</b> 25           |
|                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Credits:</b> 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>From:</b> A. Y. 2025-26 |
| <b>Name of the Course: BDCTSEC II Advanced Analytical Techniques</b>                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |
| <b>Course Objectives:</b> Students should be able to...<br>1) learn techniques for isolating and purifying individual compounds from the fractions collected during chromatography.<br>2) monitor the temperature of the distillation apparatus.<br>3) analyse experimental data obtained from chromatographic experiments.<br>4) develop skills in troubleshooting chromatographic separations. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |
| <b>Course Outcomes:</b> By the end of course, students will be able to...<br>1) note the appearance of the impure solid compound before recrystallization<br>2) determine the mass of the recrystallized compound obtained after the process.<br>3) identify the different purified compounds.<br>4) describe the methods of crystallization.                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                            |
| <b>Module</b>                                                                                                                                                                                                                                                                                                                                                                                    | <b>Title and Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Hrs</b>                 |
| <b>Module -1:</b>                                                                                                                                                                                                                                                                                                                                                                                | <b>Purification Techniques</b><br>1. Overview of common purification methods.<br>2. Fundamentals of Recrystallization: Definition and basic principle: Solubility differences based on temperature. Ideal solvent properties for recrystallization (good solubility at high temp, poor at low temp, non-reactive, volatile, etc.).<br>3. Factors affecting solubility (polarity, intermolecular forces).<br>4. The Recrystallization Process: Steps involved: Dissolution, hot filtration, cooling, crystal formation, cold filtration, washing, drying.<br>5. Effect of impurities on crystal growth.<br>6. Techniques for inducing crystallization (scratching, seeding).<br>7. Assessing Effectiveness and Optimization: Determining purity: Melting point depression, mixed melting point, Calculating percent recovery<br>8. Optimization strategies: Solvent selection, temperature control, cooling rate.<br>9. Limitations of recrystallization<br>10. Distillation: Definition and basic principle: Separation based on differences in boiling points. Vapor pressure and boiling point relationship (Clausius-Clapeyron concept, qualitatively).<br>11. Types of Distillation: Simple distillation, Fractional Distillation, Steam distillation.<br>12. Chromatography: introduction, Types of Chromatography.<br>13. High-Performance Liquid Chromatography (HPLC): Principle: High-pressure liquid chromatography, enhanced efficiency. | 15                         |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>14. Types of HPLC modes: Normal phase vs. Reverse phase (focus on reverse phase as it's more common for aqueous samples).</p> <p>15. Advantages over traditional column chromatography (speed, resolution, automation).</p> <p>16. Applications: Analysis of complex mixtures, pharmaceutical quality control, environmental analysis, identifying unknown compounds.</p> |  |
| <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1) Furniss, Brian S., Anthony J. Hannaford, Peter W. G. Smith, and Austin R. Tatchell. Vogel's Textbook of Practical Organic Chemistry. 5<sup>th</sup> ed. Harlow: Longman Scientific &amp; Technical, 1989.</li> <li>2) Lehman, John W. Operational Organic Chemistry: A Problem-Solving Approach to the Laboratory Course. 4<sup>th</sup> ed. Upper Saddle River, NJ: Prentice Hall, 2009.</li> <li>3) Pavia, Donald L., Gary M. Lampman, George S. Kriz, and James A. Vyvyan. Introduction to Organic Laboratory Techniques: A Microscale Approach. 5<sup>th</sup> ed. Belmont, CA: Brooks/Cole, Cengage Learning, 2013.</li> <li>4) Skoog, Douglas A., F. James Holler, and Stanley R. Crouch. Principles of Instrumental Analysis. 7<sup>th</sup> ed. Boston: Cengage Learning, 2017.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                              |  |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                              |  |
| <b>Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                              |  |
| <b>Continuous Comprehensive Evaluation: 20 Mark</b> <ul style="list-style-type: none"> <li>• Journal: 10 Mark</li> <li>• Students Performance: 5 Mark</li> <li>• Attendance: 5 Mark</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>End Semester Examination: 30 Marks</b> <ul style="list-style-type: none"> <li>• Question -1:</li> <li>• Question -2:</li> </ul>                                                                                                                                                                                                                                           |  |



# Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

## Faculty of Science and Technology

Yashavantrao Chavan Institute of Science, Satara

### Board of Studies in Drug Chemistry

**Programme:** B.Sc.II

**Semester - IV**

**Type:** VEC

**Marks:** 50

**Credits:** 2

**From:** A. Y. 2025-26

**Name of the Course:** BDCTVEC II Environmental Awareness for Drug Chemistry

**Course Objectives:** Students should be able to...

- 1) understand the United Nations Sustainable Development Goals.
- 2) recognize the responsibility of an environmentally aware citizen in promoting sustainability at local, national, and global levels.
- 3) explore and analyze various environmental challenges such as pollution freshwater overuse, fuel and energy shortage, biodiversity loss, and natural disasters.
- 4) discuss the concept of sustainable development and the ethical responsibilities of individuals, businesses, and governments in protecting the environment.

**Course Outcomes:** By the end of course, students will be able to...

- 1) identify the links between human activities, especially industrial and pharmaceutical sectors, and their effects on the environment.
- 2) apply ethical principles in making decisions related to environmental sustainability and conservation.
- 3) analyze the environmental impact of drug chemistry, including the creation of pollution and waste in pharmaceutical manufacturing processes.
- 4) critically assess environmental issues and propose sustainable alternatives to current practices in industries like pharmaceuticals, energy, and agriculture.

| Module            | Title and Contents                                                                                                                                                                                                                                                                                                                                                    | Hrs |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module -1:</b> | <b>Environmental Issues</b><br>1.1. Pollution (Air Water and land) Fresh water overuse,<br>1.2. Natural disasters, Fuel and Energy shortage due to overuse,<br>1.3. Increase in the wasteland, Biodiversity loss,<br>1.4. Global warming and climate change (Cause and intensity of the problem),<br>1.5. Role of Drug chemistry in creation of environmental issues. | 8   |
|                   | <b>Environmental Laws and Ethics</b><br>2.1. Environmental protection act<br>2.2. Wildlife protection act<br>2.3. Forest conservation act prevention and control of pollution action (air, water and land) from unsustainable to sustainable development<br>2.4. Responsibilities of an environmentally aware citizen.                                                | 8   |
|                   | <b>Sustainable Development Goals and Drug Policy</b><br>3.1. End Poverty<br>3.2. End Hunger, achieve food security and improved nutrition, and promote sustainable agriculture.<br>3.3. Ensure healthy livesand promote well-being for all ages.<br>3.4. Achieve gender equality and empower all women and girls, Sustainable use of                                  | 7   |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | terrestrial ecosystem                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Role of Drug Chemistry in Meeting the Sustainable Development Goals</b><br>4.1 Good health and well-being,<br>4.2 CleanWater and sanitation,<br>4.3 Affordable and clean energy,<br>4.4 Industryinnovation and infrastructure,<br>4.5 Responsible consumption and reproduction.<br>4.6 Descent work and economic growth, ClimateAction, life below water, life on land.<br>4.7 Peace justice and strong institutions, partnership for the goals. | 7                                                                                                                                                             |
| <b>Reference Books:</b><br>1) Botkin, Daniel B., and Edward A. Keller. Environmental Science: Earth as a Living Planet. 9 <sup>th</sup> ed. Hoboken, NJ: Wiley, 2014.<br>2) Cunningham, William P., and Mary Ann Cunningham. Environmental Science: A Global Concern. 14 <sup>th</sup> ed. New York: McGraw-Hill Education, 2020.<br>3) Ryden, Lars, et al., eds. Environmental Science: Understanding, Protecting, and Managing the Environment in the Baltic Sea Region. Lund: Studentlitteratur AB, 2003.<br>4) Shah, Kalim. Sustainability and the Pharmaceutical Industry: Emerging Issues and Opportunities. Oxford: Academic Press, 2022. |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                               |
| <b>Evaluation Pattern: 60:40</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                               |
| <b>Total Marks: Total Marks: 50</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                               |
| <b>Continuous Comprehensive Evaluation: 20 Marks</b><br>• CCE -1 Compulsory Home assignment: 10 M<br>• CCE -2 Short & long Answer Question Test/ Seminar/Open Book Test/ Book Review/Field Work/ Industry Visit: 10 M<br>• CCE- 3 Compulsory MCQ test: 10 M<br>Best two scores will be considered for final internal evaluation                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>End Semester Examination: 30 Marks</b><br>• Question -1 10 Marks<br>• Question -2 20 Marks<br>• Question -3 20 Marks<br>Note: 50 Mark converted to 30 Mark |